# z/OS WLM – What Are You Thinking?

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# Agenda

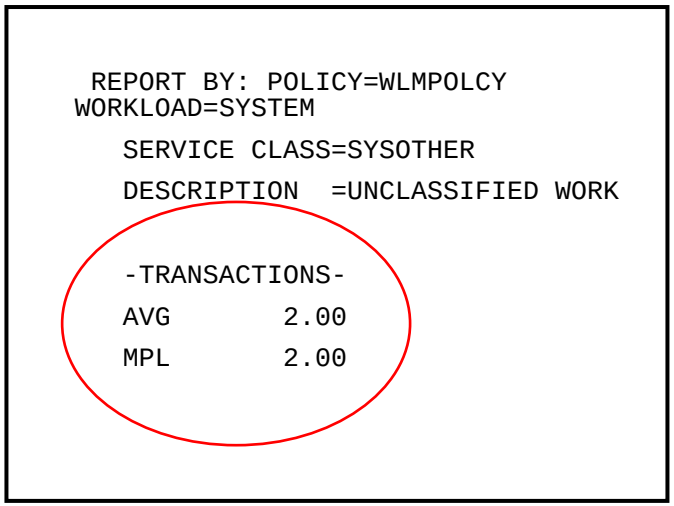
- **IBM Recommendations not being followed**
  - Service Definition Coefficients
  - Classifying new work and SYSOTHER
  - SYSSTC Observations and recommendation
- **CICS/IMS Velocity vs. Response Time Goals**
- **Common mistakes**
  - Bad Service Class Example

# Service Definition Coefficients

- **Following are typical values**
  - CPU – 1.0, SRB – 1.0, IOC – 0.1, MSO – 0.0000
  - MSO needs to be 0, long running address spaces (CICS, IMS, DB2) will accumulate so much service the reports will be skewed
  - MSO is a calculated value
    - Storage used while CPU Cycles are being used
    - With no storage contention, old frame pages may stay for multiple days

# Have a Method to Identify New Work

- **Unclassified work will default to one of two places**
  - Started Tasks default to SYSSTC
  - All other work defaults to SYSOTHER
- **Do not want new started task work to dominate the system**
- **Recommendation:**
  - Under Started Task Rules, have ‘NEWWORK’ as your default service class to prevent new tasks from running in SYSSTC
    - Give NEWWORK a medium importance and velocity
  - Monitor both NEWORK and SYSOTHER for any activity
  - In SYSOTHER, if active, or even have resident transactions, work to classify work as soon as possible
    - Many times see TCPIP Enclaves in SYSOTHER

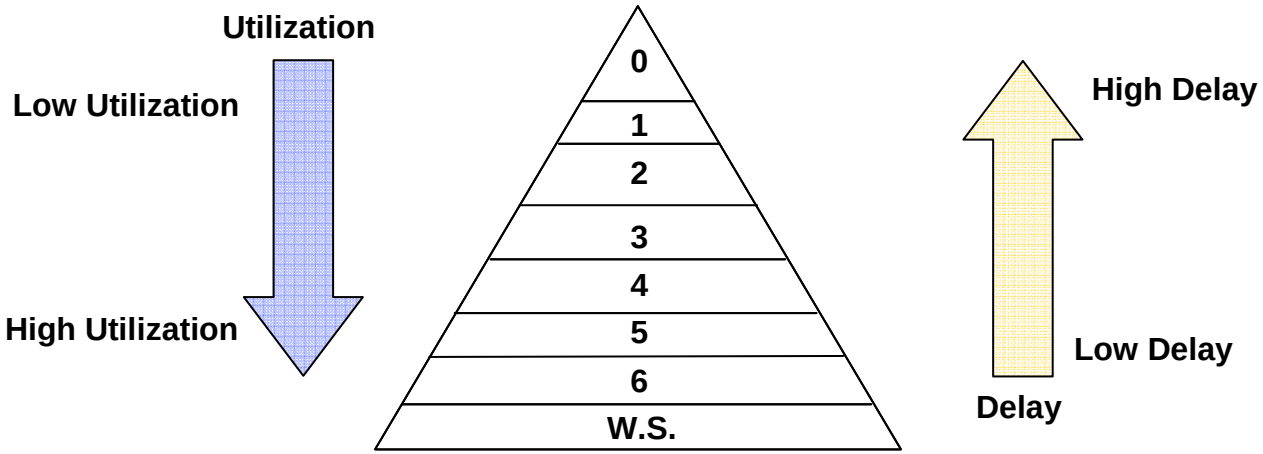


# User Work in SYSSTC

- **Many times we have seen work classified SYSSTC that should not be there**
  - DB2MSTR, DB2WLM, some CICS address spaces, MQMSTR, etc.
- **Recommendations for SYSSTC**
  - DB2IRLM and IMS IRLM – Lock manager needs high dispatching priority in order to let work flow properly through the system
  - “Emergency” TSO ID – Only one TSO ID should be defined to SYSSTC
    - All other TSO IDs should be grouped together, no special high priority service class for system programmers or management

# Importance Levels

- **Many customers not effectively using importance levels**
  - Best recommendation is to use all five importance levels in order to differentiate work
- **Policy must be clear enough so that in times of contention you know which workloads will get delay**
  - There will be some importance level where delays are not acceptable



# Use of CPU critical

- **Limit use of CPU critical**
  - Intended to be used when rapid workload shifts happen regularly and WLM will not be fast enough in adjusting priorities
  - CPU Critical only protects that work from lower importance work, no protection from work at same or higher importance, better to have the right goal
- **When running CICS/IMS with response time goals, and CPU critical is necessary, designate both regions and transactions as CPU critical**
  - Handles idle periods and restarts

# Other Issues Commonly Seen

- **Use of Average Response time Goals instead of Percentile**
  - Use of percentile goals negates impact of outliers
- **Unachievable/Unrealistic velocity goals – ie. goal of 90**
  - Check velocities of SYSTEM and SYSSTC to determine highest achievable velocities
  - Smaller n-way partitions will necessitate lower velocity goals
- **Do not want some regions doing region management, and some transaction management**
  - In workload activity report, see service class SERVER serving CICSPRD and SERVER service classes
- **Server service classes should be separated from other service classes**

# CICS and IMS – R.T. or Velocity Goal?

- **Which is the better way to manage online work?**
- **Remember, WLM will set dispatching priority for the region**
  - Need to have the CICS and IMS Regions dispatched properly
  - CICS and IMS have their own internal routines to decide which to run within their regions
  - If transactions 0101 and PRD1 both run in AOR1, CICS will decide which to dispatch, **NOT** Workload Manager
- **So the 'right' goal depends on your environment**

# Velocity Goals for CICS and IMS

- **Velocity goals are acceptable for environments with only one partition, or sysplexes with similar sized partitions**
  - A sysplex with a 4-way and a 20-way may not be a good candidate
  - Want to put enough work into each service class that WLM sampling gives a good view of usage
- **Can be used when the nature of online transactions does not make classification of transactions goals reasonable**
  - Vastly different types of transactions would skew response time distribution data
  - Two transactions service classes in same region will get same dispatching priority
- **Velocity goals do need to be monitored and may need to be adjusted during any processor changes**
  - Processor upgrades, LPAR definition changes, etc.

# Response Time Goals for CICS and IMS

- **3 major advantages of response time goals**
  - Easier to understand and can be set to a business SLA
  - Normally no need to change when environment is changed
  - Can use same goal across entire parallel sysplex, regardless of individual partition size/speed
- **Too many policies have too many response time goals defined in policy**
  - Okay only if each region only runs one type of transaction
  - Keep it Simple!
- **Recommendation:**
  - Strive for 1 to 2 response time service classes (Fast, Other)
  - Set goal for dominate transaction(s)
  - Manage to stable population
    - If you know 10% or transactions will never meet goal, take that into account when setting the goal,

# Velocity Goals – Understand Distribution

- **When running with velocity goals, for online work create report classes or use new functionality in z/OS V1R13 support**
  - Will give transaction level information and statistics
- **Advantages**
  - Get ended transaction rate
  - Average transaction time
  - Response time breakdown buckets (only in V1R13)
- **Review service classes to determine possibility of migrating if desired**

# Setting Service Class Definitions

- **Use service class called DDFEXAMP to highlight many common issues**
- **Issues common to multi-period service classes**
  - DDF
  - TSO
  - Batch
  - Enclaves

# The DDFEXAMP Service Class

- **Four period service class with both response time and velocity goals**

```
Service Class Name . . . . . . DDFEXAMP  (Required)
Description  . . . . . . . . . Example
Workload Name  . . . . . . . . DB_WKL    (name or ?)
Base Resource Group  . . . . . _________  (name or ?)
Cpu Critical . . . . . . . . . NO         (YES or NO)

Specify BASE GOAL information. Action Codes: I=Insert new period,
E=Edit period, D=Delete period.

          -- Period --  ------------------- Goal -----------------
Action  #  Duration   Imp.  Description
  __    _  _________   _    ____________________________________________
  __    1  2000        2    90% complete within 00:00:00.500
  __    2  5000        3    Execution velocity of 40
  __    3  10000       4    Execution velocity of 43
  __    4  _________   _    Discretionary
```

# DDFEXAMP Issue Number 1

- **Multiple Service Class Periods**
  - Recommendation is to use as few multi-period service classes as possible
  - Keep within the rule of thumb of 25-35 active service class periods
  - Each period needs to have sufficient samplings and ended transactions to give accurate view of workload
- **Typical assumption is longer running work is less important**
  - Low importance work can hold resources needed by high importance work
  - If work drops into lower periods, less access to CPU.
- **For Batch and Websphere work**
  - Batch and Websphere queue time delay only accumulates in first period
  - May have more success with single period workloads
- **Proper use of multiple periods**
  - For some work, many times unable to have all work in single period due to mixture
  - Attempt to keep number of periods to a max of 2
  - Check Standard Deviation of response time in Workload Activity Report

# Notes on Multiple Periods

- **Workload Manager makes better decisions when there are more samples per service class period**
- **Review RMF Workload Activity Report for service class utilization by period**
- **If one period of a multi-period service class is always much smaller than the other periods, consider consolidation**
- **For example, typical utilization pattern of three period service class**
  - SCLAS Period 1 – APPL% = 71.1
  - SCLAS Period 2 – APPL% = 0.37
  - SCLAS Period 3 – APPL% = 138.0
- **In this case, period 2 should either be combined with 1 or 3**

# DDFEXAMP Issue Number 2

- **Comparing periods 2 and 3, velocity goals are too close**
  - Period 2 Velocity of 40, Period 3 Velocity of 43
  - Indication of trying to micro-manage goals
- **Many times customers will have two or more service classes with velocity goals that are too close together**
- **Workload Manager does not manage a velocity, it adjusts a dispatching priority and observes the resulting velocity**
  - Different dispatching priorities can result in wide variety of achieved velocities
- **Velocity goals should be set with a difference of at least 10 to be effective**
  - Any service classes with goals closer than 10 should be evaluated to be combined into one service class

# DDFEXAMP Issue Number 3

- **Discretionary goal used**
- **When discretionary goals are active, discretionary goal management may affect other production service classes**
  - Can see capping on other service classes with velocity less of 30 or less or response time goal over 1 minute, and PI less than 0.71
- **Work that holds resources should be in managed service class**
  - Some customers may be okay with longer running batch in discretionary
  - Discretionary is first work to see delay, should have no SLA associated for work with a discretionary goal
- **Discretionary work and specialty processors**
  - The ‘Needs Help’ algorithm will not cause discretionary work to run on general purpose CPs
- **Only discretionary goals get mean time to wait**

# DDFEXAMP Issue Number 4

- **Duration Values are not set appropriately**
- **Can only be checked by reviewing RMF Data**
  - DDFEXAMP Period 1 duration of 2,000
  - From RMF:

```
REPORT BY: POLICY=POL01     WORKLOAD=DB2        SERVICE CLASS=DDFEXAMP

  -TRANSACTIONS-  TRANS-TIME HHH.MM.SS.TTT  --DASD I/O--  ---SERVICE---
  AVG      78.97  ACTUAL               201  SSCHRT  1466  IOC          0
  MPL      78.97  EXECUTION            200  RESP     7.2  CPU      29852K
  ENDED   349080  QUEUED                 0  CONN     0.4  MSO          0
  END/S   387.87  R/S AFFIN              0  DISC     6.0  SRB          0
  #SWAPS       0  INELIGIBLE             0  Q+PEND   0.8  TOT      29852K
  EXCTD        0  CONVERSION             0  IOSQ     0.0  /SEC     33169
```

  - Divide total service by total ended transactions
    - Or service/sec divided by end/s
  - On average, transactions ended in period 1 used 85.5 service units
- **Many times duration values were not adjusted when SDC were changed to current recommended values**
  - CPU and SRB changed from 10.0 to 1.0

# DDFEXAMP Issue Number 4

- **When multiple periods are necessary, usually better for first period to have a more uniform set of transactions**
  - Easier to set a proper response time goal if desired
- **DDFEXAMP Period 1 has a goal of 90% of transactions completing in 0.5 seconds**
  - Adjusting duration from 2,000 to 200 will allow for better management of short running transactions with a tighter goal
- **This leads us too….**

# DDFEXAMP Issue Number 5

- **Period 1 response time goal may be set too leniently**
- **All goals must be checked to determine if they are set appropriately for business goals and average system performance**
- **Note: In RMF, response time PI will range from 0.5 to 4.0**
  - Response time buckets range from half of goal to four times goal

```
----------RESPONSE TIME DISTRIBUTION----------
     ----TIME----    --NUMBER OF TRANSACTIONS--    -------PERCENT-------  0    10   20   30   40   50   60   70   80   90   100
     HH.MM.SS.TTT    CUM TOTAL        IN BUCKET    CUM TOTAL   IN BUCKET  |....|....|....|....|....|....|....|....|....|....|
  <  00.00.00.250       349080           348929          100       100.0  >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
  <= 00.00.00.300       349080                0          100         0.0  >
  <= 00.00.00.350       349080                0          100         0.0  >
  <= 00.00.00.400       349080                0          100         0.0  >
  <= 00.00.00.450       349080                1          100         0.0  >
  <= 00.00.00.500       349080                0          100         0.0  >
  <= 00.00.00.550       349080                3          100         0.0  >
  <= 00.00.00.600       349080                0          100         0.0  >
  <= 00.00.00.650       349080                0          100         0.0  >
  <= 00.00.00.700       349080                2          100         0.0  >
  <= 00.00.00.750       349080                5          100         0.0  >
  <= 00.00.01.000       349080                0          100         0.0  >
  <= 00.00.02.000       349080                0          100         0.0  >
  >  00.00.02.000       349080              151          100         0.0  >
```

# Review

- **Follow recommendations on SDC**
- **In debate of Response Time goals vs. Velocity goals, understand and use what is best for your environment**
- **Server service classes need appropriate even when transactions are running**
- **Separate Velocity goals by at least 10 each**
- **Use multiple periods sparingly**
- **Monitor PIs of all service classes**
  - PI for Response time goals have range of 0.5 to 4.0
- **For CICS/IMS transaction goals, have only 1 or 2**

- **And as always, keep number of active service class periods to a range of 25 to 35!!!**

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- **Top Facebook pages related to System z:**
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# Questions?