



Catalys LMA User Guide

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Table of Contents

1. Introduction	1
1.1. Catalys Overview	1
1.2. LMA Overview	2
1.3. Catalys Releases	3
1.4. What's New in Catalys 2.2	4
1.4.1. Installers	4
1.4.2. New Features in Catalys Node 2.2	4
1.4.3. Public API changes Catalys Node 2.2	6
1.4.4. Known Issues in Catalys Node 2.2	6
1.4.5. New Features in Catalys Node 2.1 Maintenance Releases	7
1.4.6. New Features in Catalys MIS 2.2	9
1.4.7. Known Issues in Catalys MIS 2.2	10
1.4.8. New Features in Catalys MIS 2.1 Maintenance Releases	12
1.4.9. New Features in Catalys LMA 2.2	12
1.4.10. Known Issues in Catalys LMA 2.2	12
1.5. Getting Support	13
1.5.1. Contacting Support	13
1.5.2. Sending Files to Your Support Team	14
2. Installation	15
2.1. Introduction	15
2.2. Compatibility	15
2.3. Installation Steps	16
2.3.1. Post-Installation LMA Directories	17
2.3.2. Upgrading or Installing Additional Features	17
2.3.3. Uninstaller	17
2.3.4. Manual Service Installation	18
2.3.5. LMA Unwrapped Mode	20
2.3.6. Command Line Options	20
2.4. Troubleshooting	20
3. Configuration	22
3.1. Introduction	22
3.2. Configuration File	23
3.2.1. Specifying custom pgrep and pkill commands	23
3.2.2. Changing default ports	24
3.2.3. Specifying security settings	24
3.2.4. Guest Application Log Streaming	25
3.2.5. Logs Replication	28
3.2.6. Changing default JMX request timeout	29
3.3. Logging	29
3.4. LMA Scripts	29

3.5. SSL	30
3.5.1. Creating keystore in the LMA	30
3.5.2. Export the LMA's certificate	30
3.5.3. Create a keystore in the MIS	30
3.5.4. Import the LMA's certificate into the MIS' keystore	30
3.5.5. LMA Configuration	31
3.5.6. MIS Configuration	31
3.5.7. Specify LMA path to keystore	31
3.5.8. Specify MIS path to keystore	31
4. API	32
4.1. JMX API	32
4.2. JavaDoc	32
A. Third-Party Software	33

Chapter 1. Introduction

Table of Contents

1.1. Catalys Overview	1
1.2. LMA Overview	2
1.3. Catalys Releases	3
1.4. What's New in Catalys 2.2	4
1.4.1. Installers	4
1.4.2. New Features in Catalys Node 2.2	4
1.4.3. Public API changes Catalys Node 2.2	6
1.4.4. Known Issues in Catalys Node 2.2	6
1.4.5. New Features in Catalys Node 2.1 Maintenance Releases	7
1.4.6. New Features in Catalys MIS 2.2	9
1.4.7. Known Issues in Catalys MIS 2.2	10
1.4.8. New Features in Catalys MIS 2.1 Maintenance Releases	12
1.4.9. New Features in Catalys LMA 2.2	12
1.4.10. Known Issues in Catalys LMA 2.2	12
1.5. Getting Support	13
1.5.1. Contacting Support	13
1.5.2. Sending Files to Your Support Team	14

1.1. Catalys Overview

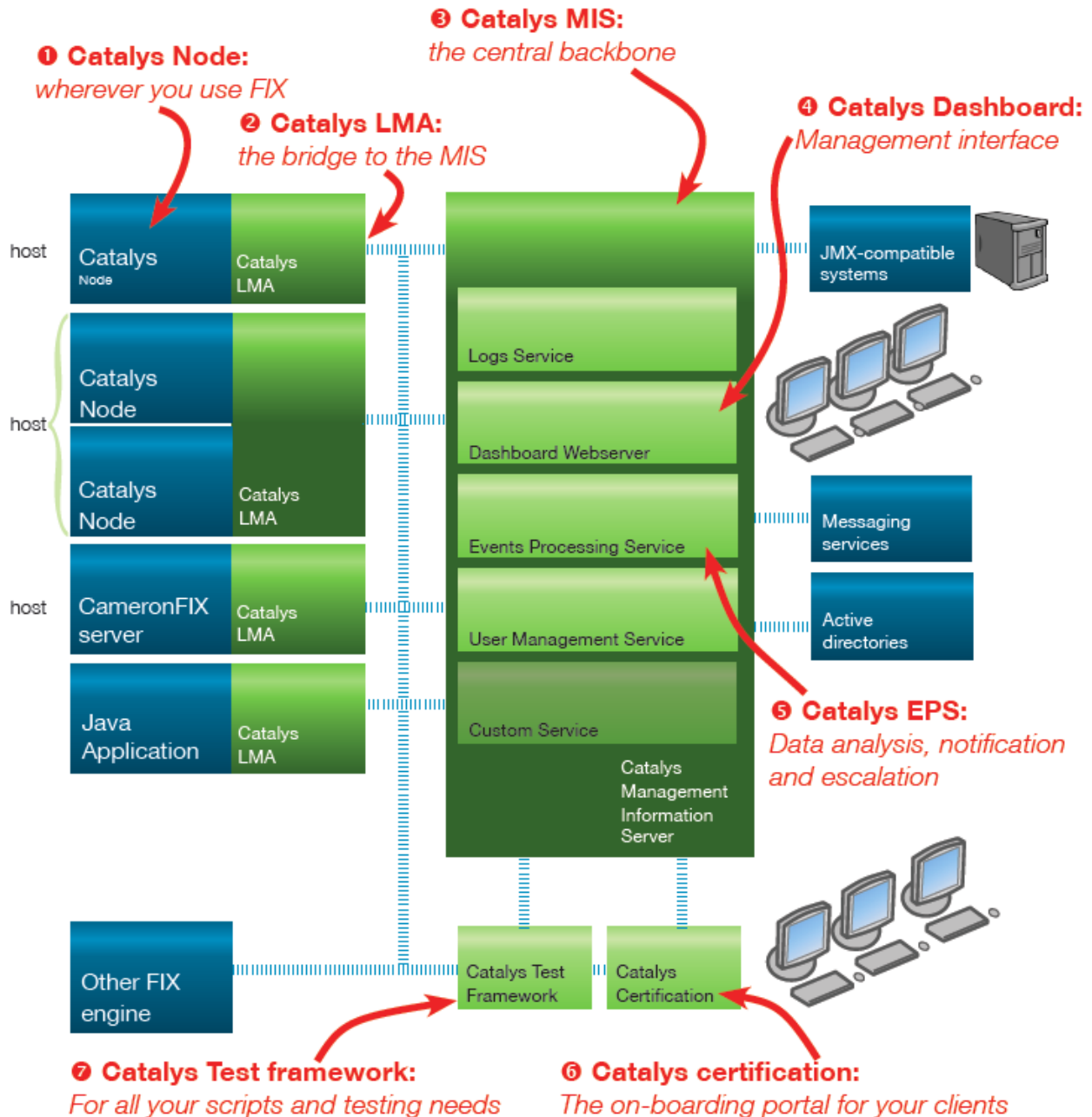
Catalys is [CameronTec](#)'s integrated software solution designed to meet the broad spectrum of functional needs for firms seeking to utilize advanced FIX connectivity.

What makes Catalys different is its unique approach: it is an unprecedented environment to develop, deploy and operate your advanced FIX infrastructure as an **ecosystem**.

Multiple components work together inside the Catalys ecosystem:

- The Catalys Nodes handle the FIX message flows. Refer to the Catalys Node Documentation.
- The Catalys LMA connects the nodes to the rest of the ecosystem. Refer to the Catalys LMA Documentation.
- The Catalys MIS is the central backbone for transversal services such as monitoring provided via an API or the Catalys Dashboard user interface. Refer to the Catalys MIS Documentation.
- The Catalys Test Framework produces and runs testing scripts for all aspects of the ecosystem. Refer to the Catalys Test Framework.

The various components are represented in the following diagram. For more information, please consult the specific section of the Catalys documentation.



1.2. LMA Overview

The Local Management Agent (LMA) is a process that runs on the same host as CameronFIX Servers or Catalys Nodes. It serves as a relay between the manageable applications and the Catalys Management Information Server (MIS). The LMA is also responsible for making new applications immediately manageable by the MIS via its automatic discovery mechanism. The LMA is intended to be run as a

daemon process on Unix machines, and as a service on Windows so that it's automatically started when the system boots, and so that its logs appear in the system logs (syslog on Unix, Event Manager on Windows).

1.3. Catalys Releases

Introduction

Catalys products are delivered in three different types of releases: major, minor and maintenance.

Major Releases

A major release delivers new functionality and occasionally includes changes to the public APIs, configuration schemas, data file formats and default configuration values which may not be backward-compatible. New features can also replace previous features that accomplish the same function.

An example of a new major release is 2.0

Minor Releases

A minor release delivers new functionality and bug fixes and will be compatible with the previous release.

An example of a new minor release is 2.1

Maintenance Releases

In between each major and minor release, CameronTec provides iterative updates called Maintenance Releases. These contain the baseline software delivered in the current release plus bug fixes and minor new features. Although it's not required, it is always recommended to download the latest maintenance release for evaluation as it may provide finer tuning, performance improvements or increased stability.

When a maintenance release is created, the product's version number does not change. Rather, the *revision* number is incremented. For example: 2.1 r37928.

Release Notes

Each major release is accompanied by a Release Summary which provides a high-level view of the changes and new features.

Maintenance releases are accompanied by Release Notes that provide an incremental listing of the enhancements and resolved issues in each release.

Here is a sample Release Notes excerpt:

r35564 released 2015-05-18

ENHANCEMENTS	COMPONENTS	SUPPORT CASES
■ NODE-4752: Provide user feedback when scanning large journals	Buffering File Persistence	
RESOLVED ISSUES		
■ NODE-734: Re-enable the "s_reprocess" command	Core File Persistence	SERV-60346

All releases, documentation and release notes can be downloaded from the [Docs Portal](#).

1.4. What's New in Catalys 2.2

The following new features are available in Catalys 2.2 products at launch. In addition, Catalys 2.2 includes a large number of new features that were also back-ported to Catalys 2.1 as part of maintenance releases.

For any changes made after the initial release of Catalys 2.2, refer to the release notes for each maintenance release. Release notes are available from the [Docs Portal](#).

1.4.1. Installers

Catalys products are now distributed with an installer, automating the process of install, upgrade and uninstall. The installers are platform-specific and support Linux, Windows (32- and 64-bit) and most Unix-based operating systems.

1.4.2. New Features in Catalys Node 2.2

General

- NODE-4929: `SendingTime` can now be expressed with millisecond, microsecond, or nanosecond precision.
- NODE-4884: New `-version` command-line switch for Catalys Node.
- NODE-4910: `Session.maximumGapQueueSize` is no longer unbounded by default.
- NODE-3771: New consolidated drop-copy message processor for low impact drop-copy of another Catalys Node's message flow.
- NODE-4727: `MarketMirrorPopulator` now supports message object reuse.
- NODE-4745: Added JMX monitoring for multi-connection sessions.

High Performance Logging

- NODE-4365: Improved performance with many threads logging under intensive load.
- NODE-2428: Display jar file details in stack traces.

High Availability

- NODE-4596: Support for HA replication of a custom service's configuration.
- NODE-4674: HA data replication performance improvements. Introduced new multicast data replication option, as well as a new passive site replication feature allowing periodic pull-based data replication instead of continual push-based data replication. Also added a safety mechanism that will prevent a node from do a resynchronization if it is too far behind.

Collections Framework

- NODE-4765: Collections can now be created at run-time instead of only at startup.
- NODE-4925: High-capacity lists now support set in the middle of the list instead of only at the end.
- NODE-4586: High-capacity lists can now share the same indexer thread.
- NODE-4817: Maps and high-capacity lists can now use an off-heap cache for fast, garbage-free caching of very large amounts of data.

Buffering

- NODE-4350: Message buffers now support message object reuse.
- NODE-4826: Message buffer size is no longer excessively logged.
- NODE-4809: Serialization format changed to be faster and more compact.

Solace Adapter

- NODE-5030: Provide configurable last resort action for consumed Solace messages which cannot be processed.
- NODE-4860: Add option to safeguard against message loss due to windowing.
- NODE-4856: Add option to clear CompIDs in consumed Solace messages before firing to FIX.
- NODE-4821: Create `SolaceEndpoint` component for routing Solace messages.

Advanced Socket Adapter

- NODE-4862: New high-capacity message store option.

Socket Adapter

- NODE-4841: Minimizing logging of undeliverable events when no socket client is connected.

Scheduling

- NODE-4848: New option to execute missed reset tasks on startup.

Multi-threading

- NODE-4617: More descriptive thread naming.
- NODE-4803: Enhanced thread pinning capabilities.

Routing

- NODE-2286: `Link.ignoreSessionSide` attribute removed.

1.4.3. Public API changes Catalys Node 2.2

Catalys Node 2.2 is compatible with Catalys Node 2.1 except that the following XML configuration attributes are no longer necessary and have been removed:

- `ListenerMessageBuffer.setStoresMessages`
- `SourceMessageBuffer.setStoresMessages`
- `Link.ignoreSessionSide`

In addition there is currently a known issue causing an incompatibility between the persistence files of message buffers in 2.1 and 2.2. See issue NODE-5046.

1.4.4. Known Issues in Catalys Node 2.2

- NODE-5046: Message buffer persistence from 2.1 is not compatible with 2.2.
- NODE-5045: RulesEngine round() function is inconsistent with legacy valueOf() function.
- NODE-5038: HA synchronization window warning should only be logged once.
- NODE-5037: Unexpected exception while trying to reload config containing rules.
- NODE-5033: Spurious OpenHFT thread affinity GC warnings.
- NODE-5031: Exception when activating a component that is already active.
- NODE-5016: Installer does not accept relative or home directory-related paths.
- NODE-4999: Node installer reports incorrect required disk space.
- NODE-4978: Uninstall does not remove empty CameronTec directory.

- NODE-4977: Uninstall incorrectly reports that it will delete the parent directory of an installation.
- NODE-4871: MarketDataProcessor leaves a thread running after deactivation.
- NODE-4870: NotifyingMessageBuffer retry thread ignores interrupts.
- NODE-4790: .NET client intermittently reports error when disconnecting.
- NODE-4713: Catalys server should not log errors and warnings when shutdown.

1.4.5. New Features in Catalys Node 2.1 Maintenance Releases

The following features were added to Catalys Node 2.2 and also back-ported to Catalys Node 2.1 as part of maintenance releases, and have been available for some time.

General

- NODE-4577: Safety feature: Duplicate instances of the same Catalys Node will no longer run at the same time.
- NODE-4379: Improved logging at startup.
- NODE-2834: Maven POM file now included in the distribution.
- NODE-4694: Support for explicitly specifying SSL protocols
- NODE-4351: Reload configuration from XML now disables affected sessions automatically.
- NODE-4682: New `license_reload` command.
- NODE-4360: New session configuration attribute `maximumAppQueueSize`.
- NODE-3176: New Multiplexed and non-blocking I/O capability for FIX sessions.
- NODE-3174: Move `SendingTime` generation off critical outbound latency path.
- NODE-3172: Add core affinity capability to `MessageAssembler` thread.
- NODE-230: Add ability to control the ordering of tags within an `IFIXMessage`.
- NODE-4558: Removed periodic object creation in `SessionManager`.

High Availability

- NODE-4788: Ability to mark certain cluster nodes as not to be used as data sources during synchronization.

Collections Framework

- NODE-4752: Progress is now logged periodically when scanning very large journals.

- NODE-4636: Collection directory uniqueness is now validated at startup.
- NODE-4747: Journaling persistent stores unnecessarily copy bytes when reading from journal

Scheduling

- NODE-4878: EventLists are now validated so that two tasks will not execute at the same time.

Buffering

- NODE-4763: Introduced output limit to `mb_messages` command.
- NODE-2212: New `mb_remove` command for removing messages from buffers.

Embedded Adapter

- NODE-4380: Added ability to manage sessions from the embedded Catalys Node's owning application.

IBM MQ Adapter

- NODE-4432: SSL support.

Advanced Socket Adapter

- NODE-4525: New `asa_list` command that lists all connected ASA clients and the sessions they are subscribed to.
- NODE-4484: New CONNECT message that supports filtering by SessionID.
- NODE-4472: Added keepAlive configuration option.

Solace Adapter

- NODE-4446: New Technology Adapter: Solace Adapter.
- NODE-4824: Support Solace JCSMP API v7.
- NODE-4823: Add support for reply-to topics.
- NODE-4822: Add support for dynamic error topics.
- NODE-4779: New Solace message transformer that ensures valid tag order, BodyLength and CheckSum.
- NODE-4571: Remove restriction on Solace message type.
- NODE-4567: DMQ support.

.NET Adapter

- NODE-4767: Added ability to get session status from .NET application.

Throttling

- NODE-4864: New inbound message throttling feature based on limiting the speed at which messages are read from the socket rather using message buffering.

Routing

- NODE-2272: Any-to-any routing support. No need to define static session groups.
- NODE-4813: `AutoRoutingResponse` can now be placed anywhere in the message processing chain.

Rules Engine

- NODE-4608: Added the concept of default rules.
- NODE-4619: New action: `ActionStripChars`.
- NODE-4734: New action: `ActionFileLookup`.
- NODE-4589: New action: `ActionLog`.
- NODE-4520: New condition: `ConditionFieldsUnique`.
- NODE-4547: New condition: `ConditionOvernightOrder` to hold and release outbound messages to FIX session based on a schedule.
- NODE-4611: `ActionReject` can now send application level rejects.
- NODE-4622: New function available in expressions: `round()`.
- NODE-4497: Add the ability to pass the message processor object to custom actions.
- NODE-4496: Add ability to load rules from the config file and apply them to messages outside the Catalys FIX engine.
- NODE-4923: Add verbose output for rules engine tracking.
- NODE-2612: Rules Engine now supports message object reuse.
- NODE-4661: New option for handling Amend or Cancel messages where the original order cannot be found.
- NODE-4877: Reduce garbage creation in rules engine.

1.4.6. New Features in Catalys MIS 2.2

General

- MIS-1563: LDAP connection timeout is now configurable.

Logs

- NODE-2858: Introduced a new high-throughput logs streaming stack. Logs can now be transferred from Catalys Nodes to the MIS at approximately the bandwidth of the network connection.
- MIS-1677: New parallel log insertion algorithm increases the speed at which logs can be inserted into the log events repository.
- MIS-1584, MIS-1477: Log cleanup speed and memory usage drastically improved.
- MIS-1478: Browser memory usage stabilized when tailing logs for long periods of time.
- MIS-1593: Logs tab now provides visual feedback of ongoing searches.
- MIS-1598: Logs tab date selection widget is easier to use.
- MIS-1663: Logs cleanup configuration simplified.
- MIS-1646: New 'find' feature added to logs tab.
- MIS-1393: Custom conversation correlators can now define arbitrary custom message types.
- MIS-1392: Added ability to name custom tags.
- MIS-1699: Log streaming admin page redesigned.

Events

- MIS-1661: New Action: Windows NT Event.
- MIS-916: Add Category filter to Log interests.

1.4.7. Known Issues in Catalys MIS 2.2

- MIS-1844: Logs streaming does not work on Solaris unless `LD_LIBRARY_PATH` contains `/usr/sfw/lib:/usr/sfw/lib/amd64`.
- MIS-1837: JMX cascading suffers poor performance over a slow network.
- MIS-1828: Logs cleanup is significantly slower when logs are being inserted at a high rate.
- MIS-1815: Replicated log files can become corrupt if source log files are modified in unexpected ways while being replicating.
- MIS-1812: Text Search - Escape button does not clear out search field.
- MIS-1811: Text Search - Search results should wrap around to start.
- MIS-1810: Events - Session Report interest taking union of selection when multiple interests configured.

Introduction

- MIS-1805: Logs tab - Buttons are off screen while re-sizing left section panel.
- MIS-1796: MIS sometimes incorrectly reports that no logs were deleted during cleanup.
- MIS-1795: Admin - log streaming tab has double scroll bars and blank bottom section after exit from full screen mode.
- MIS-1790: Abrupt MIS termination can lead to duplicate log entries in the logs repository.
- MIS-1775: Events - Email password in mis.conf not encrypted.
- MIS-1773: Events - Escalation sequences - Stop-here-on-ack doesn't work correctly.
- MIS-1771: Admin - Permissions - Add escalation sequence permission only works if change escalation sequence permission is assigned.
- MIS-1770: Admin - Permissions - Add interest permission only works if change interest permission is assigned.
- MIS-1769: Admin - Permissions - Admin Tab is hidden unless incorrect set of permissions is assigned.
- MIS-1764: Servers and Sessions - Script info not shown for CameronFIX 8.0 servers.
- MIS-1763: Servers and Sessions - Process info not shown for CameronFIX 8.0 servers.
- MIS-1757: Config - Tooltips should be displayed for configuration tree icons.
- MIS-1756: Config - View changes so far menu item should be disabled when there are no changes.
- MIS-1755: Config - Add top-level selector should be disabled for 2.0 nodes.
- MIS-1754: Config - Unable to delete compression without multiple reloads.
- MIS-1753: Servers and Sessions - Change session sequence number doesn't work for 1.1 Catalys Nodes.
- MIS-1752: Events - Escalation Sequences - Event view of an escalation sequence's progress is faulty.
- MIS-1749: Events - Interests - Session report interest events are unreadable in dashboard.
- MIS-1747: Events - Interests - Log regex interest category field implies that it is a regular expression but is not.
- MIS-1745: Events - Add Interest - Underlined fields do not link to anything.
- MIS-1744: Events - Interest template description is not displayed.
- MIS-1743: Admin - Disabling a user while they are logged in causes their browser to repeatedly logout and login.
- MIS-1731: Uninstalling MIS on Windows does not warn if it cannot remove all directories.
- MIS-1709: Dashboard logged user out automatically after executing a log search after tailing logs overnight.

- MIS-1705: Multiple errors logged if replicated logs directory is deleted when logs replication and insertion into logs repository is in progress.
- MIS-1693: Logs tab apply button sometimes needs to be pressed twice.
- MIS-1640: When log filter end time is earlier than start time, an error comes up on dashboard.
- MIS-1610: Too many error message on dashboard if live streaming is on when shutting down MIS server.
- MIS-1581: If opening an interest after resizing the dashboard GUI smaller, the custom text fields are not popped out.
- MIS-1320: Events - Creation of an interest with incorrect regular expression is allowed by dashboard.
- MIS-461: Rules - Error when renaming rulesPack which is referenced before rules engine is reloaded.

1.4.8. New Features in Catalys MIS 2.1 Maintenance Releases

The following features were added to Catalys MIS 2.2 and also back-ported to Catalys MIS 2.1 as part of maintenance releases, and have been available for some time.

- MIS-1542: Log insertion can now be filtered by message type to exclude high-volume messages that do not need to be stored.
- MIS-1385: Added a calendar for public holidays to the interest schedules.
- MIS-1384: Session status column now takes session's schedule into account.
- MIS-1350: Open conversation view now retains user's current category selection.
- MIS-1301: Improved dashboard responsiveness when monitoring nodes with high latency.
- MIS-811: The MIS can now expose the output of scripts via JMX.
- MIS-1349: Conversation correlators added for SecurityDefinition conversations.

1.4.9. New Features in Catalys LMA 2.2

- NODE-2858: Introduced a new high-throughput logs streaming stack. Logs can now be transferred from Catalys Nodes to the MIS at approximately the bandwidth of the network connection.
- LMA-50: Unwrapped LMA distribution.

1.4.10. Known Issues in Catalys LMA 2.2

- LMA-65: Log4j guest logger support not handling `CR/LF` properly.

1.5. Getting Support

1.5.1. Contacting Support

Email

Send an email to your regional support team with the details of your issue or question and include log files and configuration files if applicable. This automatically creates a support ticket and alerts the support team.

- North America and South America: supportamericas@itiviti.com
- Europe, the Middle East and Africa: supportemea@itiviti.com
- Asia Pacific: supportapac@itiviti.com

Online Form

[Submit a request](#) on our support portal. This automatically creates a support ticket and alerts the support team.

Phone

For high priority issues you can call your regional support team. This does not create a support ticket.

- North America and South America: **+1-312-235-5602**
- Europe, the Middle East and Africa: **+44-20-7942-0969**
- Asia Pacific: **+61-29002-4273**

Support Tickets

Emailing support or filling out the online support form automatically creates a support ticket, notifies the support team and sends the customer an automated email with a support ticket number. Any updates made to the ticket will be sent to the customer via email.

You can track and update all tickets submitted by your organization on the Support Portal by clicking on the [My activities](#) button on the top of page after logging in.

Support Level Agreement

During the License Term, as a part of the License Fee, Licensor undertakes to provide the software support set out in your contract, with respect to the Software Product. Such software support will be provided to the Customer through the Service Center during the Service Center's normal Business Hours: All Business Days between 8.00 a.m. – 6.00 p.m. local time for the respective Service Center.

The Service Center may choose to refer the calls to any other Licensor certified Service Center, or to the relevant third party Service Center as and when needed, during and outside its Business Hours.

1.5.2. Sending Files to Your Support Team

Most support issues require the support team to review certain configuration files or logs from your Catalys environment. These files will vary from product to product.

Catalys Node

- **Configuration File(s):** One or XML files that contain the configuration for the Node instance. These are located in the `<CATALYS_NODE_INSTANCES>/<INSTANCE>/conf` directory if using the installer.
- **Log File(s):** One or more log files containing application and FIX message logging for the Node instance. These are located in the `<CATALYS_NODE_INSTANCES>/<INSTANCE>/logs` directory if you used the installer.
- **Log Configuration Files:** The *HighPerformanceLogger.conf* and *logback.xml* files for the Node instances. These are located in the `<CATALYS_NODE_INSTANCES>/<INSTANCE>/conf` directory if using the installer.
- **License File:** *camerontec_license.xml* file located in the root of your CameronTec installation.

Catalys LMA

- **LMA Configuration File:** *lma.conf* file located in the `/conf` directory of the standard LMA directory layout.
- **LMA Registry File:** *lma.registry* file located in the `/data` directory of the standard LMA directory layout.
- **LMA Log File:** The application log file for the LMA located in the `/logs` directory of the standard LMA directory layout.

Catalys MIS

- **MIS Configuration File:** *mis.conf* file located in the `/conf` directory of the standard MIS directory layout.
- **MIS Log File:** The application log file for the MIS located in the `/logs` directory of the standard MIS directory layout.
- **License File:** *camerontec_license.xml* file.

Chapter 2. Installation

Table of Contents

2.1. Introduction	15
2.2. Compatibility	15
2.3. Installation Steps	16
2.3.1. Post-Installation LMA Directories	17
2.3.2. Upgrading or Installing Additional Features	17
2.3.3. Uninstaller	17
2.3.4. Manual Service Installation	18
2.3.5. LMA Unwrapped Mode	20
2.3.6. Command Line Options	20
2.4. Troubleshooting	20

2.1. Introduction

The Catalys LMA application has traditionally been packaged as a zip file which is installed simply by unzipping the package in the desired destination directory. Starting with Catalys v2.2, we provide an automated platform-specific installer. The installer also helps you to:

- Install and start the LMA as a service
- Simplify the upgrade process

We continue to provide the zip package for customers who prefer to manually manage their installation process. However, for all other customers, we recommend using the installer, which is covered in the remainder of this section.

2.2. Compatibility

Java Compatibility

Java 8 or later is required to run the LMA 2.2 installer and executables.

Catalys MIS Compatibility

The LMA interfaces with the Catalys Management Information Server (MIS). The MIS is available from [Docs Portal](#).

Please consult the [compatibility matrix](#) for supported combinations of CameronFIX, Catalys Node, MIS and LMA.

2.3. Installation Steps

1. Download the installer for your platform:

- **Linux, Solaris, Mac OSX, and other Unix-based systems:** `catalys-lma-2.2-installer-r<revision>.sh`

After downloading this file, you may need to make it executable if not already. This can be done by running `chmod +x <filename>`.

- **Windows 64-bit:** `catalys-lma-2.2-installer-64bit-r<revision>.exe`
- **Windows 32-bit:** `catalys-lma-2.2-installer-32bit-r<revision>.exe`

The *r<revision>* indicates the latest [maintenance revision number](#).

Windows installers require a JRE to be installed that matches the architecture of the installer.

2. Launch the installer.



Note

When the Windows installer is launched, a User Access Control dialog appears asking if this installer has permission to make changes to the system as an Administrator. If the installer was launched by a user that is not in the Administrators Group role the dialog also prompts for Administrator credentials. If Yes is clicked (and Administrator credentials are entered if required), the installer will display screens related to Service installation. If Administrator credentials are unavailable or service installation is not needed, click No to close the dialog and resume installation without elevated privileges, with only the service installation screens being unavailable.

3. Select a Destination Directory: This is where the LMA distribution will be installed.
4. Program Group: On Windows, this allows creation of a Start Menu folder and shortcuts for the LMA executable. On Linux/Solaris, this allows creation of symlinks for the LMA executable.
5. Install Service: Select this option to have the installer configure the LMA executable as a background service daemon process. If this option is selected, the final screen of the installer will give the option to attempt to start the service before the installer closes. Note that the service will install and run as Local System account (on Windows) and as root (on Linux/Solaris).



Note

This screen will only be displayed if the installer was Run As Administrator or was given permission in the UAC dialog to make changes as Administrator (on Windows) or as root (on Linux/Solaris).

2.3.1. Post-Installation LMA Directories

After the installation is complete, you will see the following LMA directories. The default location is `<INSTALL_BASE>/CameronTec/catalys-lma-2.2`.

- **bin** - contains the LMA executables, including the service executable and the console executable
- **conf** - contains logging configuration and the configuration for the LMA executable
- **data** - contains the LMA registry file
- **doc** - contains information on our 3rd party libraries and has links to our online documentation
- **lib** - contains *catalys-lma.jar*
- **scripts** - contains scripts executed by the LMA and published as attributes of the `LMA.Scripts` MBean

2.3.2. Upgrading or Installing Additional Features

The installer can be used for upgrading the LMA to a newer version, starting at version 2.2 or later. It can also be rerun to choose additional options that weren't selected on a previous installation. When the installer starts it should recognize that a previous installation exists.

2.3.3. Uninstaller

To uninstall Catalys LMA, run the *uninstall* executable located in the Catalys LMA home directory. On Windows, this uninstaller can also be invoked from the *Programs and Features* tool by selecting the Catalys LMA entry and clicking "Uninstall/Change". The uninstaller will delete the Catalys LMA root directory and all files and directories it contains. If the parent directory (*CameronTec* by default) is empty and was created by the installer, it will be deleted as well. If the LMA was installed as a service by the installer, running the uninstaller will remove this service. If the service was installed manually, it must be removed manually by the user - the uninstaller will not attempt to remove it.

2.3.4. Manual Service Installation

The Catalys LMA installer provides the option to install and start the LMA as a service. If this was not done initially, it can be done at a later time by re-running the installer. However, the LMA can also be manually configured to run as a service without using the installer with the following steps.

Installation Steps - Windows

1. Open a Command Prompt



Note

If User Account Control (UAC) is enabled on the system, the Command Prompt must be opened by an Administrator (right click on `cmd.exe` and select "Run as administrator").

2. Change the directory to the `bin` directory under the LMA installation directory
3. Execute the command `lma.exe /install`
 - To install the service with a different name than the default ("lma"), pass in the new name as a second parameter after `/install`. For example: `lma.exe /install Catalys LMA`.
 - To prevent the automatic start of the service when the computer reboots, use the `/install-demand` option instead of `/install`.

If the service installation is successful, the line "Installed service 'lma'" is output to the console. If the service was installed under a different name, that name will be output instead of 'lma'.

Installation Steps - Unix

- Note that the 'root' user must run this installation.
- Create a link in folder `/etc/init.d` to the LMA executable. If symlinks were set up, link should be to the service executable there. If not, link to the service executable in the LMA directory.

```
%> ln -fs /usr/local/bin/lma /etc/init.d
```

or

```
%> ln -fs <LMA_HOME>/bin/lma /etc/init.d
```

- Use the installed service to start the LMA:

Installation

```
%> /etc/init.d/lma start
```

- Check that the LMA was successfully started by looking at the end of the LMA log file:

```
%> tail -100 <LMA_HOME>/logs/catalys-lma.log
```

You should see something similar to:

```
*****
Catalys LMA

version   : 2.2
revision  : 37706
build     : 20151203232007

Copyright (c) 1997-2015 CameronTec. All rights reserved.
*****
```

- Ensure the operating system will start/stop the LMA automatically at the right run level, which involves creating symbolic links in the appropriate rc*.d run-level directories.
- On RedHat based systems use the chkconfig command:

```
%> chkconfig --add lma
```

- On Debian and Ubuntu use the following command:

```
%> update-rc.d lma defaults
```

- On Solaris, a startup (S) and process kill (K) link must be created for each desired runlevel. A typical configuration is:

```
ln -s /etc/init.d/lma /etc/rc0.d/K20lma
ln -s /etc/init.d/lma /etc/rc1.d/K20lma
ln -s /etc/init.d/lma /etc/rc2.d/S20lma
ln -s /etc/init.d/lma /etc/rc3.d/S20lma
```

- (Optional) Running the LMA as a non-root user

While the LMA service must be installed by root, it can be configured to run as any user that has the correct permissions. To enable this, edit the *lma* service executable script. Uncomment the line with the "RUNUSER" variable, and set it to the username that you wish to run the service. Note that the user you have specified needs to have full access to the LMA installation directory, so you may need to either change the ownership of the directory using the `chown` command or change the permissions of the directory using the `chmod` command.

2.3.5. LMA Unwrapped Mode

To run the LMA without the Java Service Wrapper, obtain the unwrapped package from the CameronTec Support Portal and unzip it. The package name is similar to the installer executable but including the string *package*. For example: *catalys-lma-2.2-package-r<revision>.zip*. The *r<revision>* indicates the latest [maintenance revision number](#).

The package structure is similar to the platform-specific one. Run *bin/lma.sh* (on Unix platforms) or *bin/lma.bat* (Windows) to run the LMA directly as a Java application in a console window. This program will print log messages to that console window. To stop the LMA when it is being run in its unwrapped mode, simply press CTRL-C in the console window.

2.3.6. Command Line Options

The *lma.[exe/sh]* service executable provides command line options to interact with the service. In Windows, each of these options is preceded by a forward slash (e.g. */start* and */stop*).



Note

In Windows, if the service was installed with a name other than the default ("lma"), that name must be passed as a second parameter after the option.

- *start*: starts the LMA service manually, outputting messages to a file in the */logs* directory of the LMA installation home
- *stop*: stops the LMA service manually
- *run*: starts the LMA service in the foreground, outputting messages to the console, as well as in the */logs* directory in the LMA installation home. This is intended primarily for debugging the service installation; for extended use of the LMA in a non-service mode, the *lmaconsole.[exe/sh]* executable is recommended.
- *status*: prints out whether the LMA service is running or not running
- *restart*: stops the LMA service manually and starts it again, outputting messages to a file in the */logs* directory of the LMA installation home

2.4. Troubleshooting

Java not installed

```
java: command not found
```

A Java Runtime Environment (JRE) version 8 or higher must be installed to run the LMA.

Java version mismatch

```
Exception in thread "main" java.lang.UnsupportedClassVersionError: \
com/camerontec/catalys/server/CatalysServer: Unsupported major.minor version 51.0
```

A Java Runtime Environment (JRE) version 8 or higher must be installed to run the LMA.

LMA does not start

If the LMA service has not started correctly, attempt to run it in the foreground with output in the console. This is achieved by running the *lma.[exe/sh]* executable with the `run` option.

The output on the console should give sufficient information to diagnose and fix the problem.

Socket port number clash

The Java Service Wrapper used by the LMA is pre-configured to work with most configurations, however it uses a socket to communicate with the Java JVM which may clash with third party applications installed on your platform. The default port range is [31000, 31999].

Cannot Restart Node Instances

If one or more Node instances are provided with the `-DJMXManagementService.startupScript` property then the LMA can be used to stop and start the Node process (a function which would normally be performed through the MIS Dashboard). If the CameronTec license file is not accessible then the Node will not restart. Ensure that the license file is present in the resources directory of the Node installation.

Chapter 3. Configuration

Table of Contents

3.1. Introduction	22
3.2. Configuration File	23
3.2.1. Specifying custom pgrep and pkill commands	23
3.2.2. Changing default ports	24
3.2.3. Specifying security settings	24
3.2.4. Guest Application Log Streaming	25
3.2.5. Logs Replication	28
3.2.6. Changing default JMX request timeout	29
3.3. Logging	29
3.4. LMA Scripts	29
3.5. SSL	30
3.5.1. Creating keystore in the LMA	30
3.5.2. Export the LMA's certificate	30
3.5.3. Create a keystore in the MIS	30
3.5.4. Import the LMA's certificate into the MIS' keystore	30
3.5.5. LMA Configuration	31
3.5.6. MIS Configuration	31
3.5.7. Specify LMA path to keystore	31
3.5.8. Specify MIS path to keystore	31

3.1. Introduction

The LMA normally does not require any configuration. Some of the reasons to modify the default behaviour are:

- To change either the pgrep or pkill command used to search for a given process or to kill a given process respectively
- To change the ports used to communicate with the managed applications on one side, and with the MIS on the other side. **Doing so is not recommended**, though, because this would require that you also modify the configuration of all managed applications and of the MIS accordingly.
- To specify some security settings for the communication with the MIS
- To enable the streaming of logs from a guest application
- To modify the default parameters of the logs replication server

- To modify the default JMX request timeout

3.2. Configuration File

The LMA's configuration file is *conf/lma.conf*.

3.2.1. Specifying custom pgrep and pkill commands

The implementation of attribute *applicationProcessRunning* and operation *killApplicationProcess()* in application delegate MBeans requires that the LMA be able to issue the following operating-system commands:

- A *pgrep* command to search for a process with the given PID
- A *pkill* command to kill the process with the given PID

The LMA provides default pgrep and pkill command on both Unix and Windows platforms, and you normally should not need to override these commands. Below are the default commands, with %p representing the PID of the process to look for or kill:

- On Unix:
 - pgrep command: `sh -c [-d /proc/%p]`
 - pkill command: `sh -c kill -9 %p`
- On Windows:
 - pgrep command: `cmd /c tasklist /NF /FI "PID eq %p"2>NUL|find "%p">NUL`
 - pkill command: `cmd /c taskkill /F /PID %p`

If you wish to override these default commands, it is possible to do so by specifying attributes *pgrep-command* and/or *pkill-command* in the configuration:

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE lma-configuration
  SYSTEM 'http://www.camerontecgroup.com/dtd/management/lma-configuration.dtd'>
  <lma-configuration pgrep-command="some command with a %p in it"
    pkill-command="some other command with a %p in it"/>
```

Note:

- It is possible to specify only one custom command without the other
- Custom commands must contain at least one occurrence of the %p placeholder, which will be replaced at runtime by the actual PID of the process to look for/kill.

- On Unix, if a custom command does not start with `sh -c`, then the `sh -c` prefix will be prepended to it.
- On Windows, if a custom command does not start with `cmd /c`, then the `cmd /c` prefix will be prepended to it.
- The specified custom `pgrep` command is expected to follow some guidelines:
 - The command should not generate any error output
 - The command should have an exit value of 0 (zero) if the process with the given PID is found.
 - The command should have an exit value different from 0 (zero) if the process with the given PID is not found.
- The specified custom `pkill` command is expected to follow some guidelines:
 - The command should not generate any error output
 - The command should always have an exit value of 0 (zero).

3.2.2. Changing default ports

By default, the local communication between the LMA and managed FIX servers is done on port 10001. To change the default port, a new JMX service URL will need to be configured in the `internal-jmx-server-url` attribute of the `lma-configuration` element. The format is as follows:

```
<lma-configuration
  internal-jmx-service-url="service:jmx:jmxmp://localhost:PORT"/>
```

By default, the communication between the LMA and the MIS, as well as the LMA and other Nodes (if running in an HA cluster), is done on port 10002. To change the default port, a new JMX service URL will need to be configured in the `external-jmx-server-url` attribute of the `lma-configuration` element. The format is as follows:

```
<lma-configuration
  external-jmx-service-url="service:jmx:jmxmp://localhost:PORT"/>
```

3.2.3. Specifying security settings

You can instruct the LMA to use some encryption in its communication with the MIS. Encryption can be configured in the *security* section of the LMA's configuration file. By default, no encryption is used in the connection with the MA.

If some security is configured here, then the MIS should also be configured accordingly.

The example below demonstrates how to configure TLS security:

Configuration

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE lma-configuration
  SYSTEM 'http://www.camerontecgroup.com/dtd/management/lma-configuration.dtd'>
<lma-configuration>
  <security>
    <tls-server />
  </security>
</lma-configuration>
```

The following optional attributes can be specified for the *tls-server* element:

Attributes	
<code>jmx.remote.tls.need.client.authentication</code>	A string that is "true" or "false" according to whether the connector server requires client authentication. If true, a client that does not authenticate during the handshake sequence will be refused
<code>jmx.remote.tls.want.client.authentication</code>	A string that is "true" or "false" according to whether the connector server requires client authentication if appropriate to the cipher suite negotiated. If true, then if a client negotiates a cipher suite that supports authentication but that client does not authenticate itself, the connection will be refused
<code>jmx.remote.tls.enabled.protocols</code>	A string that is a space-separated list of TLS protocols to enable. If the value of this property is not specified, the TLS enabled protocols default to <code>SSLSocket.getEnabledProtocols()</code> .
<code>jmx.remote.tls.enabled.cipher.suites</code>	A string that is a space-separated list of TLS cipher suites to enable. If the value of this property is not specified the TLS enabled cipher suites default to <code>SSLSocket.getEnabledCipherSuites()</code> .

The current implementation uses the JDK's default SSL socket factory to obtain SSL sockets. Should you wish to customize the key store, trust store, store type and passwords used by this SSL factory, you can do so by specifying system properties, as described in [Sun's JSSE reference guide](#).

3.2.4. Guest Application Log Streaming

It is possible to configure the LMA to stream logs from a guest (non-CameronTec) application to the Management Information Server, where they can be displayed by the Dashboard. The logs from guest applications can be searched and filtered in the Dashboard in the same way as internal logs. They can also be used as the source of the Log-type interest events in the Dashboard, such as raising an event when there is an error in the log, or when a particular regular expression search matches a guest log.

Configuration

Before guest logs are streamed to the Management Information Server, they are firstly rewritten in Catalys High Performance Log format, so that they can thereafter be treated identically to Catalys native logs.

This configuration is specified using the "guest" element of the LMA configuration, which has the following attributes.

Attribute	Description
type	<p>The type of guest application that this instance belongs to. Applications of the same type are grouped together in the Dashboard. Internally the LMA supports CatalysNode and UniversalServer types. Guest applications of the same type are also grouped. For example, all QuickFIX guest applications.</p> <p>Required.</p>
name	<p>The name of the guest application. This name appears (with any other guest applications of the same type) on the Dashboard. It can be filtered on or off in the Dashboard log display.</p> <p>Required.</p>
logger.name	<p>The name of the logger. This name appears beneath the guest application's name in the Dashboard. It can be filtered on or off in the Dashboard log display.</p> <p>Required.</p>
file.scanner	<p>The fully qualified file scanner class.</p> <p>The class: <code>com.camerontec.util.guestlogs.-filenamingscheme.FixedFileScanner</code> is provided for log files with a fixed absolute name.</p> <p>The class: <code>com.camerontec.util.guestlogs.-filenamingscheme.DailyDatedFileScanner</code> is provided for log files which are named according to their date.</p> <p>Custom file scanners must implement the IFileScanner interface, and must be included in the class path of the LMA.</p> <p>Required.</p>

Configuration

Attribute	Description
file.pattern	<p>The pattern that is used to identify log files associated with the guest application. This string must consist of a fixed absolute directory name; and a file name component that is either fixed (indicating there is only one log file), or contains a pattern that identifies multiple log files.</p> <p>For the FixedFileScanner, this attribute is the absolute file name of the log file (e.g. "/log/files/directory/logfile.log").</p> <p>For the DailyDatedFileScanner, this attribute is the absolute directory plus a file name with a %d date token (e.g. "/log/files/directory/logfile%d.log").</p> <p>For custom file scanners, this pattern can contain other tokens that are interpreted by the file scanner (e.g. "/log/files/directory/logfile%d-%s.log where the %s token might represent a particular session identifier).</p> <p>Required.</p>
line.parser	<p>The fully qualified line parser class.</p> <p>The class: com.camerontec.util.guestlogs.lineparser.- Log4jDefaultLineParser is provided for log files that are in the Log4j default format:</p> <div data-bbox="703 1255 1414 1341" style="border: 1px solid #ccc; padding: 5px; margin: 10px 0;"> <pre>Timestamp [Thread] Level Owner - Message</pre> </div> <p>For example:</p> <div data-bbox="703 1428 1414 1543" style="border: 1px solid #ccc; padding: 5px; margin: 10px 0;"> <pre>2013-06-10 14:19:40,911 [Main] INFO \ CameronTec.Session.BUY_SELL.out - > 8=...</pre> </div> <p>The class: com.camerontec.util.guestlogs.lineparser.- QuickFIXDefaultLineParser is provided for log files that are in the QuickFIX default format:</p> <div data-bbox="703 1751 1414 1837" style="border: 1px solid #ccc; padding: 5px; margin: 10px 0;"> <pre>Date, FIX version:Session, direction (Message Contents)</pre> </div> <p>For example:</p>

Attribute	Description
	<div>20120731-00:10:12, FIX.4.2:BUY->SELL, incoming (8=...)</div> <p>Custom classes must implement the ILineParser interface, and must be included in the class path of the LMA.</p> <p>Required.</p>
rewritten.log.max.file.length	<p>The maximum size (in bytes) that a re-written guest log file can reach before roll over occurs.</p> <p>Optional. Defaults to 2147483648 bytes (2GB).</p>
rewritten.log.prune.period	<p>The period over which to check and prune the high performance logs so that they match their guest log counterparts.</p> <p>Optional. Defaults to 60000(ms).</p>

There can be multiple guest elements contained in the LMA configuration. The combination of the "name" and "logger.name" attributes must be unique.

For example:

```
<guest
  type="QuickFIX"
  name="FIXEngine1"
  logger.name="SessionA_MessageLog"
  file.scanner="com.camerontec.util.guestlogs.filenameingscheme.FixedFileScanner"
  file.pattern="/apps/quickfix/logs/sessionA.log"
  line.parser="com.camerontec.util.guestlogs.lineparser.QuickFIXDefaultLineParser"
/>
```

3.2.5. Logs Replication

Logs are replicated from the host that is generating the logs to the logs repository on a Management Information Server. The default properties of this replication process can be modified using the `logs-replication-server` element.

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE lma-configuration
  SYSTEM 'http://www.camerontecgroup.com/dtd/management/lma-configuration.dtd'>
<lma-configuration>
  <logs-replication-server [logs replication properties]>
</lma-configuration>
```

where the properties of this element can include:

Attribute	Description
socket.send.buffer.size	The size of the socket buffer that the LMA uses when sending log files to the MIS. Defaults to 0 (the platform default).
file.read.block.size	The amount of data (in bytes) that the LMA reads each time it accesses the log files on disk. Defaults to 1MB or 1048576 bytes.
thread.pool.size	The number of client requests that the LMA can process at one time. Defaults to 4.
use.compression	Whether data is compressed before sending it to the MIS. Defaults to true.

3.2.6. Changing default JMX request timeout

By default, the timeout for communication between the LMA and managed FIX servers is set to 2000ms. To change the default timeout, a `jmx-request-timeout` attribute of the `lma-configuration` element must be specified. The format is as follows:

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE lma-configuration
  SYSTEM 'http://www.camerontecgroup.com/dtd/management/lma-configuration.dtd'>
<lma-configuration jmx-request-timeout="10000"/>
```

3.3. Logging

The LMA uses Logback for logging. To change the logging configuration, modify the *resources/logback.xml* file.

3.4. LMA Scripts

The LMA executes any scripts it finds in its *scripts* directory of the LMA installation, and reports the results of the execution via attributes of the ["LMA.Scripts" MBean](#).

On Unix, a script is any file with the 'x' permission. On Windows, it is any file in this directory, although the .bat extension is recommended.

The scripts directory is only scanned at LMA startup, so to add new scripts, the LMA must be re-started.

The LMA.Scripts MBean contains one attribute for each script, where the attribute name is the same as the script name except that dot extensions are replaced with an underscore. For example, the result of the freespace.sh/bat script provided with the distribution is given by the freespace_sh/bat MBean attribute.

The value of the attribute is the output of the script.

Each script is executed whenever the attribute is accessed; the results of the script are not cached.

3.5. SSL

This chapter describes how to enable SSL encryption between the LMA and the MIS. Please follow these steps.

3.5.1. Creating keystore in the LMA

Create a keystore in %LMA_HOME%\resources

```
keytool -keystore keystore -genkey -keyalg RSA
```

3.5.2. Export the LMA's certificate

Also in %LMA_HOME%\resources run

```
keytool -exportcert -file lma.cert -keystore keystore -storepass password
```

3.5.3. Create a keystore in the MIS

Create a keystore in %MIS_HOME%\resources

```
keytool -keystore keystore -genkey -keyalg RSA -validity 3650
```

3.5.4. Import the LMA's certificate into the MIS' keystore

```
keytool -importcert -file path\to\lma.cert -keystore keystore  
-storepass <password> -keypass <password> -trustcacerts -alias lma
```

3.5.5. LMA Configuration

Add the following section to the %LMA_HOME%\conf\lma.conf (inside <lma-configuration> element):

```
<security>
  <tls-server/>
</security>
```

3.5.6. MIS Configuration

Add the following section to the %MIS_HOME%\conf\mis.conf (and adjust hostname):

```
ma/managedHosts = \
<set>\
  <value>\
    <host>localhost</host>\
    <security-profile>\
      <socket-factory>sun.security.ssl.SSLSocketFactoryImpl</socket-factory>\
      <protocols>\
        </protocols>\
      <cypher-suites>\
        </cypher-suites>\
    </security-profile>\
  </value>\
</set>>
```

3.5.7. Specify LMA path to keystore

In the %LMA_HOME%\conf\wrapper.conf add the following additional Java parameters (adjust values)

```
wrapper.java.additional.1=-Djavax.net.ssl.keyStore=%LMA_HOME%\resources\keystore
wrapper.java.additional.2=-Djavax.net.ssl.keyStorePassword=<password>s
```

3.5.8. Specify MIS path to keystore

In the %MIS_HOME%\conf\mis-wrapper.conf add the following additional Java parameters (adjust values)

```
wrapper.java.additional.1=-Djavax.net.ssl.keyStore=%MIS_HOME%\resources\keystore
wrapper.java.additional.2=-Djavax.net.ssl.keyStorePassword=<password>
wrapper.java.additional.3=-Djavax.net.ssl.trustStore=%MIS_HOME%\resources\keystore
wrapper.java.additional.4=-Djavax.net.ssl.trustStorePassword=<password>
```

Now you can restart the LMA and MIS.

Chapter 4. API

Table of Contents

4.1. JMX API	32
4.2. JavaDoc	32

4.1. JMX API

The LMA JMX API uses only open MBeans to avoid introducing any binary dependency between the management console and manageable applications.

JMX is a self-descriptive management technology. Each MBean exposes its metadata, which fully describes its management API. For more details on JMX, please refer to the [JMX Technology Home Page](#).

To inspect the LMA JMX API, start the LMA and connect a jconsole to it.

For example, any [scripts](#) added to the *scripts* directory of the LMA installation are published as attributes of the "LMA.Scripts" MBean. The results of these scripts can be used to generate events in the MIS by configuring an interest that inspects the MBean. The freespace script that is provided with the LMA installation is one such application, the results of which can be utilized by configuring a numeric gauge interest in the MIS.

4.2. JavaDoc

JavaDoc for the LMA can be found [here](#).

Appendix A. Third-Party Software

The Catalys LMA leverages third-party software including commercial software subject to license agreements between CameronTec and third-party firms. In accordance with such license(s), users of the LMA are hereby informed that the use of the third-party libraries embedded in or distributed with the LMA is strictly limited to the functionality covered in the LMA. Users are not allowed to use those libraries for any other usage.

Licenses for bundled software are presented in the following table. Users are invited to review the terms of the licenses.

Library (GroupID:ArtifactID:Version)	License(s)
cglib:cglib-nodep:2.2	The Apache Software License, Version 2.0
ch.qos.logback:logback-classic:1.2.10	Eclipse Public License v1.0 GNU Lesser General Public License, version 2.1
ch.qos.logback:logback-core:1.2.10	Eclipse Public License v1.0 GNU Lesser General Public License, version 2.1
com.google.code.findbugs:jsr305:3.0.2	The Apache Software License, Version 2.0
com.google.errorprone:error_prone_annotations:-2.3.4	The Apache Software License, Version 2.0
com.google.guava:failureaccess:1.0.1	The Apache Software License, Version 2.0
com.google.guava:guava:30.1-jre	The Apache Software License, Version 2.0
com.google.guava:listenablefuture:9999.0-empty-to-avoid-conflict-with-guava	The Apache Software License, Version 2.0
com.google.j2objc:j2objc-annotations:1.3	The Apache Software License, Version 2.0
com.intellij:annotations:12.0	The Apache Software License, Version 2.0
com.lmax:disruptor:3.3.2	The Apache Software License, Version 2.0
com.squareup:javapoet:1.5.1	The Apache Software License, Version 2.0
com.thoughtworks.paranamer:paranamer:2.3	Paranamer License (BSD)
com.thoughtworks.xstream:xstream:1.4.19	XStream License (BSD)

Third-Party Software

Library (GroupID:ArtifactID:Version)	License(s)
commons-cli:commons-cli:1.4	The Apache Software License, Version 2.0
commons-codec:commons-codec:1.14	The Apache Software License, Version 2.0
io.github.lukehutch:fast-classpath-scanner:1.9.17	The MIT License
io.github.x-stream:mxparser:1.2.2	XStream License
javatar:javatar:2.5	Java Tar License (Public Domain)
javax.management:jmxremote_optional:-1_2_2_03-b34.2	Sun Microsystems, Inc. Binary Code License Agreement (Java(TM) Optional Package)
jaxen:jaxen:1.1.4	Jaxen License
joda-time:joda-time:2.5	The Apache Software License, Version 2.0
net.java.dev.jna:jna-platform:4.1.0	GNU Lesser General Public License, version 2.1
net.java.dev.jna:jna:4.1.0	GNU Lesser General Public License, version 2.1
net.openhft:affinity:2.2	The Apache Software License, Version 2.0
net.openhft:chronicle-algorithms:1.16.0	The Apache Software License, Version 2.0
net.openhft:chronicle-bytes:2.17.4	The Apache Software License, Version 2.0
net.openhft:chronicle-core:2.17.0	The Apache Software License, Version 2.0
net.openhft:chronicle-map:3.17.0	The Apache Software License, Version 2.0
net.openhft:chronicle-threads:2.17.0	The Apache Software License, Version 2.0
net.openhft:chronicle-values:2.16.1	The Apache Software License, Version 2.0
net.openhft:chronicle-wire:2.17.5	The Apache Software License, Version 2.0
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