Description of Rules

Appendix A

This appendix contains a description of each rule that results in a finding by the WLM Component of CPExpert. The description summarizes the rule, lists predecessor rules, discusses the rationale for the finding, and suggests action. The Appendix is contained in both Volume 1 and Volume 2 of this User Manual.

The summary of the rule presents a short description of the finding.

The predecessor rules are listed so you can follow the line of reasoning leading to a particular rule being executed.

The discussion describes as much as necessary of the operation of the computer system (the hardware, the WLM, the SRM, etc.) as it relates to the particular rule. The purpose of the discussion is to explain the reasoning behind the rule, and what causes the rule to be produced.

The suggestions list possible actions that should be considered based on the findings. In many cases, multiple possible actions are listed. You must determine which actions should be taken (this determination is based upon the suitability of the actions to your own environment, the financial implications of the action, and the "political" acceptability of the action.)

The rules are organized in numerical order. However, not all numbers are represented (for example, RULE WLM200 follows RULE WLM150). The LIST OF RULES in this appendix lists all rules that are included in the current release of the WLM Component. Within the rule framework, the following general categories apply:

- **Service Policy Findings**. The Service Policy Findings are rules in the WLM001 to WLM050 range. These findings help identify problems or potential problems with the Workload Manager service definition. The Service Policy Findings are contained in Volume 1.

  It is important to realize that these findings normally identify a POTENTIAL problem. Your systems programming staff must decide whether the findings (and their associated recommendations) make sense in your environment. For example, your systems programming staff might have deliberately selected certain parameter values. The values might be appropriate for your installation and your management objectives, even though CPExpert might produce a rule indicating that there is a potential problem with the parameter.

  You can disable CPExpert's checking the service definition by modifying the CHKPLCY guidance variable in USOURCE(WLMGUIDE). If the CHKPLCY guidance variable is set to N, CPExpert will not check the service definition for potential problems.

- **General System Findings**. The General System Findings are rules in the WLM050 to WLM099 range. These findings identify problems or potential problems with your overall system. For example, many of the rules deal with problems with the paging subsystem. These findings are made only if CPExpert detected that a performance goal was not met and that some general system problem might have caused the goal to be missed. The General System Findings are contained in Volume 1.

- **Specific Findings**. The Specific Findings are rules above WLM100. These findings are made if CPExpert detected that a service class did not meet its performance goal. In the Specific Findings, CPExpert attempts to isolate the reason(s) the performance goal was not met. The Specific Findings are contained in Volume 2.

  WLM1nn(series) relate to performance goal findings

  WLM2nn(series) relate to CPU-related findings

  WLM3nn(series) relate to UNKNOWN delay findings

  WLM4nn(series) relate to swap-in and target MPL findings

  WLM6nn(series) relate to Cross System Coupling Facility (XCF) findings

  WLM7nn(series) relate to System Logger findings

You may wish to read all of the rules in this appendix, just to see the type of problems that are encountered in different installations. However, it is not necessary to read all of the rules. It is necessary only to read the rules that apply to your installation. The rules that apply to your installation are identified by the report produced from the WLMCPE Module.

All references to *MVS Initialization and Tuning Guides* or *MVS Initialization and Tuning References* apply to the following specific documents:

MVS/XA Initialization and Tuning Guide, GC28-1149-4

MVS/ESA SP3.1 Initialization and Tuning Guide, GC28-1828-2

MVS/ESA SP4.1 Initialization and Tuning Guide, GC28-1634
MVS/ESA SP4.1 Initialization and Tuning Reference, GC28-1635

MVS/ESA SP4.2 Initialization and Tuning Guide, GC28-1634-3
MVS/ESA SP4.2 Initialization and Tuning Reference, GC28-1635-3

MVS/ESA SP4.3 Initialization and Tuning Guide, GC28-1634-4

MVS/ESA SP4.3 Initialization and Tuning Reference, GC28-1635-4

IBM released a new version of the *Initialization and Tuning Guide* and *Initialization and Tuning Reference* for SP4.3 in January 1994. The following documents are used for references updated after January 1994.

MVS/ESA SP4.3 Initialization and Tuning Guide, GC28-1634-5
MVS/ESA SP4.3 Initialization and Tuning Reference, GC28-1635-5

Beginning with MVS/ESA SP5.1, the references to IBM documents **apply to IBM BookManager documents**. This change was made because all CPExpert users installing MVS/ESA SP5.1 also use IBM BookManager to access soft-copy IBM documents rather than acquiring hard-copy IBM documents.

- The IBM BookManager documents are contained in IBM CDROM LK2T-5114 or in IBM CDROM SK2T-0710 (with appropriate quarterly updates).
- With OS/390, the IBM BookManager documents are contained in IBM CDROM SK2T-6700.
- With z/OS, the IBM BookManager documents are contained in IBM CDROM SK3T-4269.

If any user does not have access to IBM BookManager documents, please call Computer Management Sciences. We will be happy to provide references to hardcopy manuals.

Beginning with CICS/Transaction Server for z/OS, CICS documentation is contained in the CICS Information Center (InfoCenter). IBM provides the following description of the documentation available with CICS/Transaction Server for z/OS:

"For CICS Transaction Server V2.1 (announced March 2001), there has been a move away from printed books as the default deliverable to a new online concept. The primary source of user information for this release is a new CICS Information Center with a graphical user interface, delivered with the product on a CD-ROM. This HTML-based Information Center runs inside a Web browser, and provides a number of alternative means of accessing the information within it.

The objective of the Information Center is to make it easy for users to retrieve the information they need to perform specific CICS tasks, or to find relevant background or reference information on demand. At the heart of the Information Center is an HTML representation of the total CICS library (unlicensed books) Within the graphical user interface, the key documentation can be accessed via three main classes: tasks, concepts, and reference, each separately selectable. On selecting a class, the categories for that class are displayed in the navigation panel. Each of these can be expanded into a hierarchical navigation tree of topics in turn point to the detailed information.

The Information Center also includes a powerful search capability based on IBM's NetQuestion technology. Search results can be saved for future reference. In addition to the new methods of accessing the CICS documentation, the Information Center provides the more traditional alternative of a complete library listing of the books, which can be viewed in both HTML and PDF formats. The latter also provides the capability to print either the whole book or some of the pages in hardcopy a printer, using Adobe Acrobat.

For this new release of CICS, the main focus of the documentation is the implementation of EJB technology in the CICS environment. A new piece of documentation entitled "Java Applications in CICS" is the cornerstone of this information, and has been designed to make use of the new capabilities of the Information Center."

CPExpert references for CICS/Transaction Server for z/OS are specific to the CICS Information Center.

List of Rules
Volume 1

RULE	DESCRIPTION
WLM001	The service class definition may not match workload
WLM002	Conflict exists between service class and report class
WLM003	The service policy was changed
WLM004	CPExpert believes too many service policy changes occurred
WLM005	The velocity goal may be too high for batch service class
WLM006	The response time goal is too large
WLM007	MSO service definition coefficient may be too large
WLM008	DUR value may be too large for TSO Period 1
WLM009	Minimum CPU service specified for Resource Group
WLM010	Velocity goals have values which are too similar
WLM011	The service definition does not describe all workloads
WLM012	A server workload defaulted to the SYSSTC service class
WLM013	Response goal was specified for a server service class
WLM014	Response goal specified for "hot batch" workload
WLM015	Execution velocity goal specified for TSO Period 1 or Period 2
WLM016	Low execution velocity goal specified for server service class
WLM017	Server and subsystem transactions in same service class
WLM018	Multiple periods specified for server service class

List of Rules (Continued)
Volume 1

RULE	DESCRIPTION
WLM019	Multiple periods specified for subsystem transaction service class
WLM020	Subsystem transactions in same service class as address space
WLM021	Subsystem transactions service class assigned to resource group
WLM022	Execution velocity goal specified for subsystem transaction service class
WLM023	Too many service class periods may have been specified
WLM024	More than three periods were specified for a service class
WLM025	The service class period may be unnecessary
WLM026	Highest importance service class period had few samples
WLM027	Service class periods have same velocity goal and importance
WLM030	Report class period is heterogeneous
WLM031	Dynamic alias management was active but I/O priority management was not selected.
WLM032	Server was assigned CPU protection, but most work was done in support of lower importance work

List of Rules (Continued)
Volume 1

RULE	DESCRIPTION
WLM050	The number of available page slots is low
WLM051	The number of local page data sets may be inadequate
WLM052	The number of allocated page slots may be insufficient
WLM053	The number of allocated page slots may be insufficient
WLM054	The number of allocated page slots may be insufficient
WLM055	Local page data sets are on same volume as swap data sets
WLM056	Local page data sets share volume with COMMON or PLPA
WLM057	Multiple local page data sets are on the same volume
WLM058	Local page response is significantly worse than average
WLM059	Insufficient local page data sets are defined for migration
WLM060	PLPA and COMMON page data sets may be combined
WLM061	Swap data sets are defined
WLM070	Terminal Output Wait swaps occur too often
WLM071	Detected Wait swaps occur too often
WLM080	JES-managed and WLM-managed job classes conflict
WLM081	WLM-managed job class assigned to multiple service classes
WLM082	Job might not be suitable for WLM-managed initiators
WLM090	SMF Type 30 interval recording not turned on

List of Rules (Continued)
Volume 2

RULE	DESCRIPTION
WLM101	Service class did not achieve average response goal
WLM102	Service class did not achieve percentile response goal
WLM103	Service class did not achieve velocity goal
WLM104	Served service class did not achieve average response goal
WLM105	Served service class did not achieve percentile response goal
WLM106	Response time distribution for service class
WLM107	Response time distribution for service class
WLM108	Response time distribution for served service class
WLM109	Response time distribution for served service class
WLM110	BTE Phase samples count was larger than calculated samples
WLM111	BTE Phase Idle sample count is large
WLM112	BTE Phase had large (Ready plus Active) sample count
WLM113	BTE sample count was significantly less than calculated samples
WLM114	BTE phase had large ready samples
WLM115	Service class did not have begin_to_end phase samples
WLM116	Execution Phase samples did not exist in SMF data
WLM117	Transaction service class wait states
WLM119	Work manager data was not collected for service class

List of Rules (Continued)
Volume 2

RULE	DESCRIPTION
WLM120	Significant transaction time was in Active state
WLM121	Significant transaction time was in Ready state
WLM122	Significant transaction time was in Idle state
WLM123	Significant transaction time was Waiting for Lock
WLM124	Significant transaction time was Waiting for I/O request
WLM125	Significant transaction time was Waiting for Conversation
WLM126	Significant transaction time was Waiting, Distributed
WLM127	Significant transaction time was Waiting, Local Session
WLM128	Significant transaction time was Waiting, Sysplex Session
WLM129	Significant transaction time was Waiting, Network Session
WLM130	Significant transaction time was Waiting for Timer
WLM131	Significant transaction time was Waiting, Another Product
WLM132	Significant transaction time was Waiting, Miscellaneous
WLM135	IMS activity processing transactions in service class
WLM136	DB2 activity processing transactions in service class
WLM140	Sysplex performance index was significantly less than local
WLM150	Server service class delays (single transaction service class)
WLM151	Server service class delays (multiple transaction service classes)
WLM152	Server served multiple transaction service classes

List of Rules (Continued)
Volume 2

RULE	DESCRIPTION
WLM153	Server served multiple transaction service classes
WLM170	Address spaces were idle a significant percent of time
WLM171	Execution velocity was based on a small sample set
WLM172	Server was idle a significant percent of time
WLM173	The response performance goal may be too large

List of Rules (Continued)
Volume 2

RULE	DESCRIPTION
WLM200	Average CPU use per transaction is higher than goal
WLM201	Goal may be unrealistic - average CPU use is high
WLM202	Average CPU use was a major cause of transaction delay
WLM210	Average server CPU use per transaction is higher than goal
WLM211	Goal may be unrealistic - average server CPU use is high
WLM212	Average CPU use was a major cause of transaction delay
WLM220	Service class was delayed because of resource capping
WLM221	Service Class was capped for discretionary goal management
WLM222	Service class was Active, but server was CPU capped
WLM250	Service class waited for access to CPU
WLM251	Dispatcher reduced preemption might have caused CPU delay
WLM252	CPU access might be denied because of Resource Group minimum
WLM255	Service class was active but server was denied CPU
WLM256	Service class was active and server was not denied CPU

List of Rules (Continued)
Volume 2

RULE	DESCRIPTION
WLM340	Batch jobs may be delayed waiting for an initiator
WLM341	Service class may be waiting for initiator/scheduler
WLM350	I/O activity may have caused significant delays
WLM351	I/O activity may have caused significant delays
WLM352	I/O activity may have caused significant delays to server
WLM353	I/O activity may have caused significant delays to server
WLM355	Device DISConnect time was a major cause of DASD delays
WLM356	Device PEND time was a major cause of DASD delays
WLM357	Device CONNect time was a major cause of DASD delays
WLM358	Device IOS queuing time was a major cause of DASD delays
WLM359	I/O activity probably did not cause major delays
WLM360	Service class did not reference DASD

List of Rules (Continued)
Volume 2

RULE	DESCRIPTION
WLM361	Non-paging DASD I/O activity caused significant delays
WLM362	Non-paging DASD I/O activity caused significant delays
WLM363	Non-paging DASD wait time was a major cause of DASD delays
WLM364	non-paging DASD CONNect time was a major cause of delays
WLM365	Non-paging DASD DISConnect time was a major cause of delays
WLM366	Non-paging DASD IOSQ time was a major cause of DASD delay
WLM370	Non-DASD I/O activtity or delay was significant
WLM371	Non-paging DASD I/O activity caused significant delays
WLM385	SMF Type 30 (Interval) data was not available for service class
WLM390	UNKNOWN delay was not accounted for by above analysis

List of Rules (Continued)
Volume 2

RULE	DESCRIPTION
WLM400	Page-in from auxiliary storage was major performance problem
WLM410	Some higher importance service class has storage protection
WLM420	Some equal importance service class has storage protection
WLM450	Swap-in delay was major performance problem
WLM480	Target multiprogramming level delay was major performance problem

List of Rules (Continued)
Volume 2

RULE	DESCRIPTION
WLM601	XCF transport class may need to be split
WLM602	XCF message buffer length may be too small
WLM603	XCF message buffer length may be too large
WLM604	XCF outbound message buffer space may be too small
WLM605	XCF inbound message buffer space may be too small
WLM606	XCF local message buffer space may be too small
WLM607	Insufficient outbound paths were defined
WLM608	Transport class did not have a signalling path assigned
WLM620	Message buffer space may be too small for inbound path
WLM621	Message buffer space may be too small for inbound path
WLM622	The number of outbound paths may need to be increased
WLM623	The number of outbound paths may need to be increased
WLM630	A hardware problem may exist
WLM632	An inbound path was non-operational
WLM633	An outbound path was non-operational

List of Rules (Continued)
Volume 2

RULE	DESCRIPTION
WLM651	Lock contention was high
WLM652	False lock contention was high
WLM660	Service time was high for synchronous requests
WLM661	Service time was high for asynchronous requests
WLM662	Subchannel contention was high for synchronous requests
WLM665	Too many synchronous requests were changed to asynchronous

List of Rules (Continued)
Volume 2

RULE	DESCRIPTION
WLM701	Log stream coupling facility structure was full
WLM702	Log stream staging data set was full
WLM703	Log stream structure offloads occurred: 90% full
WLM704	Interim storage was not efficiently used for log stream
WLM705	Local storage buffers not efficiently used, DASD-only log stream
WLM706	DASD staging data set high threshold was reached
WLM707	Frequent log stream DASD-shifts occurred
WLM708	Log stream caused structure to reach high threshold
WLM709	Log stream consumed most of structure resources

