1 Introduction

In a previous paper the meaning of the WLM General Execution Delay states has been discussed. Understanding these delays is an essential requirement for all z/OS Performance Analysts.

However there are situations where most of the delay samples are in the “unknown” bucket (waiting for WLM not managed resources). In this case a further step is needed.

By defining a transaction service class for IMS or CICS transactions it is possible to collect useful information about the delay states experienced inside the subsystems. DB managers such as DB2 and IMS cooperate with the transaction managers providing their delay samples. This information is maintained by WLM and used for managing and reporting purposes.

Since z/OS 1.4 also subsystems using enclaves (such as the Websphere Application Servers) may collect delay states information. Also in this case a transaction service class has to be defined and used in order to collect them. This information is sampled by WLM and used for reporting purposes only.

This paper shortly describes the services used to collect the information, the implications of the different subsystems structure and the meaning of each delay state. Some real life examples showing how to use this information are also presented.

Due to the complexity of the topic the paper has been divided in three parts.

2 Overview of Workload Management Services

Workload Management Services are a wide set of macros provided by WLM. Their primary objective is to allow a cooperation with the z/OS subsystems\(^1\) (Work Manager Subsystems) in order to achieve the required performance goals and provide information on how well these goals have been achieved.

The services available for Work Manager Subsystems fall into the following categories:

- Work manager services
- Execution delay services
- Enclave services
- Queueing manager services
- Routing manager services
- Scheduling environment services
- Sysplex routing services
- Query system information service

\(^1\) These services are automatically invoked by CICS, IMS, DB2 and Websphere as soon as you define a transaction service class to manage the incoming requests.
Other services provided are the Workload Reporting Services; they are intended for use by monitoring or reporting products that collect performance data.

For the scope of this paper only the Work Manager and the Execution Delay Services are relevant. The most important Work Manager Services are:

- IWM4CON; to establish a connection with WLM;
- IWMCLSFY; to classify an incoming request in the appropriate Service Class period;
- IWM4DIS; to disconnect from WLM.

The most important Execution Delay Services are:

- IWM4MCRE; to create a monitoring environment (normally called Performance Block – PB);
- IWMMRELA; to relate to an existing PB for the same work request creating a dependent monitoring environment; normally used by database managers as DB2 and IMS;
- IWM4MINI; to initialize the PB;
- IWM4MCHS; to record the state of a work request;
- IWMMXFER; to return the information collected in the dependent monitoring environment; normally used by database managers as DB2 and IMS;
- IWMMNTFY; to report the completion of an execution phase;
- IWMREPT; to report the response time of a completed work request;
- IWMMDELE; to delete the PB.

Depending on the structure of the Work Manager Subsystem different services will be invoked. In the following chapters the following scenarios will be discussed:

- Single Address Space;
- Single Address Space and supporting DB;
- Multiple Address Spaces and supporting DB;
- Multiple Address Spaces.
3 Single Address Space scenario

Nowadays this is rather an uncommon structure for a Work Manager Subsystem; it foresees a single CICS Address Space with no supporting DB Address Space. However it’s a good starting point to understand more complex scenarios.

In Figure 1 the services required to exploit Work manager and Execution Delay Services in a single CICS Address Space have been represented.

At CICS initialization the IWM4CON and IWM4MCRE services are invoked to connect to WLM and create the PBs.\(^2\)

As soon as a work request arrives the IWMCLSFY and IWM4MINI services are invoked to classify the request and initialize a PB.

Every time the work request changes state the IWM4MCHS service is invoked to record state information.

When the request completes the IWMREPT service is invoked to report the request completion.

At CICS termination the IWMMDELE and IWM4DIS services are invoked to delete the PBs and disconnect from WLM.

In this configuration, looking at the RMF Workload Activity report you will find the information on the using, idle and delay states for the CICS EXEcution phase only.

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\(^2\) The number of PBs created is based on the CICS Maxtask value.
4 Single Address Space and supporting DB scenario

A single CICS Address Space supported by a DB Manager (DB2 or IMS) is a very common scenario for small/medium CICS workloads. Figure 2 shows the services required to exploit Work manager and Execution Delay Services in this configuration.

At CICS initialization the IWM4CON and IWM4MCRE services are invoked to connect to WLM and create the PBs. At DB initialization only the IWM4MCRE service is invoked to create the PBs. As soon as a work request arrives the IWMCLSFY and IWM4MINI services are invoked by CICS to classify the request and initialize a PB.

When a DB call is encountered the work request is passed to the DB A.S. and the IWMMRELA service is issued by DB to initialize the PB creating a dependent monitoring environment and relating it to the one created by CICS.

Every time the work request changes state, both in CICS and DB, the IWM4MCHS service is invoked to record state information.

When the DB call has been processed, DB invokes the IWMMXFER service to send back the information collected in the dependent monitoring environment.

When the request completes the IWMREPT service is invoked from CICS to report the request completion.

At DB termination the IWMMDELE service is invoked to delete the PBs.

At CICS termination the IWMMDELE and IWM4DIS services are invoked to delete the PBs and disconnect from WLM.
Looking at the RMF Workload Activity report you will find the information on the using, idle and delay states in two distinct rows for the CICS and DB (DB2 or IMS) EXEcution phases. In the CICS row you’ll find a delay for “other product” that is the time spent processing DB calls.

*In Part 2 the Multiple address spaces scenarios will be described for CICS TOR/AOR, IMS and Websphere subsystems.*