z/OS V2.5 IBM Education Assistant

Solution Name: Performance Trigger - New PFA check to model and evaluate address space velocity obtained from WLM

Solution Element(s): BCP WLM and BCP/PFA

August 2021

Agenda

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- Upgrade & Coexistence Considerations
- Installation & Configuration
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Trademarks

- See url http://www.ibm.com/legal/copytrade.shtml for a list of trademarks.
- Additional Trademarks:
  - None

Objectives

- Discuss the new PFA_WLM_ADDR_SPACE_VELOCITY Check
  - Alerts your system operators of symptoms related to performance to enable recovery and to improve decision-making regarding recovery steps so that the systems can be recovered quickly and accurately.

Overview

- Who (Audience)
  - Systems operators, systems programmers

- What (Solution)
  - Create a new Predictive Failure Analysis (PFA) check to *detect performance degradation in address spaces using address space velocity retrieved from Workload Manager (WLM)*.
  - If the address space velocity for an address space is too low when compared to the normal velocity for this address space on this LPAR, PFA will issue a health check exception and a report with sufficient data to investigate the problem and take appropriate action.

- Wow (Benefit / Value, Need Addressed)
  - Assists with avoiding outages due to potentially damaged address spaces or address spaces experiencing abnormal delays which could cause a business impact.

Usage & Invocation – slide 1 of 5

- Velocity % = (Using samples * 100) / (Using samples + delay samples)
- Can change configuration as to which address spaces to track based on WLM importance
  - CATEGORIES: CRITICAL, IMPORTANT, and NORMAL
    - CRITICAL – critical system work and infrastructure (system tasks)
    - IMPORTANT – CRITICAL address spaces plus critical middleware servers (importance 1 and importance 2 where server = yes)
    - NORMAL – CRITICAL and IMPORTANT address spaces plus normal work (importance 2 where server = no and importance 3)
  - COLLUPTIME – the number of minutes an address space must be up before data is collected for it
  - INCLUDED_JOBS and EXCLUDED_JOBS files – force PFA to include or exclude
- Dynamic severity is used and is based on the category of address spaces causing exception.
- Can change configuration to affect the sensitivity of the comparisons
  - STDDEVLOW – defines the variance allowed between the current velocity and the expected velocity
  - LIMITLOW – defines the maximum velocity allowed when issuing an exception

Usage & Invocation – slide 2 of 5

- The check's report
  1. Shows dynamic severity and exception message at top of reports
     - Dynamic severity is based on CATEGORIES of address spaces in exception
  2. Reminds you to look at new diagnostic actions in the "Operator Response" section of the message at the bottom of the report.
  3. Has section headings
  4. Includes Runtime Diagnostics output for address spaces causing exception if there is any
  5. Includes the WLM health setting for address spaces causing exception
  6. Lists recommended actions in the "Operator Response" of the exception message.
  7. Indicates with an asterisk if the service class changed for this job in the last hour.
- Example scenario on next slides: A job is running that has a velocity rate that is abnormally low when compared to its normal velocity.

Usage & Invocation – slide 3 of 5

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* High Severity Exception Issued *

The address space velocity calculated from WLM data for one or more
address spaces is lower than expected and may indicate a system problem.

See the 'Operator Response' section of the exception message below for
recommended actions.

              WLM Address Space Velocity Prediction Report

Last successful model time     :  10/20/2020 11:06:02
Next model time                :  10/20/2020 23:06:02
Model interval                 :  720
Last successful collection time:  10/20/2020 11:10:04
Next collection time           :  10/20/2020 11:20:04
Collection interval            :  10

SECTION 1: ADDRESS SPACE VELOCITY DATA

Highest STDDEVLOW needed to avoid this exception:  4.2

Address spaces causing exception:

Job                          Current              Expected Velocity
Name     ASID  Category     Velocity      1 Hour     24 Hour       7 Day
________ ____  _________    ________  _________  _________  _________
JOB1     0023  CRITICAL      *3.82%      82.55%      41.83%      65.23%

 * = The service class for this job changed in the last hour and may be
 affecting the current velocity.

Additional details for address spaces:

               Current  Service                                  Highest
Job            Service  Class    Report    Resource             Delay
Name     ASID  Class    Period   Class     Group     Workload   Reason
________ ____  _______  _______  ________  ________  _________  ________
JOB1     0023  SYSSTC         1                      SYSTEM     CPU
```

5

6

```
                WLM
Job             Health
Name     ASID   Setting
________ ____   ________
JOB1     0023        100

* High Severity Exception *

AIRH284E The address space velocity calculated from WLM data for one
or more address spaces is lower than expected and may indicate
a system problem.

  Explanation:  This check detects abnormalities in the address space
    velocity calculated from WLM data in individual address spaces to
    determine if an address space is behaving abnormally. An abnormal
    decrease in the WLM address space velocity can indicate damage to an
    address space that most often leads to performance degradation on
    the system. The next model will occur at 10/20/2020 23:06:02. The
    prediction used in the comparison was modeled at 10/20/2020
    11:06:02.

  System Action:  Subsequent runs of this check will not produce an
    operator message until new data is available.

  Operator Response:

    1. Examine SECTION 1: ADDRESS SPACE VELOCITY DATA in the report
    above and the details of any address spaces listed.

    2. If provided, examine SECTION 2: RUNTIME DIAGNOSTICS OUTPUT.
    Runtime Diagnostics was invoked for all address spaces whose
    velocity was too low. Look for any events that show the address
    spaces are using excessive CPU or looping. Perform the ACTION steps
    in the output.

    3. Consult a performance monitor to look for jobs with very high CPU
    usage, thus locking out other jobs from running. For example, use
    the various Resource Management Facility (RMF) Monitor III Delay
    reports and the Monitor III Sysinfo report to seek clues of
    underlying problems such as additional resources being used for
    error recovery. Based on the workload's service class, use your
    monitor to analyze the performance indicator (PI) metric to
    determine whether the work is meeting goals. Note that if an address
    space has recurring problems, it might also be an option to assign
    this address space to a separate WLM report class and analyze the
    RMF postprocessor Workload Activity Report for that report class.
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Usage & Invocation – slide 4 of 5

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   - I/O delays could result from insufficient capacity or a problem
in the fabric.
  - CPU delays could indicate insufficient capacity unless there is
another consumer.
  - Update the WLM policy to improve management for the workload,
especially if missing PI goals. It is crucial that meaningful goals
are defined in the WLM policy. Otherwise, the PI metric is not very
conclusive.
  - Some performance monitors offer top 10 lists of CPU, paging, and
storage consumers. If you have access to a monitor, look for the top
10 analysis of CPU users.

4. Examine the IBM Health Checker for z/OS log for related
exceptions in other checks.

5. Examine SYSLOG, OPERLOG, and LOGREC (i.e., EREP report) around
the time the anomaly started to determine whether there are problems
being recovered which may be causing the degradation in velocity.
Look for problems reported by key components like XCF, GRS, Logger,
etc., as problems in those areas can affect components that are
dependent on them. See if any SVC dumps have been taken recently for
existing problems.

6. If the problem cannot be isolated and local guidelines allow it,
initiate an SVC dump of the address spaces listed in the report.

7. Determine the type of address space where performance degraded.
Analyze the PI to determine whether the workload is meeting goals.
If meeting goals and no other issues are found, monitor the
performance of the address spaces. If not meeting goals, follow
installation restart procedures to determine whether to restart the
address space.

8. To find additional recommendations, consult the z/OS Problem
Management book, Predictive Failure Analysis checks chapter,
PFA_WLM_ADDR_SPACE_VELOCITY subsection, in the 'Best Practices'
topic.

9. If the problem cannot be easily determined in a short amount of
time and you want to stop all exceptions until the problem can be
resolved, do one of the following:

  a. Quiesce the check so that data continues to be collected, but
comparisons are not performed. Quiescing the check allows the check
to resume processing with no interruption of collected data once the
check is reactivated. First, ensure the check will collect and model
data while deactivated by setting COLLECTINACTIVE to 1 and then
deactivate the check.
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  f hzsproc,update,check(IBMPFA,PFA_WLM_ADDR_SPACE_VELOCITY),
  parm('collectinactive(1)')

  f hzsproc,deactivate,check(IBMPFA,PFA_WLM_ADDR_SPACE_VELOCITY)

  b. Change the severity of the exception so that all processing
continues for this check, but exceptions are not issued by modifying
the dynamic severity parameters for this check by setting these
parameters so that all exceptions issued by this check use no
severity. Use the command below or establish an IBM Health Checker
for z/OS PARMLIB member to make the change persistent:

  f hzsproc,update,check(IBMPFA,PFA_WLM_ADDR_SPACE_VELOCITY),
  parm('e_high(unused) e_med(unused) e_low(unused) e_none(max)')

10. After investigating the problem, if you have determined that the
exception is normal operating behavior and you do not want to be
alerted for similar data in the future, perform one or more of the
following actions:

  a. If this check continues to issue exceptions for address spaces
that have an abnormal WLM address space velocity but are normal
fluctuations and are not an indication of damage, add the address
spaces to the EXCLUDED_JOBS file. The file is found in the
pfa_directory/PFA_WLM_ADDR_SPACE_VELOCITY/config directory where
'pfa_directory' is the name of your PFA directory. Update the file
and then force PFA to read the file by issuing the following
command:

  f pfa,update,check(PFA_WLM_ADDR_SPACE_VELOCITY),EXCLUDED_JOBS

  b. Modify this check's STDDEVLOW parameter to the value on the
report that would have been required to avoid the exception if the
value is not TOO HIGH or IRRELEVANT. Setting the STDDEVLOW too high
might cause damaged address spaces to be undetected by this check.
Use the command below and specify your desired value in place of the
X or establish an IBM Health Checker for z/OS PARMLIB  member to
make the change persistent:

  f hzsproc,update,check(IBMPFA,PFA_WLM_ADDR_SPACE_VELOCITY),
  parm('stddevlow(X)')
```

Usage & Invocation – slide 5 of 5

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  c. If the exceptions issued by this check are for address spaces
whose WLM category is of less importance than you wish to check,
change the CATEGORIES parameter to include only those whose level of
importance represents the WLM category of the address spaces you
wish to check. For example, if the CATEGORIES parameter has a value
of NORMAL and the check issues exceptions for NORMAL address spaces
that aren't desired, consider changing the CATEGORIES parameter to
IMPORTANT or CRITICAL as shown below:

  f hzsproc,update,check(IBMPFA,PFA_WLM_ADDR_SPACE_VELOCITY),
  parm('categories(CRITICAL)')

  d. If the exception was received for an address space velocity
that was relatively high, consider setting the LIMITLOW to a lower
value. This parameter defines the maximum WLM address space velocity
that is allowed when issuing an exception for an unexpectedly low
velocity. For example, with LIMITLOW(50), the velocity must be 50%
or less in order for an exception to occur.

  f hzsproc,update,check(IBMPFA,PFA_WLM_ADDR_SPACE_VELOCITY),
  parm('limitlow(X)')

  e. Modify this check's dynamic severity parameters by using the
IBM Health Checker for z/OS modify command. These parameters
determine the severity of the WTO issued when this check issues an
exception. The severity is based on the highest WLM category of the
address spaces causing the exception. The dynamic severity is
specified in the E_HIGH, E_MED, E_LOW, and E_NONE parameters and
corresponds to the CATEGORIES parameter. For example, if medium
severity exceptions are desired for address spaces with importance
CRITICAL and IMPORTANT and low severity exceptions are desired for
address spaces with importance NORMAL, use the command below and
specify your desired values in place of X or establish an IBM Health
Checker for z/OS PARMLIB member to make the change persistent:

  f hzsproc,update,check(IBMPFA,PFA_WLM_ADDR_SPACE_VELOCITY),
  parm('e_high(UNUSED) e_med(IMPORTANT) e_low(NORMAL)
  e_none(UNUSED)')
```

Interactions & Dependencies

- Software Dependencies
  - None
- Hardware Dependencies
  - None
- Exploiters
  - None

Upgrade & Coexistence Considerations

- To exploit this solution, all systems in the sysplex must be at the new z/OS level: No
- List any toleration/coexistence APARs/PTFs: None

Installation & Configuration

- Nothing new.
  - The check is automatically added to IBM Health Checker for z/OS when PFA starts.
  - If you have not previously used PFA, see the chapter entitled *Predictive Failure Analysis overview and installation* in *z/OS Problem Management* (also listed in the Appendix of this presentation).

Summary

- Predictive Failure Analysis (PFA) has added a new check, PFA_WLM_ADDR_SPACE_VELOCITY, which detects performance degradation in address spaces using address space velocity retrieved from WLM.
- This new check detects and alerts you to performance degradation to enable recovery and improve decision-making regarding recovery steps so that the systems can be recovered quickly and accurately.

Appendix

- *z/OS Problem Management C23-6844*