
Rule WLM622: The number of outbound paths may need to be increased

Finding: The PATH BUSY (when selected for transfer) was high relative to the PATH AVAILABLE for the indicated path. CPExpert believes that outbound paths may need to be added to the indicated transport class.

Impact: This finding can have a LOW IMPACT, MEDIUM IMPACT, or HIGH IMPACT on the signalling performance of the sysplex. The level of impact depends upon how often XCF was unable to obtain outbound paths when needed.

Logic flow: This a basic finding. There are no predecessor rules.

Discussion: The XCF component of MVS/ESA allows authorized programs on one MVS system in a sysplex to communicate with programs on the same system or on other systems. A typical example of this communication is between CICS regions; CICS regions often communicate with other CICS regions in the same system or with CICS regions on other systems in the sysplex.

Please refer to the discussion associated with Rule WLM601 for additional information about XCF buffers.

XCF group members communicate with each other using the XCF *signalling* mechanism. The communication is done via signalling paths consisting of ESCON channels operating in channel-to-channel (CTC) mode, a coupling facility list structure (beginning with MVS/ESA Version 5), or 3088 Multisystem Channel Communication Unit. Messages are sent over the signalling paths, and the paths have one or more buffers associated with them to hold the messages as they are sent or received.

Outbound paths are assigned to transport classes by using the CLASS parameter on the PATHOUT statement (or by using the SETXCF PATH command after IPL). At least one outbound signalling path should be assigned to each transport class¹. If there is high message traffic in the transport class, you may wish to assign more than one signalling path to the transport class. Additionally, you may wish to assign more signalling paths for redundancy.

¹You are not required to assign a signalling path to a transport class. If no signalling path is assigned to a transport class, the XCF groups in the transport class compete for signalling resources of other transport classes. This situation can degrade signalling performance.

XCF attempts to select signalling paths that can immediately transfer a message because these paths should provide the least amount of delay to the message.

SMF Type 74 (Subtype 2) provides statistics about the number of messages sent by XCF groups in a transport class, where the messages are sent, the paths used to send the messages, how BUSY each path was when selected for transfer, and how often each path was AVAILABLE when selected for transfer.

CPEXpert analyzes this information to determine whether sufficient outbound paths have been defined. CPEXpert evaluates the PATH BUSY versus PATH AVAILABLE for each outbound path. CPEXpert concludes that the path is becoming overloaded when the PATH BUSY when selected for transfer was greater than 25% of the PATH AVAILABLE time.

The following example illustrates the output from Rule WLM622:

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|---|----------------|------------------------|--------------------|
| RULE WLM622: THE NUMBER OF OUTBOUND PATHS MAY NEED TO BE INCREASED | | | |
| The PATH BUSY (when selected for transfer) was high relative to the PATH AVAILABLE for the C605 path on System JB0, sending messages to the C611 path on System JA0 in transport class DEFSMALL. This usually means that you need to add more OUTBOUND paths to the transport class. This finding applies to the following RMF measurement intervals: | | | |
| MEASUREMENT INTERVAL | TOTAL MESSAGES | PCT OUTBOUND PATH BUSY | PCT PATH AVAILABLE |
| 12:00-12:30,26MAR1996 | 2562 | 21.1 | 78.9 |

Suggestion: If Rule WLM622 is regularly produced, CPEXpert suggests that you consider the following alternatives²:

- You should evaluate the number of outbound paths specified for the transport class. You should examine the DEVICE parameter or the STRNAME parameter list of the PATHOUT statement associated with the transport class to determine whether additional paths should be assigned.

In evaluating the number of paths assigned to the transport class, you should consider (1) the importance of the messages in the transport class, (2) how often the "ALL PATHS UNAVAILABLE" condition was experienced, and (3) the potential impact on other transport classes

²**WARNING:** There exists little practical experience with analyzing coupling facility data and with selecting proper values for the controlling parameters. The CPEXpert analysis and suggestions are based on (1) the information contained in the referenced documents and (2) our analysis of data provided by IBM or CPEXpert users. Please keep this paucity of knowledge in mind when considering the alternatives. Additionally, **please** provide Computer Management Sciences with feedback!

when XCF must route the outbound messages to paths assigned to other transport classes.

- You should evaluate whether the XCF groups are properly assigned to transport classes. XCF groups are assigned to transport classes via the GROUP parameter on the CLASSDEF statement.
- XCF groups can be assigned to more than one transport class. When evaluating which transport class to use (when XCF groups are assigned to more than one transport class) XCF will select the transport class with the smallest buffer that will hold the message being sent. You potentially can "optimize" the buffer space used by assigning XCF groups to more than one transport class.

All groups assigned to a transport class have equal access to the signalling resources of that class. Consequently, you should make sure that you do not assign "low priority" groups to transport classes that have high performance requirements if the "low priority" groups could cause performance degradation to the "high priority" groups.

Fortunately, SMF Type 74 (Subtype 2) records contain information about the XCF groups and XCF members, including the number of signals sent and received by each member. This information is in the **Member Data Section** of the Type 74 records, and can be analyzed to assess the impact of message traffic of the XCF members and XCF groups.

- Alternatively, it may be preferable to reassign XCF groups to transport classes. In practice, this situation is unlikely to occur as most installations will have a relatively small number of transport classes.
- If Rule WLM622 occurs frequently and there is no action you wish take, you can to exclude the transport class from CPEXpert's analysis, using the **EXCLASSn** guidance variables. The EXCLASSn guidance variables allow you to exclude one or more transport classes from analysis.

Reference: MVS/ESA: Setting Up a Sysplex (GC28-1449)
Section 5: Planning Signalling Services in a Sysplex

MVS/ESA: Initialization and Tuning Reference (GC28-1452)
COUPLExx (Cross-System Coupling Facility Parameters)

OS/390: Setting Up a Sysplex (GC28-1779)
Section 5: Planning Signalling Services in a Sysplex

OS/390: Initialization and Tuning Reference (GC28-1752)
COUPLExx (Cross-System Coupling Facility Parameters)

z/OS: Setting Up a Sysplex (SA22-7625)
Section 5: Planning Signalling Services in a Sysplex

z/OS: Initialization and Tuning Reference (SA22-7592)
COUPLExx (Cross-System Coupling Facility Parameters)

"Parallel Sysplex Performance: tuning tips and techniques,"
Kelley, Joan (IBM, Poughkeepsie, NY), SHARE 86, February 1996.