Maximo Knowledge Transfer Session April 28, 2011

Maximo Logging and Troubleshooting

Manjunath Makonahalli

April 28, 2011

Tivoli software

Agenda

- Logging Overview
- Loggers
- Memory Problems Logging
- SQL Problems Logging
- Database Connection Leak Logging
- TLPA for log analysis

Logging Overview

- Logging is essential to finding problems at run time.
- Without logging and an evidence of where the problem is, it is very difficult to solve the problem.
- Maximo uses Log4j.
  - Came out of open source project and now is part of Java.
- Log4j libraries are packaged as part of Maximo source.
  - Currently using log4j 1.2.13 library.
- Log4j provides the ability to selectively enable or disable logging requests based on the logger.
- Log4j allows logging requests to print to multiple destinations.

Logging Properties

- In Maximo 6, we used logging.properties.
- In Maximo 7, logging properties are moved into a Maximo application called Logging and stored in the database.
  - This is to help configure and apply changes on the fly.
  - Logging.properties is still valid.
  - **If logging.properties exists in the ear file, then the properties file will override the database settings.**
- Let us open a logging.properties and try to understand.
- Three main components to understand
  - LOGGERS
  - LOG APPENDERS
  - LAYOUT

Loggers

- Logger is a category for logging.
  - Named entities, are case sensitive names.
  - SQL logging
  - Database Connection
  - BIRT Reporting
  - WORKORDER application
- Hierarchical – follow hierarchical naming rules.
  - e.g. log4j.logger.maximo.service.WORKORDER.WOSTATUS=INFO
- **Named Hierarchy**
  - A logger is said to be an *ancestor* of another logger if its name followed by a dot is a prefix of the *descendant* logger name. A logger is said to be a *parent* of a *child* logger if there are no ancestors between itself and the descendant logger.

Root Loggers

- Under Maximo implementation.
  - Maximo logger is the root logger.
  - The root logger i.e. maximo has to exist, without maximo logger, no logging will work in maximo.
  - To ensure that all loggers can eventually inherit a level, the root logger always has an assigned level.
- Main loggers in Maximo – sometimes called as root loggers.

Root Loggers – Maximo top level loggers

- crontaskmgr log4j.logger.maximo.crontaskmgr
- report log4j.logger.maximo.report
- security log4j.logger.maximo.security
- sql log4j.logger.maximo.sql
- service log4j.logger.maximo.service
- application log4j.logger.maximo.application
- workflow log4j.logger.maximo.workflow
- crontask log4j.logger.maximo.crontask
- datadictionary log4j.logger.maximo.datadictionary
- mail log4j.logger.maximo.mail
- event log4j.logger.maximo.event
- integration log4j.logger.maximo.integration
- exception log4j.logger.maximo.exception // resource intensive
- dm log4j.logger.maximo.dm
- dbconnection log4j.logger.maximo.dbconnection
- interaction log4j.logger.maximo.interaction
- uisession log4j.logger.maximo.webclient.uisession

LOG APPENDERS

- Output destination that stores the log information.
  - Log4j appenders exist for the console, files, GUI components, remote socket servers, JMS, NT Event Loggers, and remote UNIX Syslog daemons.
  - Maximo uses files only.
- Can have multiple log appenders, depending on what is being logged.
- Typical ones
  - Console Appender
  - Rolling File Appender
  - Daily File Appender
  - MX File Appender – Maximo's extension.
    - MXFileAppender
    - MXDailyFileAppender
    - These basically add server name to the file name. Use "-Dmxe.name=<servername>" on the jvm parameters.
- First define an appender, then you can assign the appender to any logger.

Log Appenders - 2

- Each enabled logging request for a given logger will be forwarded to all the appenders in that logger as well as the appenders higher in the hierarchy.
- It is good to have console appender at the root level and specific file appenders are lower levels.
  - log4j.rootLogger=A1 // root logger appender
  - log4j.logger.maximo=INFO,A2
  - # ~~ Output destinations or appenders
  - ## A1 is set to be a ConsoleAppender which outputs to System.out.
    log4j.appender.A1=org.apache.log4j.ConsoleAppender
  - # A2 is set to be a RollingFileAppender which outputs to maximo.log file
  - log4j.appender.A2=org.apache.log4j.RollingFileAppender
  - log4j.appender.A2.File=maximo.log
  - log4j.appender.A2.MaxFileSize=5MB
  - log4j.appender.A2.MaxBackupIndex=20

Log Appenders - 3

- Specifying file appenders are lower level.
  - log4j.logger.maximo.sql=INFO,A3
    - Where A3 is a log appender defined to hold all sql statements.
    - # A3 is set to be a RollingFileAppender which outputs to sql_maximo.log file
    - log4j.appender.A3=org.apache.log4j.RollingFileAppender
    - log4j.appender.A3.File=sql_maximo.log
- If you want to collect only the WORKORDER related sql in a file.
  - log4j.logger.maximo.sql.WORKORDER=INFO,A4
    - Where A4 is a log appender defined to hold all workorder sql statements.
    - # A4 is set to be a RollingFileAppender which outputs to workorder_sql_maximo.log file
    - log4j.appender.A4=org.apache.log4j.RollingFileAppender
    - log4j.appender.A4.File=workorder_sql_maximo.log

Log Appender Layout

- Layout is used to format the log output.
- This is accomplished by associating a *layout* with an appender.
- Sample
  - log4j.appender.A1.layout=org.apache.log4j.PatternLayout
  - log4j.appender.A1.layout.ConversionPattern=%d{dd MMM yyyy HH:mm:ss:SSS} [%-2p] %m%n
- %d - date in the format specified inside the brackets.
- %-2p – displays the log level
- %m – user provided message
- %n – platform dependent new line separator
- 16 Apr 2011 16:40:57:636 [INFO] BMXAA7084I - The DbConnectionWatchDog class has been trying to close the database connection for: 73000
- **%C{1}** - Will print the class name where this message was printed.
- **%M{1}** - Will print the method name where the logging was issued.

Log Appender Layout - 2

- **%M{1} -** Will print the method name where the logging was issued.
- %t – Will print the thread info.
- %% - will print a single % sign.

Log Levels

- FATAL – Logs on severe errors that indicate application failure
  - Maximo has minimal to none – don't use.
- ERROR – Logs on Errors in the application
  - This is a problem that needs to be looked into.
  - Could be an application problem going back to user or a system level error written to the log file.
- WARN – Logs warnings in the application
  - Not as critical as the ERROR level, but needs to be addressed.
- INFO – Logs informational messages
  - This is mainly for administrators to know what is happening, so they can investigate.
  - Indicates progress inside the application.
- DEBUG – Logs extensive information at very low level of code execution.
  - This is mainly to collect data to be sent to support / development for further analysis.
- TRACE – Further lower level than Debug, Maximo does not use this.

Loggers and Log Level assignment

- Every logger needs a log level.
- If a given logger is not assigned a level, then it inherits one from its closest ancestor with an assigned level.
- **Basic Selection Rule**
  - A log request of level *p* in a logger with (either assigned or inherited, whichever is appropriate) level *q*, is enabled if *p* >= *q*.
  - Example 1
    - log4j.logger.maximo.service=ERROR
    - log4j.logger.maximo.service.CONFIGURE=INFO
  - Example 2
    - log4j.logger.maximo.service=INFO
    - log4j.logger.maximo.service.CONFIGURE=ERROR
- **DEBUG < INFO < WARN < ERROR < FATAL**

Maximo Memory Analysis

- To check whether a maximo server is using excessive memory.
  - Set root logger to INFO level.
  - log4j.logger.maximo=INFO
- You will see messages as below every minute.
  - [4/16/11 16:39:59:933 EDT] 0000003f SystemOut O 16 Apr 2011 16:39:59:933 [INFO] BMXAA7019I - The total memory is 1631584256 and the memory available is 227070992.
- This does not tell you the server maximum memory setting.
  - You need to collect javacore / thread dump information to collect the exact settings on the server.
- When you look through the log and notice that there is very little memory left on the server, then the server is using up lot of memory.
- Next step is to look at the “mbocount” information to see if the problem is with large number of objects in memory.
  - This is done through a system property and not logging. But, the information is written to the log files.

Maximo Memory Analysis - 2

- Set mbocount = 1 through System Properties application.
- This setting produces the following output in log files associated with Maximo root logger.
  - For this to log to a file, the maximo root logger must be at INFO level.
  - 16 Nov 2010 18:09:18:942 [INFO] LOCANCESTOR: mbosets (1168), mbos (1706)
  - 16 Nov 2010 18:09:18:942 [INFO] LOCATIONMETER: mbosets (53), mbos (null)
  - 16 Nov 2010 18:09:18:942 [INFO] LOCATIONS: mbosets (1867), mbos (2934)
  - 16 Nov 2010 18:09:18:942 [INFO] LOCATIONSPEC: mbosets (401), mbos (915)
  - 16 Nov 2010 18:09:18:942 [INFO] LOCCHANGESTATUS: mbosets (4), mbos (null)
  - 16 Nov 2010 18:09:18:942 [INFO] LOCHIERARCHY: mbosets (1945), mbos (2933)
  - 16 Nov 2010 18:09:18:942 [INFO] LOCLEADTIME: mbosets (102), mbos (102)
  - 16 Nov 2010 18:09:18:942 [INFO] LOCOPER: mbosets (557), mbos (1072)
  - 16 Nov 2010 18:09:18:942 [INFO] LOCSTATUS: mbosets (51), mbos (51)
  - 16 Nov 2010 18:09:18:942 [INFO] LOCSYSTEM: mbosets (406), mbos (707)
  - 16 Nov 2010 18:09:18:942 [INFO] LONGDESCRIPTION: mbosets (330), mbos (591)
  - 16 Nov 2010 18:09:18:942 [INFO] MASTERPM: mbosets (2), mbos (2)
  - 16 Nov 2010 18:09:18:958 [INFO] MATRECTRANS: mbosets (17), mbos (17)

SQL Logging

- In Maximo, SQL Logger prints sql statements to the logger specified.
- At root level, the SQL statements are printed for all objects
  - log4j.logger.maximo.sql=INFO
- If you want specific object level SQL statements, enable
  - # ~~ Business Object SQL Loggers
  - # log4j.logger.maximo.sql.<service name>.<business object name>=<level>
  - # for example:# log4j.logger.maximo.sql.WORKORDER.WOSTATUS=INFO
- Additionally, the SQL statement time limit logging.
  - Using a system property you can get only the sql statements that exceed a certain time for sql execution.
  - Use mxe.db.logSQLTimeLimit property and set to a certain value in milliseconds.

Database Connection Leak Logging and Troubleshooting

- There is a separate logger for database connection leak – Maximo 7113 onwards.
- log4j.logger.maximo.dbconnection=INFO
- Enable this and collect log data over a 48 hour time period.
- Will print database connection information every minute.
- Take the latest SystemOut log file.
- Look for the latest set of database connection information towards the end of the file.
  - You only need the print from the last minute as the information is printed every minute.
- Find the connections that are still in use for the longest duration.
- Calculate when the original connection was created from the duration.
- Go to the SystemOut file at that time and search the reference id of the connection.

Database Connection Leak Logging and Troubleshooting

- Db Connection Watchdog prints a stack trace of the first connection acquired by the connection and held for more than 60 seconds.
- If by luck, this is the connection held over time, then you will find the stack trace of the connection creation and you can send the information for a fix.
- If the connection reference printed is not the one held for long, then you have a reference id but it will not be in the logs.
  - This is difficult to trace, until changes are made to the current connection watchdog logging functionality.

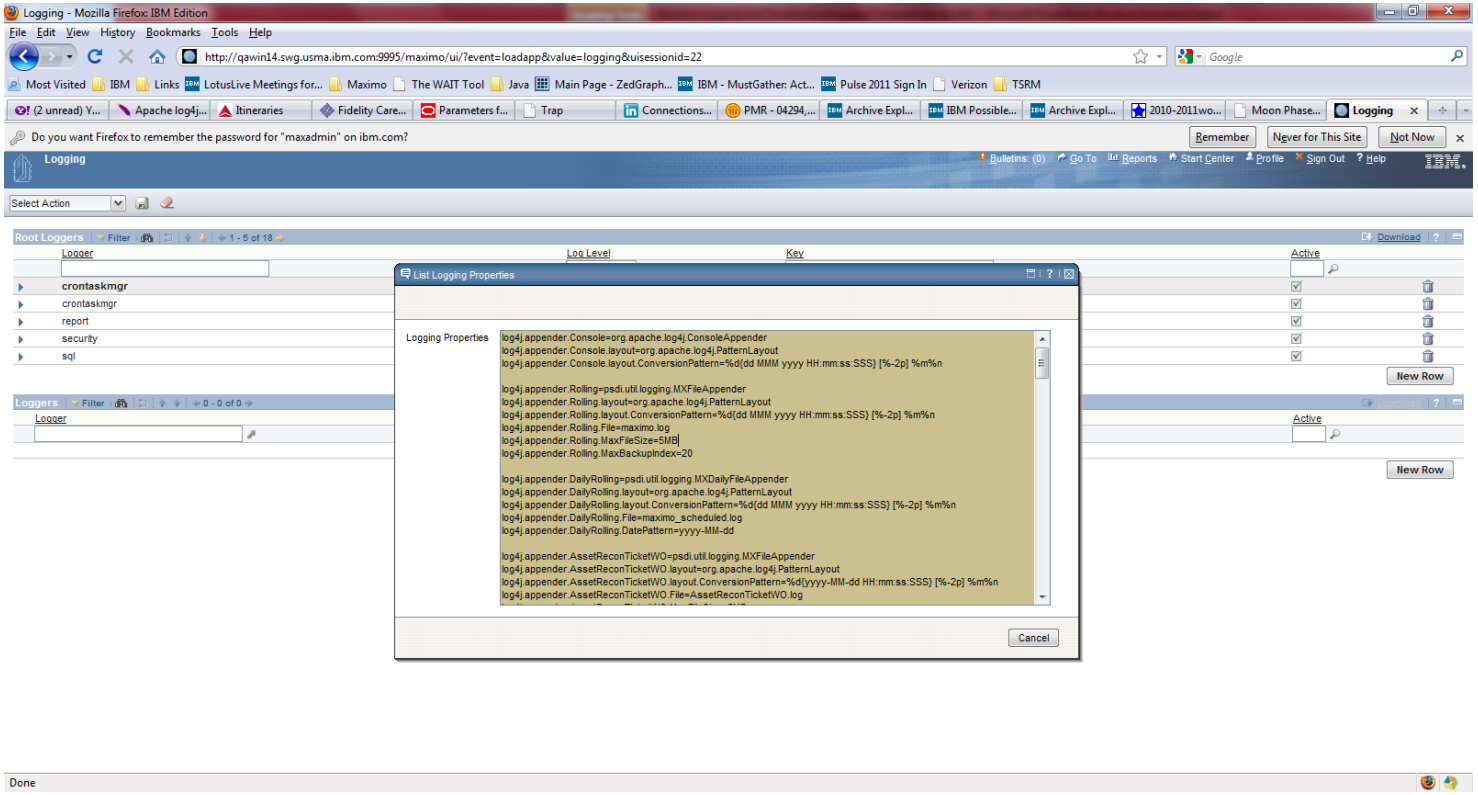
BIRT Report Logging

- BIRT reporting has its own logging.
- It is similar to other logging and can be used to log report related problems.

log4j.logger.maximo.report
log4j.logger.maximo.report.birt
log4j.logger.maximo.report.birt.admin
log4j.logger.maximo.report.birt.admin.osgibundle
log4j.logger.maximo.report.birt.queue
log4j.logger.maximo.report.birt.script
log4j.logger.maximo.report.birt.sql
log4j.logger.maximo.report.birt.sql.script
log4j.logger.maximo.report.birt.viewer

Troubleshooting some problems with Logging.

- If you don't see the logs, check the logging setup. In Maximo 7 it is in table called MAXLOGGER.
- You can also ask for an output of the logger setting through the List Logging Properties option.

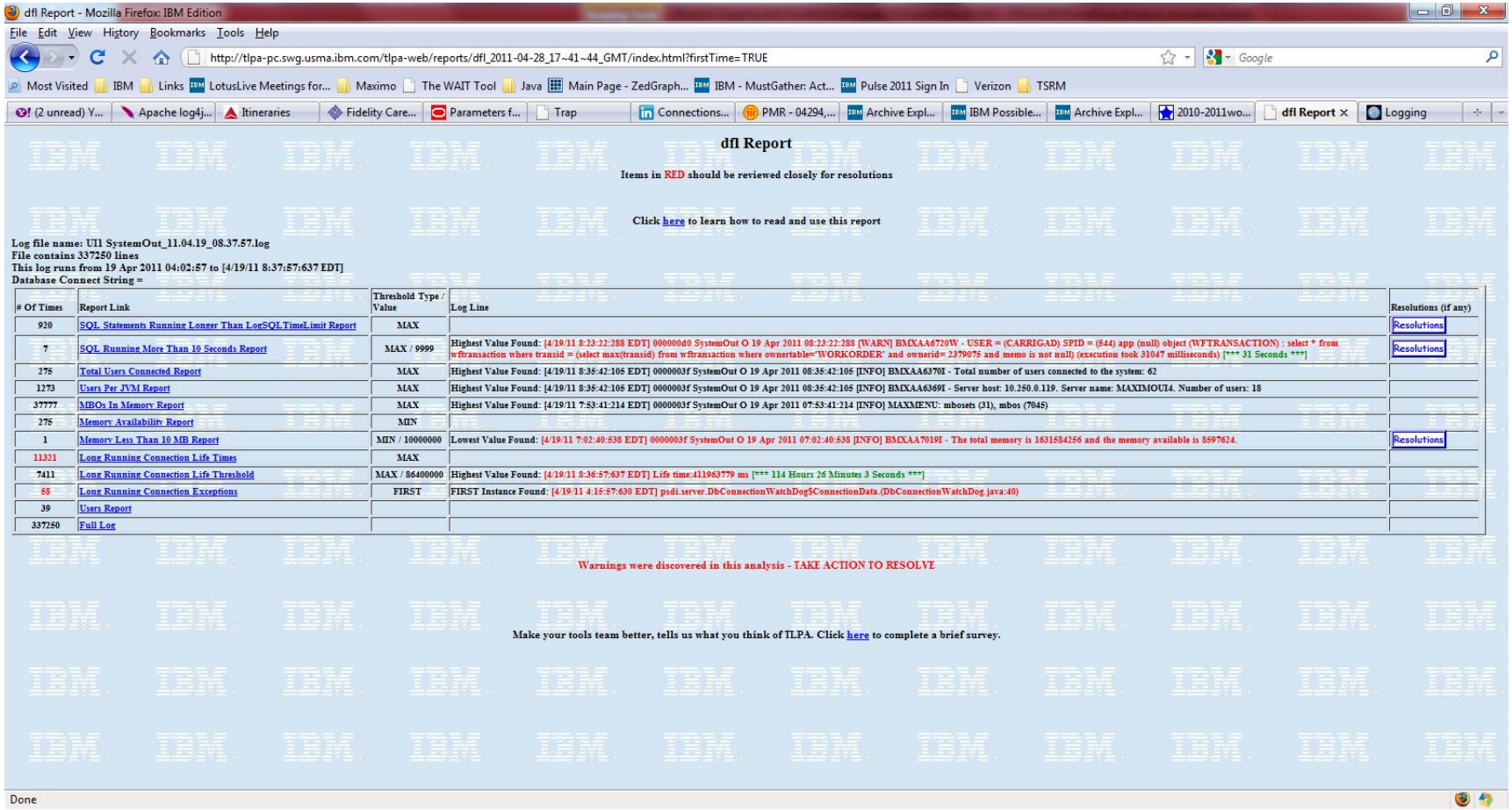


MAXMESSAGES – Where to look for information

- MAXMESSAGES - Database Configuration contains max messages.
- These are maximo messages that end users see and is also written to log files.
- Contains Error Messages
  - Explanation
  - Operator Response
  - Admin Response
  - System Action

TLPA for log analysis

- http://tlpa-pc.swg.usma.ibm.com/tlpa/tlpa.jsp




Questions...

Architecture