

SAP on DB2 for LUW: Exploitation of DB2's Workload Management in an SAP Environment



Applies to:

SAP NetWeaver AS ABAP and AS Java on IBM DB2 for Linux, UNIX, and Windows.

For more information, visit the [Landscape Design and Architecture homepage](#).

Summary

With DB2 Version 9.5 for Linux, UNIX, and Windows, a new feature called workload management (in the following referred to as WLM) was introduced. WLM lets you distinguish between different types of workloads that are running on the database system. With WLM, you can monitor these workloads separately from each other and distribute database resources over these workloads according to their business importance. This article provides an overview of how you can exploit WLM in an SAP environment and of the integration of WLM in the DBA Cockpit.

Author: Andreas Zimmermann

Company: SAP AG

Created on: December 2008

Author Bio

Andreas Zimmermann works as a developer in the IBM DB2 for Linux, UNIX, and Windows platform team at SAP. Andreas is responsible for the integration of DB2's WLM in the DBA Cockpit and the concepts proposed for using WLM in an SAP environment.

Table of Contents

Introduction	3
Stages of Workload Management.....	3
Terminology Used in the Context of WLM	3
WLM - Overview.....	4
How the SAP System Interacts with WLM.....	5
Proposed WLM Setup for an SAP Environment.....	6
Basic Setup of Workload Management.....	6
Enhanced Prioritization Scheme	8
Workload Management in the DBA Cockpit	9
Workloads and Service Classes	9
Overview	10
Workloads	11
Service Classes	12
Critical Activities	15
Threshold Configuration.....	15
Threshold Violations	16
Threshold Violation Details	18
Capture or Cancel Activities from the Application Snapshot	20
SAP WLM Setup Status	20
Workloads and Service Classes	20
Event Monitor Infrastructure.....	21
WLM Event Monitors.....	21
Basic Approaches for Using Workload Management in a Productive SAP Environment	22
Prevent Dialog Reporting from Being Slowed Down by ETL Processing in an SAP BI Environment.....	22
Create a High Priority Workload According To Business Relevance or SLAs	23
High Priority Workload for a Set of SAP Transactions	23
High Priority Workload for a Set of SAP Users	24
Enhanced Approaches for Using Workload Management	25

Introduction

In an SAP environment, you can have multiple SAP application components running on a single database system. Running only one SAP application component on your database system, can already generate thousands of database requests, where each of these requests can be of a different business relevance within that SAP application component. In a data warehouse scenario, for example, reports are constantly being generated to determine whether business targets are being met while in the background tasks are executed to load collected data into data cubes. Additionally, administration tasks such as backups and reorganizations can run to protect the data and make the server perform optimally. All these operations use the same database system and compete for the same resources.

A sophisticated workload management can help you to guarantee response times and to comply defined service level agreements (SLAs) without the need for manual intervention on a daily basis. WLM lets you assign more system resources to certain application areas or specific end users on-demand and based on their business relevance. Also, you can use WLM to monitor certain application areas separately from other application areas.

Stages of Workload Management

WLM has three clearly defined stages. The first stage is to identify the types of work that are running on the database system. The next stage is to actively manage work. In this stage, you assign resources and impose controls on the work running on the database system. The third stage of WLM is monitoring. While monitoring is described as the last stage of WLM, monitoring is ongoing.

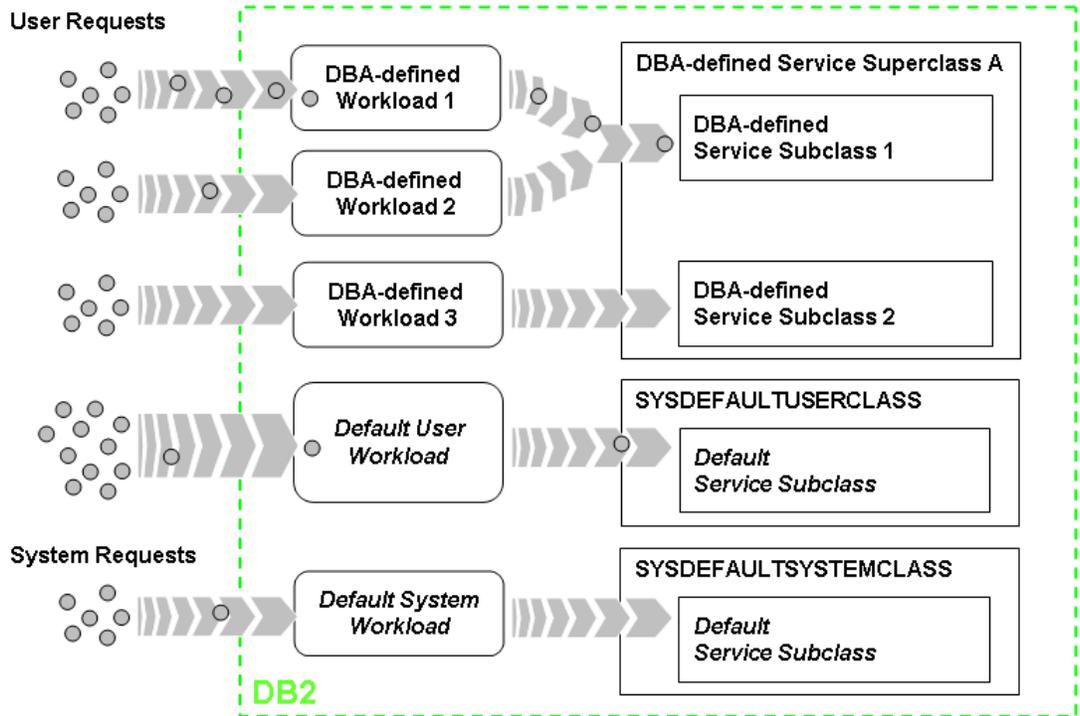
Of course, you can use WLM without actively controlling database resources. In this case, WLM would simply enable distinct monitoring that is based on specific application contexts.

Terminology Used in the Context of WLM

Term	Description
DB2 Workload	A workload serves as the primary point of control for <i>who</i> is submitting work. Workloads act as primary routers of work to a specific service class.
DB2 Service Class	A service class serves as the primary point of monitoring as well as resource control for executing work. Multiple service classes are organized in a hierarchical order. A top level service class is called <i>service superclass</i> . All other service classes are called service subclass.
DB2 Activity	An activity is an individual piece of work that consumes database resource during its lifetime. The lifetime can span one or more database requests. A CALL statement or a cursor are examples of activities; an OPEN and FETCH request are examples of database requests that occur during the life of a cursor activity.
DB2 Threshold	A threshold provides limits to control behaviors of database activities that are based on predictive and reactive elements. You can use thresholds to either record or even stop activities that consume more resources than allowed by the threshold definition.
DB2 Work Action Sets, Work Actions, Work Class Sets, Work Classes	Using work action sets, work actions, work class sets, and work classes, you can classify activities based on <i>what</i> they are in a similar fashion to how you can use workloads to classify activities based on <i>who</i> submitted them. For example, you can apply different work actions to LOAD activities so that they are processed differently than DML.

Note: Since the SAP-related integration of WLM is fully based on *who* is submitting work on the database system, the following sections concentrate on workloads when talking about identification of different types of work.

WLM - Overview



For more information about the WLM concept, see *Introduction to Workload Management Concepts* in the IBM DB2 V9.5 Information Center at:

<http://publib.boulder.ibm.com/infocenter/db2luw/v9r5/topic/com.ibm.db2.luw.admin.wlm.doc/doc/c0052594.html>

How the SAP System Interacts with WLM

To enable incoming work to be actively managed on the database system, the database system must be able to differentiate between these different types of work based on their business context. Therefore, the SAP database shared library for DB2 for LUW (in the following referred to as DB6 DBSL) enriches the context of each database transaction with application-related information by using client attributes.

For more information about client attributes, see the IBM DB2 V9.5 Information Center at:

<http://publib.boulder.ibm.com/infocenter/db2luw/v9r5/topic/com.ibm.db2.luw.apdv.api.doc/doc/r0001709.html>

Note: Only DB6 DBSL versions with a SAP kernel release level of 6.40 or higher are enriching the context of database transactions with application-related information. The DB6 DBSL that releases DB2 for LUW V9.5 for the according SAP release corresponds to the minimum patch level that is required to use this DBSL feature.

The following information is provided by the DB6 DBSL:

Client Attribute	Description
<i>CLIENT_INFO_USERID</i>	ABAP user ID
<i>CLIENT_INFO_WRKSTNAME</i>	Host name of the SAP application server
<i>CLIENT_INFO_APPLNAME</i>	Type of the SAP work process The following types are possible: <ul style="list-style-type: none"> - <i>ptype BTC</i> for SAP batch work processes - <i>ptype SPO</i> for SAP spool work processes - <i>ptype UPD</i> or <i>ptype UPD2</i> for SAP update work processes - the SAP transaction code for SAP dialog work processes
<i>CLIENT_INFO_ACCSTR</i>	Name of the ABAP Report

Note: For more information, see also SAP Note [1059905](#). This SAP Note always provides up-to-date information on the client attributes provided by the DB6 DBSL.

Besides the information that is provided by DB6 DBSL through the client attributes, additional information that can be also used to identify different types of work is:

- The application executable name, for example *disp+work.exe*.
Since the SAP kernel executables have different endings and naming schemes for different operating system platforms and SAP releases, the application executable name is only conditionally suitable to be used as an identifier for WLM in an SAP environment.
- The system user authorization ID, for example *SAP<SAPSID>*.
- The session user, session user group and session user role authorization IDs.
The initial value of the session user authorization ID is the same as the value of the system user authorization ID. Since an SAP system does not switch between authorization IDs within connections (no trusted context), this information is not suitable to be used as an identifying information for WLM in an SAP environment.

Proposed WLM Setup for an SAP Environment

Based on the information that is available from the application context as described in [How the SAP System Interacts with WLM \[page 5\]](#), a proposal for how to use WLM in an SAP environment was developed. This proposal has a two-tier setup that is described in the following.

Note: You can set up the proposed WLM configuration using a wizard in the DBA Cockpit. Keep in mind, however, that WLM is an optional feature. This means, that WLM objects are not created until you manually create them using the DBA Cockpit. For more information, see section [Workload Management in the DBA Cockpit \[page 9\]](#).

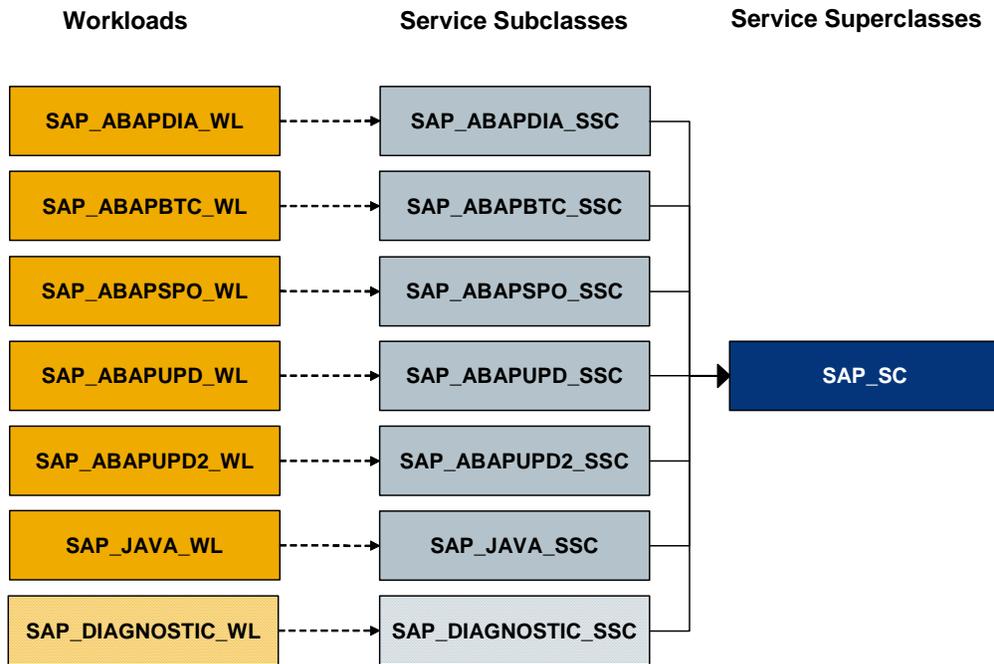
Basic Setup of Workload Management

The basic setup of WLM is designed to monitor and control database activities according the basic differentiation of work as known from the different types of work processes of an ABAP application server. A workload is used for each ABAP work process type. In an ABAP+Java system (dual stack), an additional Java workload identifies any work that is initiated by the SAP Java server. The following workloads are defined in the basic setup of the proposed WLM configuration for an SAP environment:

Workload	Description
SAP_JAVA_WL (optional)	Identifies all work that originates from a SAP Java server The Java workload is identified by a system user that matches the SAP Java connect user (which is usually <i>SAP<SAPSID>DB</i>).
SAP_ABAPBTC_WL	Identifies all work that originates from ABAP batch work-processes. The following attributes are used to identify this type of work: <ul style="list-style-type: none"> - A system user that matches the SAP ABAP connect user - Client attribute CLIENT_INFO_APPLNAME set to <i>'ptype BTC'</i>
SAP_ABAPUPD_WL and SAP_ABAPUPD2_WL	These workloads identify all work that originates from ABAP update work-processes. The following attributes are used to identify this type of work: <ul style="list-style-type: none"> - A system user that matches the SAP ABAP connect user. - Client attribute CLIENT_INFO_APPLNAME set to <i>'ptype UPD'</i> or <i>'ptype UPD2'</i>.
SAP_ABAPSPO_WL	Identifies all work that originates from ABAP spool work-processes The following attributes are used to identify this type of work: <ul style="list-style-type: none"> - A system user that matches the SAP ABAP connect user - Client attribute CLIENT_INFO_APPLNAME set to <i>'ptype SPO'</i>
SAP_ABAPDIA_WL	Identifies all work that originates from ABAP dialog work-processes The following attributes are used to identify this type of work: <ul style="list-style-type: none"> - A system user that matches the SAP ABAP connect user. - Client attribute CLIENT_INFO_APPLNAME does not equal <i>'ptype BTC'</i>, <i>'ptype UPD'</i>, <i>'ptype UPD2'</i> or <i>'ptype SPO'</i>.

Note: Since SAP enqueue work processes are not executing any activities on the database system, there is no workload defined for this type of work process.

As described in the introduction, service classes are used to manage and control different types of work. Therefore, each workload defined in the table above is linked to an appropriate service subclass. These SAP-specific service subclasses are organized in a single SAP service superclass. The following figure shows the basic WLM configuration:



Note: Workload SAP_DIAGNOSTIC_WL has been defined for diagnostic purposes in a later SAP release. Currently, no work will run in this workload and the according service subclass.

Enhanced Prioritization Scheme

In addition to the basic setup of WLM described in previous section, the enhanced prioritization scheme allows to further differentiate work. Using the wizard in the DBA Cockpit that is described in the next section, you can decide between one of the following options:

- To have no special workload and to only use the basic setup of WLM
- To have one additional workload that covers a list of SAP user names
- To have one additional workload that covers a list of SAP transaction codes
- To have one additional workload that covers a list of SAP application servers

This special workload is mapped to a distinct service subclass that allows you to monitor and control resources separately from other workloads. For examples and information about usage scenarios, see section [Basic approaches for Using Workload Management in a Productive Environment \[page 22\]](#) later in this article.

Note: The WLM configuration described in the last sections reflects the SAP recommendation for using WLM in an SAP environment. In addition, there are more ways to exploit WLM, for example by using concurrency threshold to increase the overall throughput. The strategies as described in the *IBM Best Practices - DB2 Workload Management* are supported by SAP. However, not all of the WLM features described in the *IBM Best Practices* are currently supported by the DBA Cockpit.

For more information, see the [IBM Best Practices – DB2 Workload Management](#) at:
<http://www.ibm.com/developerworks/db2/bestpractices/workloadmanagement/>

Workload Management in the DBA Cockpit

As of SAP Enhancement Package 1 for SAP NetWeaver 7.0, WLM has been integrated into the DB6-specific part of the DBA Cockpit. The new task area *Workload Management* was introduced in the navigation frame of the DBA Cockpit.

Note: The DBA Cockpit is in the process to gradually move from the classic SAPGUI-based UI to the Web browser-based UI that is using WebDynpro technology. WLM is only available in the new Web browser-based UI. If you choose one of the nodes under *Workload Management* in the SAPGUI-based UI of the DBA Cockpit, the application starts in a separate Web browser. By default, the *Workloads and Service Classes* content area appears.

The screens provided below *Workload Management* are described in the following subsections.

Workloads and Service Classes

The *Workloads and Service Classes* screen is contains the following tab pages:

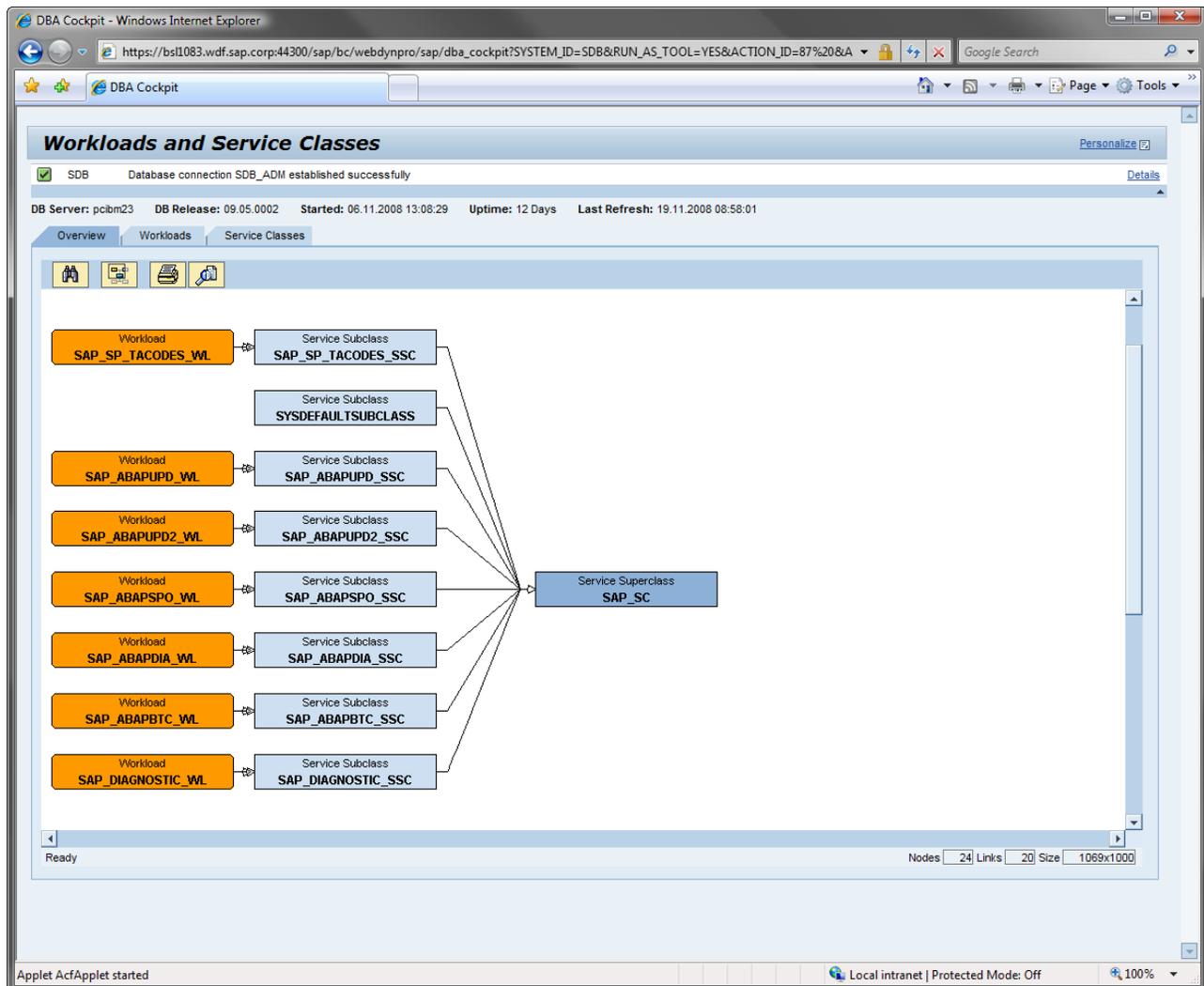
- Overview
- Workloads
- Service Classes

Note: The screens provided under *Workloads and Service Classes* are completely independent of whether the SAP WLM proposal has been set up or whether you use your own WLM setup.

Overview

The tab page *Overview* provides you with a graphical overview of all existing workloads and service classes. The figure on the *Overview* screen shows the mapping of workloads to service classes as defined in the system catalog as well as the hierarchy between service subclass and service superclasses.

The following screenshot shows the overview graphic of a system that has the proposed basic SAP WLM setup as well as the enhanced prioritization scheme based on SAP transaction codes.



Workloads

The tab page *Workloads* shows a list of all workloads defined on the system. The following information is displayed:

Column	Description
<i>Position</i>	Evaluation order used for choosing a workload
<i>Workload Name</i>	Name of the workload
<i>Enabled</i>	Workload state The following states are possible: <ul style="list-style-type: none"> • Green - The workload is enabled. • Red - The workload is disabled.
<i>DB Access Allowed</i>	Determines whether units of work (UOWs) that are associated with the workload are rejected or not
<i>Service Class</i>	Name of the service subclass to which an UOW that is associated with this workload is assigned
<i>Parent Service Class</i>	Name of the service super class to which an UOW that is associated with this workload is assigned.

By selecting a workload, additional information on the selected workload is displayed on the following tab pages in the lower half of this screen:

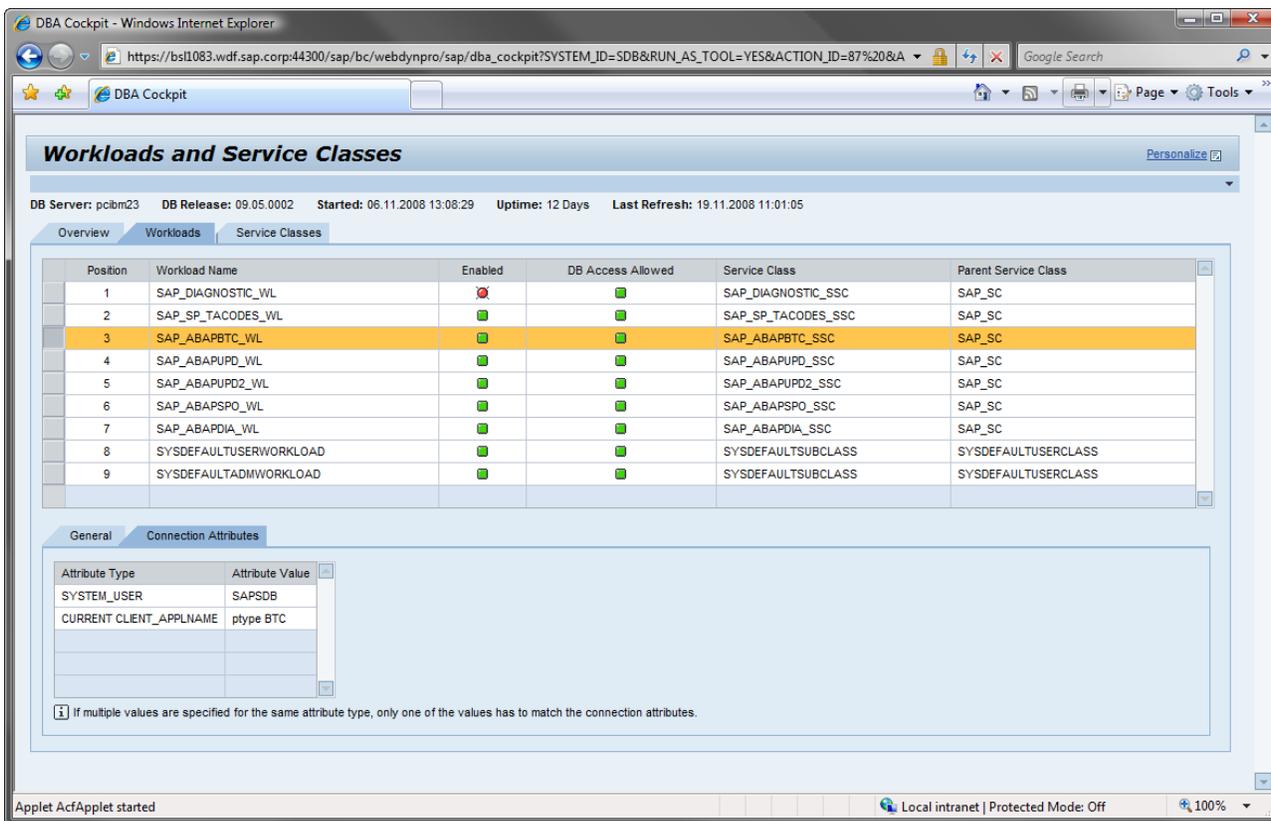
- *General*

Displays details about the workload from the system catalog as well as the configuration for collecting statistics on the workload

- **Connection Attributes**

Displays all the attributes that associate an incoming activity with the selected workload.

For an activity to be associated with a certain workload, all the connection attributes of the incoming activity must match the definition of the workload (Boolean AND). If a single attribute type is specified more than once, this indicates that only one of them must match the activity (Boolean OR).



Note: The DBA Cockpit does neither support disabling workloads nor does it support rejecting database access for a workload. Except for the optional diagnostic workload SAP_DIAGNOSTIC_WL, all workloads should be enabled and all workloads should have database access at any time in an SAP environment.

Service Classes

The tab page *Service Classes* shows all existing service classes including the hierarchy between service subclasses and service superclasses. The following information is displayed:

Column	Description
<i>Service Class</i>	Name of the service class
<i>Enabled</i>	State of service class The following states are possible: <ul style="list-style-type: none"> • Green - The service class is enabled. • Red - The service class is disabled.
<i>Agent Priority</i>	Graphical display of the thread priority of the agents in the service class

Column	Description
<i>Agent Priority (Remarks)</i>	Thread priority of the agents in the service class in relation to the normal priority of DB2 threads The value <i>DEFAULT</i> indicates that the thread priority was inherited from the parent service class.
<i>Prefetch Priority</i>	Graphical display of the agent's prefetch priority in the service class
<i>Prefetch Priority (Remarks)</i>	Prefetch priority of the agents in the service class

When you select a single service class in the table, further details for this service class are displayed. You are able to retrieve monitoring information for all the work that has been going on in that service class. You are also able to change the agent and prefetch priority of this service class.

The following tab pages are available:

- *General*

Displays details about the service class from the system catalog as well as the configuration for collecting statistics on the service class

To assign more or less resources to the currently selected service class, choose *Change Prioritization*. You can increase or decrease the priority for each the agent or the prefetcher. By setting the priority back to default value, the respective service class inherits the priority from its parent service class.

Note: On Linux[®] and UNIX[®], the valid values for the agent priority are *default*, -20 to 20 (a negative value indicates a higher relative priority). On Windows-based platforms, the valid values are *default*, -6 to 6 (a negative value indicates a lower relative priority).

Attention: Components like the logger, prefetchers and page cleaners are running in service class SYSDEFAULTSYSTEMCLASS. It is therefore crucial to always ensure sufficient resources for those components. Therefore, **SAP strongly recommends that the SYSDEFAULTSYSTEMCLASS service class is always prioritized at least as high as the highest prioritized user service class.**

The screenshot shows the DBA Cockpit interface for 'Workloads and Service Classes'. The 'Service Classes' tab is selected, displaying a table of service classes. The 'SAP_ABAPDIA_SSC' class is highlighted in orange. Below the table, the 'Statistics' tab is active, showing configuration details for the selected service class.

Service Class	Enabled	Agent Priority	Agent Priority (Remarks)	Prefetch Priority	Prefetch Priority (Remarks)
▼ SAP_SC	<input checked="" type="checkbox"/>	<input type="text"/>	DEFAULT	<input type="text"/>	DEFAULT
▼ SAP_ABAPBTC_SSC	<input checked="" type="checkbox"/>	<input type="text"/>	DEFAULT (Inherited from Parent Service Class)	<input type="text"/>	DEFAULT (Inherited from Parent Service Class)
▼ SAP_ABAPDIA_SSC	<input checked="" type="checkbox"/>	<input type="text"/>	OS Priority: -3	<input type="text"/>	OS Priority: High
▼ SAP_ABAPSP0_SSC	<input checked="" type="checkbox"/>	<input type="text"/>	DEFAULT (Inherited from Parent Service Class)	<input type="text"/>	DEFAULT (Inherited from Parent Service Class)
▼ SAP_ABAPUPD2_SSC	<input checked="" type="checkbox"/>	<input type="text"/>	DEFAULT (Inherited from Parent Service Class)	<input type="text"/>	DEFAULT (Inherited from Parent Service Class)
▼ SAP_ABAPUPD_SSC	<input checked="" type="checkbox"/>	<input type="text"/>	DEFAULT (Inherited from Parent Service Class)	<input type="text"/>	DEFAULT (Inherited from Parent Service Class)
▼ SAP_DIAGNOSTIC_SSC	<input checked="" type="checkbox"/>	<input type="text"/>	DEFAULT (Inherited from Parent Service Class)	<input type="text"/>	DEFAULT (Inherited from Parent Service Class)
▼ SAP_SP_TACODES_SSC	<input checked="" type="checkbox"/>	<input type="text"/>	DEFAULT (Inherited from Parent Service Class)	<input type="text"/>	DEFAULT (Inherited from Parent Service Class)

Service Class Definition

Service Class ID: 20
 Service Class Name: SAP_ABAPDIA_SSC
 Parent Service Class: SAP_SC
 Create Time: 02.10.2008 14:22:44
 Alter Time: 29.10.2008 14:00:15
 Inbound Correlator:
 Outbound Correlator:
 Remarks:

Statistics Collection

Aggregate Activity Data: Collect Base Aggregate Activity Data
 Aggregate Request Data: None
 Activity Data: None
 Collecting Partition(s): Database Partition of the Coordinator of the Activity

Priorization

Agent: Low 20 20- High OS Priority: -3
 Prefetcher: Low High OS Priority: High

- **Statistics**

Displays monitoring information that is related to the service class

To switch the time frame for which monitoring data is aggregated, choose the corresponding menu button indicating the time frame you have chosen. To analyze slowdowns in the service class, you can also choose between different types of diagrams:

- *Activity Execution Time Histogram*

Displays the history of the histogram for the execution times of all activities that were executed in the service class for the selected time frame

- *Activity Lifetime Histogram*

Displays the history of the histogram for the lifetimes of all activities that were executed in the service class for the selected time frame

- *Activity Queue Time Histogram*

Displays the history of the histogram for the queue times of all activities that were executed in the service class for the selected time frame

For more information about the histogram types and all other monitoring counters provided here, see *Workload Management Monitor Elements* in the IBM DB2 V9.5 Information Center at:

<https://publib.boulder.ibm.com/infocenter/db2luw/v9r5/topic/com.ibm.db2.luw.admin.mon.doc/doc/r0051833.html>

Workloads and Service Classes

DB Server: pcibm23 DB Release: 09.05.0002 Started: 06.11.2008 13:08:29 Uptime: 13 Days Last Refresh: 20.11.2008 08:48:10

Service Class	Enabled	Agent Priority	Agent Priority (Remarks)	Prefetch Priority	Prefetch Priority (Remarks)
SAP_SC	<input checked="" type="checkbox"/>	<input type="text"/>	DEFAULT	<input type="text"/>	DEFAULT
SAP_ABAPBTC_SSC	<input checked="" type="checkbox"/>	<input type="text"/>	DEFAULT (Inherited from Parent Service Class)	<input type="text"/>	DEFAULT (Inherited from Parent Service Class)
SAP_ABAPDIA_SSC	<input checked="" type="checkbox"/>	<input type="text"/>	OS Priority: -3	<input type="text"/>	OS Priority: High
SAP_ABAPSPD_SSC	<input checked="" type="checkbox"/>	<input type="text"/>	DEFAULT (Inherited from Parent Service Class)	<input type="text"/>	DEFAULT (Inherited from Parent Service Class)
SAP_ABAPUPD2_SSC	<input checked="" type="checkbox"/>	<input type="text"/>	DEFAULT (Inherited from Parent Service Class)	<input type="text"/>	DEFAULT (Inherited from Parent Service Class)
SAP_ABAPUPD_SSC	<input checked="" type="checkbox"/>	<input type="text"/>	DEFAULT (Inherited from Parent Service Class)	<input type="text"/>	DEFAULT (Inherited from Parent Service Class)
SAP_DIAGNOSTIC_SSC	<input checked="" type="checkbox"/>	<input type="text"/>	DEFAULT (Inherited from Parent Service Class)	<input type="text"/>	DEFAULT (Inherited from Parent Service Class)
SAP_SP_TACODES_SSC	<input checked="" type="checkbox"/>	<input type="text"/>	DEFAULT (Inherited from Parent Service Class)	<input type="text"/>	DEFAULT (Inherited from Parent Service Class)

General Statistics

Last 24 Hours

Completed Activities Total: 2.531
 Aborted Activities Total: 0
 Rejected Activities Total: 0
 Concurrent Activities Top: 1
 Concurrent Connections Top: 11
 Cost Estimate Top: 23
 Rows Returned Top: 1
 Activity Estimated Cost Average: 1- timerons
 Activity Interrival Time Average: 1- msec
 Activity Lifetime
 Top: 250 msec
 Average: 2 msec
 Standard Deviation: 0 msec
 Activity Execution Time
 Average: 1 msec
 Standard Deviation: 0 msec
 Activity Queue Time
 Average: 0 msec
 Standard Deviation: 0 msec
 Request Execution Time
 Average: 0 msec
 Standard Deviation: 0 msec
 Total: 0 msec

Statistics include data from: 19.11.2008 08:08:39 till 20.11.2008 08:08:39
 Greyed out counters are not available for the selected time range.

Activity Execution Time Histogram

Legend:

- max. 5 ms
- max. 29 ms
- max. 158 ms
- max. 858 ms
- max. 4,6 sec
- max. 25,2 sec
- max. 2,3 min
- max. 12,3 min
- max. 6,0 h
- more than 6,0 h

Critical Activities

On the *Critical Activities* screen, you can define thresholds for database activities on the database system. In addition, you can gather information about threshold violations for later analysis. To access the *Critical Activities* screen, call the DBA Cockpit and choose *Workload Management* → *Critical Activities*.

Threshold Configuration

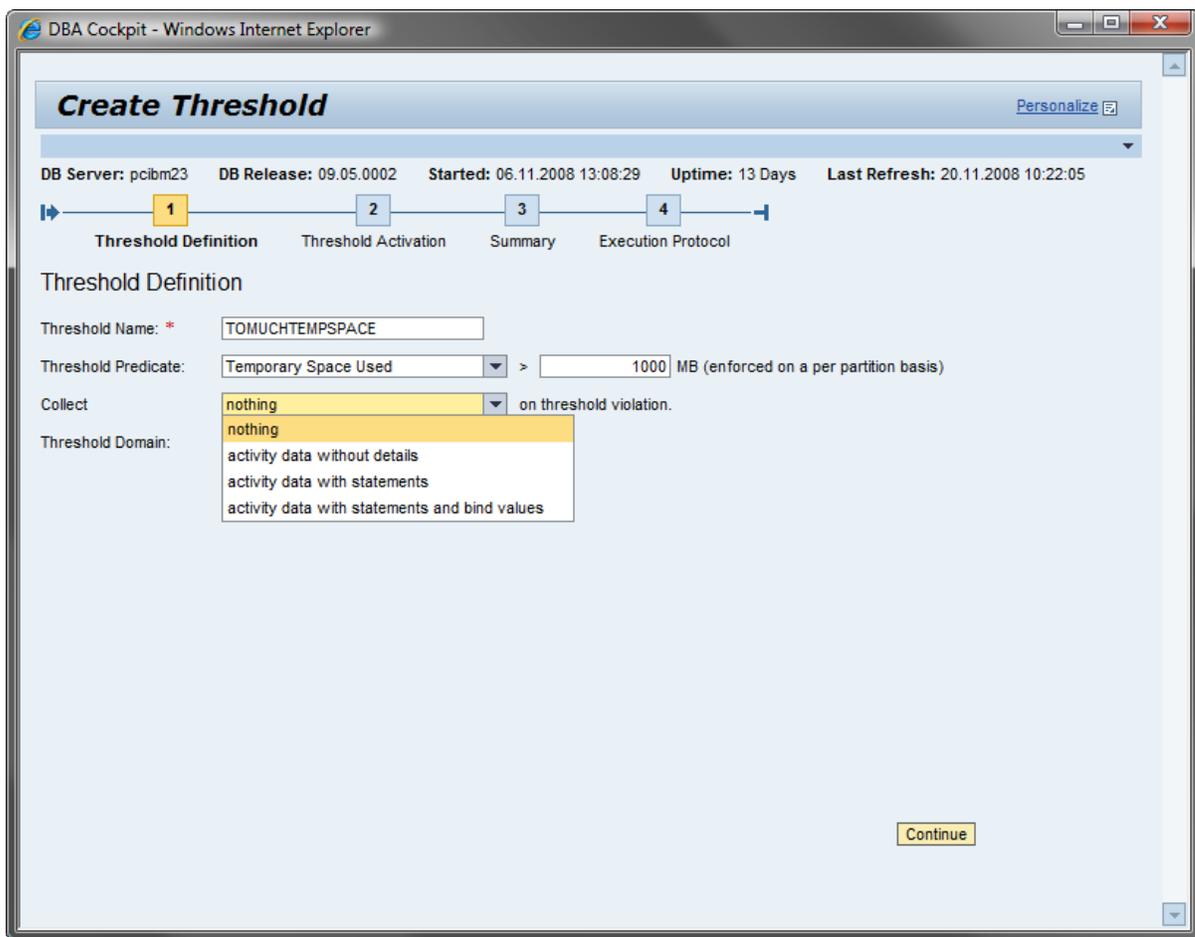
In this screen area, all defined thresholds for the database system are displayed and you can use the following functions:

- Enable or disable a threshold by selecting a line from the list and choosing the *Enable / Disable Threshold* pushbutton.
- Create a threshold by selecting a line from the list and choosing the *Create Threshold* pushbutton. A wizard appears that guides you through the creation of a threshold.

Note: DB2 allows to automatically stop activities that are violating a certain threshold. As it is not recommended to use the STOP EXECUTION action if a threshold has been exceeded, the *Create Threshold* wizard in the DBA Cockpit only supports to capture different levels of details on the violating activity, but no STOP EXECUTION.

Also, DB2 allows to define thresholds on some more predicates than available by using the wizard in the DBA Cockpit. The predicates that are available in the wizard are limited to the ones that SAP considers to be a use case in an SAP environment. These are the following:

- Estimated SQL cost
- Number of rows returned to the application
- Activity total time
- Temporary space used by the activity



- Drop a threshold by selecting a line from the list and choosing the *Drop Threshold* pushbutton.

Threshold Violations

In this screen area, a history of threshold violations on the database system is displayed:

Column	Description
<i>Violation</i>	Time when the threshold violation occurred
<i>Partition</i>	Database partition where the violation occurred

Column	Description
<i>Predicate</i>	Predicate that was violated Note: Activities with the value <i>MANUAL</i> were captured manually on the <i>Application Snapshot</i> screen. For more information about how to capture details on currently executed activities from the <i>Application Snapshot</i> , see section Capture or Cancel Activities from the Application Snapshot [page 20] .
<i>Violated Value</i>	Value that was exceeded, which violated the threshold predicate
<i>Application ID</i>	Application ID of the activity that caused the violation
<i>Agent ID</i>	Agent ID of the activity that caused the violation

By default, the history of such a threshold violation is kept for two weeks. To delete all recorded threshold violations, choose the *Reset Violation History* pushbutton.

For more information about how to change the size of the violation history, see the document [Database Administration Using the DBA Cockpit](#), section *Performance Warehouse: Configuration* in the SAP Community Network.

Threshold Violation Details

In this screen area, details about a selected threshold violation are displayed.

The following tab pages are available:

- *General*

On this tab page, details about the activity that violated the threshold as well as about the execution statistics for that particular activity are displayed.

The screenshot displays the DBA Cockpit interface for SAP on DB2 for LUW. The main window shows the 'Critical Activities' section with a 'Threshold Configuration' table and a 'Threshold Violations' table. The 'Threshold Violations' table shows a single violation for the 'LONGRUNNERS' threshold, which occurred on 20.11.2008 at 10:04:16. The violation details are shown in the 'Threshold Violation Details' section, which is currently on the 'General' tab.

Threshold Configuration

Threshold Name	Status	Predicate	Threshold	Enforcement Scope	Domain	Domain Object	Action
LONGRUNNERS	✖	TOTALTIME	300	Database	Service Subclass	SAP_ABAPBTC_SSC UNDER SAP_SC	Continue
ROWSRETURNED	✔	ROWSRET	1.000	Database	Database		Continue

Threshold Violations

Violation Time	Partition	Predicate	Violated Value	Application ID	Agent ID
20.11.2008 10:04:16	0	SQLRowsReturned	1.000	*LOCAL_db2sdb.081120090416	49.248

Threshold Violation Details - General

Category	Value
General	
Coordinator Partition:	0
Session Authorization ID:	DB2SDB
Agent ID:	49.248
Application ID:	*LOCAL_db2sdb.081120090416
Application Name:	db2bp
UOW ID:	1
Activity ID:	1
Activity Type:	READ_DML
Workload Context	
Service Superclass:	SYSDEFAULTUSERCLASS
Service Subclass:	SYSDEFAULTSUBCLASS
TPMON Accounting String:	
TPMON Client Application:	
TPMON Client User ID:	
TPMON Client Workstation:	
Resource Consumption	
Activity Execution Time:	94.235 µsec
Prepare Time:	1 msec
User CPU Time:	2.543 µsec
System CPU Time:	0 µsec
Total Sort Time:	0 msec
Total Sorts:	0
Sort Overflows:	0
Query Details	
Query Cardinality Estimate:	1.200
Query Cost Estimate:	27 timerons
Rows Fetched:	1.200
Rows Returned:	1.200
Rows Modified:	0
Buffer Pool	
Over-all Quality:	71,43 %
Data Logical Reads:	7
Data Physical Reads:	2
Index Logical Reads:	0
Index Physical Reads:	0
Temp. Data Logical Reads:	0
Temp. Data Physical Reads:	0
Temp. Index Logical Reads:	0
Temp. Index Physical Reads:	0
XDA Logical Reads:	0
XDA Physical Reads:	0
Temp. XDA Logical Reads:	0
Temp. XDA Physical Reads:	0
Error Information	
SQL Code:	0
SQL State:	00000

- **SQL Statement(s)**

On this tab page, the SQL statement that was executed within the activity is displayed. In the case of nested statement calls, for example, during the execution of a stored procedure, more than one SQL statement can be available. You can retrieve additional information about the bind values and further details on a single SQL statement by selecting the statement from the list. From there, you are also able to call either the *EXPLAIN* or the *Section EXPLAIN*.

The screenshot shows the DBA Cockpit interface in a Windows Internet Explorer browser. The page title is 'Critical Activities'. The DB Server is 'pcibm23', DB Release is '09.05.0002', Started on '06.11.2008 13:08:29', Uptime is '13 Days', and Last Refresh is '20.11.2008 10:03:59'. The 'Threshold Configuration' section is expanded, showing 'Threshold Violations'. A table lists a violation at '20.11.2008 10:04:16' for 'SQLRowsReturned' with a value of '1.000'. Below this, the 'Threshold Violation Details' section is open to the 'SQL Statement(s)' tab, displaying the statement text: 'select * from sapsdb.atlab fetch first 1200 rows only'. The 'Statement Details' section shows 'First Use Time' and 'Last Use Time' as '20.11.2008 10:04:16', 'Isolation Level' as '2', 'Lock Timeout' as '30.000', and 'Nested Level' as '0'. The 'Bind Values' section is empty, showing 'No data available'. Buttons for 'EXPLAIN' and 'Section EXPLAIN' are visible at the bottom of the details section.

Note: If you choose the *EXPLAIN* pushbutton, a newly generated access plan that is based on the current statistics is displayed. If you choose, however, the *Section EXPLAIN* pushbutton, the access plan that is currently present as a compiled section in the package cache is displayed. If you want to use the *Section Explain* pushbutton for problem determination, make sure that you read SAP Note [1227225](https://support.sap.com/en/notes/1227225).

Capture or Cancel Activities from the Application Snapshot

In addition to capturing activities that violate defined thresholds, you can either capture details on a currently executed activity or even cancel the activity on the *Performance: Application Snapshot* screen in the DBA Cockpit. To do so, select the corresponding agent with status *UOW executing* from the list, and choose either *Capture* or *Cancel*.

User	Appl. Handle	Agent PID	Appl. Name	Appl. Status	Appl. P	Buffer Quality (%)	Data Logical Reads	Index Logical Reads
DB2SDB	12	32	db2evmg_DB2DETAILDEA	Connect completed	29.88	66,67	2	
	49.248	67	db2bp	UOW waiting	21.443	71,43	7	
	49.323	56	DB2HMON	UOW executing	29.877	100,00	36.029	26
SAPSDB	7	22	dw.sapSDB_DVEBMGS00	UOW waiting	30.314	99,49	5.710.539	25.328
	22	41	dw.sapSDB_DVEBMGS00	UOW waiting	30.313	99,39	5.379.523	21.813
	23	42	dw.sapSDB_DVEBMGS00	UOW waiting	30.322	99,87	59.003	76
	36	46	dw.sapSDB_DVEBMGS00	UOW waiting	30.320	99,49	238.035	114
	37	47	dw.sapSDB_DVEBMGS00	UOW waiting	30.319	98,14	7.386.559	18.145
	38	48	dw.sapSDB_DVEBMGS00	UOW waiting	30.317	100,00	1	
	39	51	dw.sapSDB_DVEBMGS00	UOW waiting	30.318	100,00	1	
	40	49	dw.sapSDB_DVEBMGS00	UOW waiting	30.321	85,56	3.940	5
	41	50	dw.sapSDB_DVEBMGS00	UOW waiting	30.316	99,56	5.639.568	25.155
	42	52	dw.sapSDB_DVEBMGS00	UOW waiting	30.323	100,00	1	
	43	53	dw.sapSDB_DVEBMGS00	UOW waiting	30.315	99,67	5.113.178	23.644
SDBADM	9	20	db2stnm	Connect completed	29.888	100,00	0	
	10	19	db2taskd	Connect completed	29.888	97,70	32	4
	11	18	db2wrm	Connect completed	29.888	100,00	0	

Note: As an alternative to canceling the SAP work process from transaction SM50 if you know the work process runs an apparently endless database request, you can use the *Cancel* option in the *Application Snapshot* screen. Cancelling an activity results in an SQL error -4725 that is returned to the calling application. Also, the respective transaction is rolled back.

SAP WLM Setup Status

The *SAP WLM Setup Status* screen provides you with an overview of the WLM configuration in your SAP system and the environment that is required to collect event monitor data.

Workloads and Service Classes

In this area, it is indicated if the SAP-proposed workloads and service classes have been set up:

- If they have not yet been set up, you can choose the *Setup SAP Workloads and Service Classes* pushbutton. A wizard appears that guides you through the setup process of the SAP-proposed workloads and service classes.
- If they have been set up, you can modify the enhanced prioritization scheme, which had been configured on the database system, by choosing the *Modify Enhanced Prioritization Scheme* pushbutton. If you want to drop the SAP workloads and service classes, choose the *Drop SAP Workloads and Service Classes* pushbutton.

Event Monitor Infrastructure

In this area, the availability of tablespace `SAPEVENTMON` and database partition group `SAPEVENTMONGRP` is indicated

The history of the monitoring information for WLM is collected by DB2 event monitors. For all event monitor tables, tablespace `SAPEVENTMON` was introduced. To be able to distribute the event monitor tables if the database system is using the database partitioning feature (DPF), database partition group `SAPEVENTMONGRP` was introduced containing tablespace `SAPEVENTMON`.

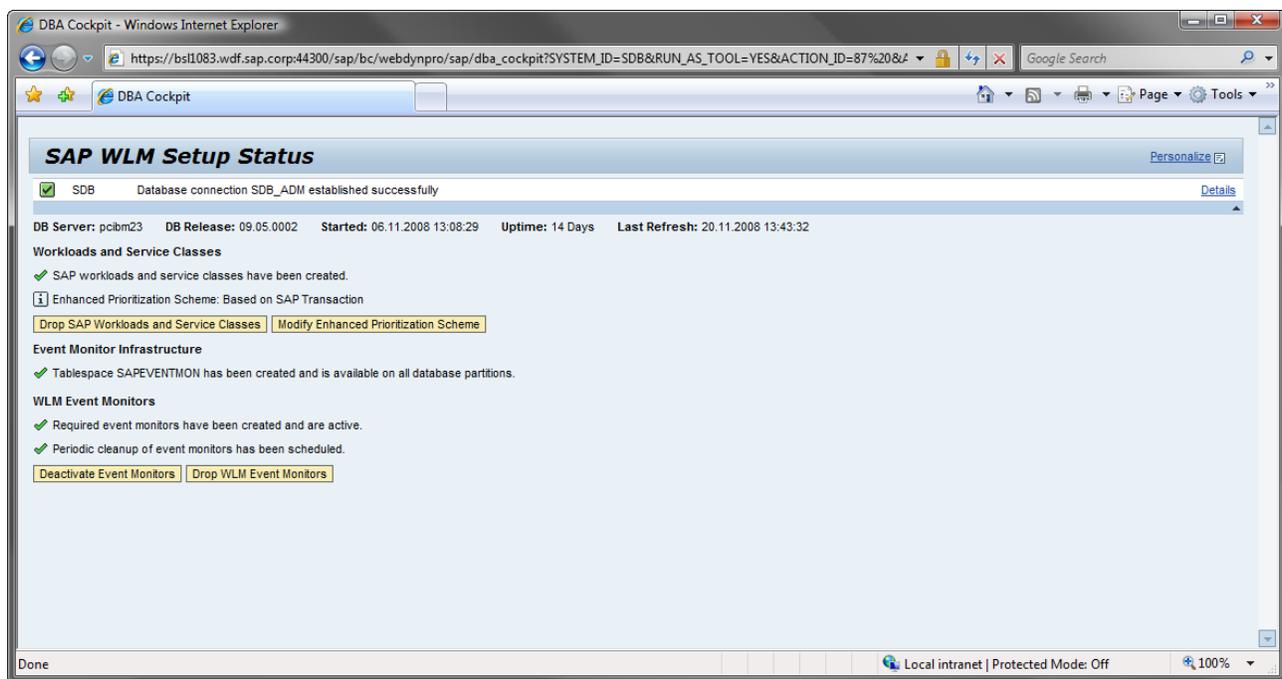
If the database partition layout changes, you must redistribute the event monitor tables over all partitions by choosing the *Redistribute Event Monitor Infrastructure* pushbutton.

WLM Event Monitors

Indicates if the WLM event monitors already exist and if the stored procedure that cleans up the event monitor tables was scheduled. By default, event monitor data is kept for two weeks. For more information about how to change the size of the violation history, see the document [Database Administration Using the DBA Cockpit](#), section *Performance Warehouse: Configuration* in the SAP Community Network.

If the WLM event monitors have not yet been created on the database, you can do so by choosing the *Setup WLM Event Monitors* pushbutton. A wizard appears that guides you through the creation of a WLM event monitors.

Alternatively, you can choose the *Activate Event Monitors* or *Deactivate Event Monitors* pushbutton to control the collection of monitoring information in the event monitor tables. If you want to drop the event monitors and the appropriate tables, choose the *Drop WLM Event Monitors* pushbutton.



Basic Approaches for Using Workload Management in a Productive SAP Environment

The following two sections provide information about how you can use WLM in a productive SAP environment. It is, of course, up to you to find further scenarios where WLM can you help to manage or control database resources according to your business needs.

Prevent Dialog Reporting from Being Slowed Down by ETL Processing in an SAP BI Environment

An SAP BI environment typically has two different categories of workloads: There are users running reports or ad-hoc queries on InfoProviders. Also, there are background tasks that extract data from source systems, transform the data and load it into InfoProviders (ETL processing). Large companies with users in different time zones require 24x7 reporting. So, in this case, ETL processing must overlap with query processing.

ETL processing runs in background work processes and it is typically started by a process chain. A single process chain can comprise many tasks meaning it can generate a significant amount of workload on the database server that has many concurrent SQL statements. Each of those SQL statements can additionally be processed in parallel by multiple DB2 agents.

Example:

Assumption 1: The database has 10 partitions.

⇒ Each SQL statement is executed with 10 parallel DB2 agents.

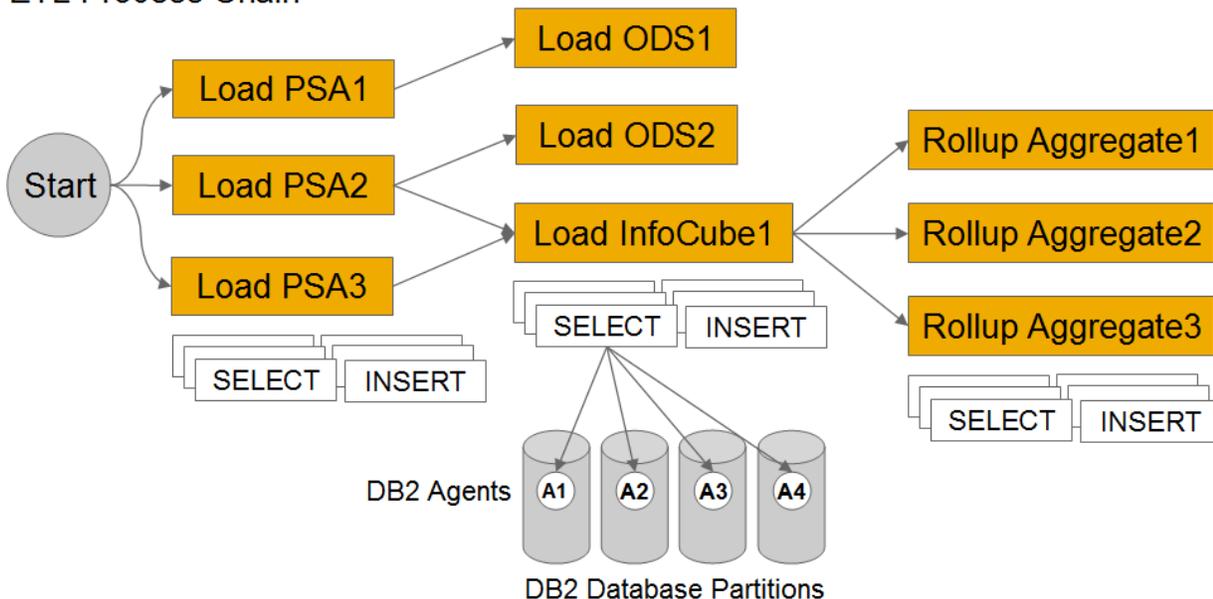
Assumption 2: 1 ETL process chain is active and executes 8 SELECTs, 8 INSERTs and 8 UPDATES concurrently.

⇒ The ETL process chain starts a total of 240 DB2 agents!

Assumption 3: A single SAP BI query is active and is processed with only 10 DB2 agents.

⇒ It therefore only gets about 4% of the available CPU and I/O resources!

ETL Process Chain



Without DB2 WLM, the ETL workload must be controlled on application level. For example, you could limit the amount of background work processes or modify the ETL parallelism settings. Nevertheless, this procedure can require ongoing monitoring and manual intervention.

With DB2 WLM, you could simply reduce the priority of batch processing on the database. That is, when end users run queries, WLM would assign more resources to those requests than to ETL processing. While at times where no end user reporting is active, WLM would automatically provide all available resources to ETL processing – without any manual intervention.

To use WLM in this or similar scenarios, you would simply need to implement the basic WLM setup using the wizard in the DBA Cockpit as described in section [Basic Workload Management Setup \[page 6\]](#). After the setup, you can reduce the priority of service class SAP_ABAPBTC_SSC as described in section [Workloads and Service Classes → Service Classes \[page 12\]](#).

Create a High Priority Workload According To Business Relevance or SLAs

High Priority Workload for a Set of SAP Transactions

Independent from the exact type of applications that run on your SAP system, there are usually some application areas having a higher business relevance than compared to others. Therefore, it might make sense to reflect the importance of these application areas on the database. This helps you to ensure sufficient resources being assigned to that work on the database and stable response times for the most important application areas.

Example:

If you run the SAP Sales and Distribution (SD) module on your SAP ERP system, it is usually very important to ensure a smooth sales order entry. Using DB2 WLM, you can create a high priority workload that covers all work going on in transaction VA01 (*Create Sales Order*).

To do so, you would need to implement the *Enhanced Prioritization Scheme* with the option *Based on SAP Transaction Codes* using the wizard in the DBA Cockpit as described in section [Enhanced Prioritization Scheme \[page 8\]](#). After the implementation, you can increase the priority of service class SAP_SP_TACODES_SSC as described in section [Workloads and Service Classes → Service Classes \[page 12\]](#).

Note: You can, of course, add more than one transaction code into the high priority workload.

High Priority Workload for a Set of SAP Users

Regardless of the type of application that runs on your SAP systems, there might be a set of decision taking SAP users who have a strong need to always have fast access to the latest business data. At times when a high workload is running on the system from different business areas, you still want to ensure fast access for these SAP users. In this particular case, DB2 WLM can again help you to always ensure fast response times for these SAP users- even at times when the system is very busy from different business areas that may be not that important.

Example:

In your company, there are three top level sales managers with SAP user names VIPSALESMNGR1, VIPSALESMNGR2 and VIPSALESMNGR3. To ensure sufficient database resources for these SAP users at any time, you can create a high priority workload that covers all work initiated by these users.

To do so, you do one of the following:

- Implement the *Enhanced Prioritization Scheme* that contains the SAP user names of the three sales managers with the option *Based on SAP User Names* using the wizard in the DBA Cockpit as described in section [Enhanced Prioritization Scheme \[page 8\]](#). Afterwards, you can raise the priority of service class SAP_SP_SAPUSERS_SSC as described in section [Workloads and Service Classes → Service Classes \[page 12\]](#).
- Create a SAP logon group that pins the three sales managers to a certain SAP application server. Then, implement the *Enhanced Prioritization Scheme* that contains the host name of the respective SAP application server with the option *Based on SAP Application Servers* using the wizard in the DBA Cockpit as described in section [Enhanced Prioritization Scheme \[page 8\]](#).

Afterwards, you can raise the priority of service class SAP_SP_APPSERVERS_SSC as described in section [Workloads and Service Classes → Service Classes \[page 12\]](#).

Enhanced Approaches for Using Workload Management

Besides the WLM features that were integrated into the DBA Cockpit and that SAP recommends to use in a productive SAP environment, DB2 offers some more WLM features. These features can also help you control resource consumption and improve the over all system performance. It is up to you if you want to use these WLM features to operate your database system. However, **SAP strongly recommends to not use any WLM feature that rejects or stops the execution of a database request.**

For more information about enhanced approaches for using WLM, see the [IBM Best Practices: DB2 Workload Management](#) at:

<http://www.ibm.com/developerworks/db2/bestpractices/workloadmanagement/>

Copyright

© 2008 SAP AG. All rights reserved.

No part of this publication may be reproduced or transmitted in any form or for any purpose without the express permission of SAP AG. The information contained herein may be changed without prior notice.

Some software products marketed by SAP AG and its distributors contain proprietary software components of other software vendors.

Microsoft, Windows, Outlook, and PowerPoint are registered trademarks of Microsoft Corporation.

IBM, DB2, DB2 Universal Database, OS/2, Parallel Sysplex, MVS/ESA, AIX, S/390, AS/400, OS/390, OS/400, iSeries, pSeries, xSeries, zSeries, System i, System i5, System p, System p5, System x, System z, System z9, z/OS, AFP, Intelligent Miner, WebSphere, Netfinity, Tivoli, Informix, i5/OS, POWER, POWER5, POWER5+, OpenPower and PowerPC are trademarks or registered trademarks of IBM Corporation.

Adobe, the Adobe logo, Acrobat, PostScript, and Reader are either trademarks or registered trademarks of Adobe Systems Incorporated in the United States and/or other countries.

Oracle is a registered trademark of Oracle Corporation.

UNIX, X/Open, OSF/1, and Motif are registered trademarks of the Open Group.

Citrix, ICA, Program Neighborhood, MetaFrame, WinFrame, VideoFrame, and MultiWin are trademarks or registered trademarks of Citrix Systems, Inc.

HTML, XML, XHTML and W3C are trademarks or registered trademarks of W3C®, World Wide Web Consortium, Massachusetts Institute of Technology.

Java is a registered trademark of Sun Microsystems, Inc.

JavaScript is a registered trademark of Sun Microsystems, Inc., used under license for technology invented and implemented by Netscape.

MaxDB is a trademark of MySQL AB, Sweden.

SAP, R/3, mySAP, mySAP.com, xApps, xApp, SAP NetWeaver, and other SAP products and services mentioned herein as well as their respective logos are trademarks or registered trademarks of SAP AG in Germany and in several other countries all over the world. All other product and service names mentioned are the trademarks of their respective companies. Data contained in this document serves informational purposes only. National product specifications may vary.

These materials are subject to change without notice. These materials are provided by SAP AG and its affiliated companies ("SAP Group") for informational purposes only, without representation or warranty of any kind, and SAP Group shall not be liable for errors or omissions with respect to the materials. The only warranties for SAP Group products and services are those that are set forth in the express warranty statements accompanying such products and services, if any. Nothing herein should be construed as constituting an additional warranty.

These materials are provided "as is" 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 shall not be liable for damages of any kind including without limitation direct, special, indirect, or consequential damages that may result from the use of these materials.

SAP does not warrant the accuracy or completeness of the information, text, graphics, links or other items contained within these materials. SAP has no control over the information that you may access through the use of hot links contained in these materials and does not endorse your use of third party web pages nor provide any warranty whatsoever relating to third party web pages.

Any software coding and/or code lines/strings ("Code") included in this documentation are only examples and are not intended to be used in a productive system environment. The Code is only intended better explain and visualize the syntax and phrasing rules of certain coding. SAP does not warrant the correctness and completeness of the Code given herein, and SAP shall not be liable for errors or damages caused by the usage of the Code, except if such damages were caused by SAP intentionally or grossly negligent.