Informatica Ultra Messaging SNMP Agent (Version 6.1)

User Guide

Informatica Ultra Messaging SNMP Agent User Guide

Version 6.1
April 2014

Part Number: UMSA-UG-61000-0001

Table of Contents

Preface

The *Ultra Messaging SNMP Agent User Guide* is written for Ultra Messaging developers. It describes how to use SNMP with Ultra Messaging. This guide assumes that you are familiar with the Ultra Messaging Streaming Edition and also the SNMP specifications.

Informatica Resources

Informatica My Support Portal

As an Informatica customer, you can access the Informatica My Support Portal at http://mysupport.informatica.com.

The site contains product information, user group information, newsletters, access to the Informatica customer support case management system (ATLAS), the Informatica How-To Library, the Informatica Knowledge Base, Informatica Product Documentation, and access to the Informatica user community.

Informatica Documentation

The Informatica Documentation team takes every effort to create accurate, usable documentation. If you have questions, comments, or ideas about this documentation, contact the Informatica Documentation team through email at infa_documentation@informatica.com. We will use your feedback to improve our documentation. Let us know if we can contact you regarding your comments.

The Documentation team updates documentation as needed. To get the latest documentation for your product, navigate to Product Documentation from http://mysupport.informatica.com.

Informatica Web Site

You can access the Informatica corporate web site at http://www.informatica.com. The site contains information about Informatica, its background, upcoming events, and sales offices. You will also find product and partner information. The services area of the site includes important information about technical support, training and education, and implementation services.

Informatica How-To Library

As an Informatica customer, you can access the Informatica How-To Library at http://mysupport.informatica.com. The How-To Library is a collection of resources to help you learn more about Informatica products and features. It includes articles and interactive demonstrations that provide

solutions to common problems, compare features and behaviors, and guide you through performing specific real-world tasks.

Informatica Knowledge Base

As an Informatica customer, you can access the Informatica Knowledge Base at http://mysupport.informatica.com. Use the Knowledge Base to search for documented solutions to known technical issues about Informatica products. You can also find answers to frequently asked questions, technical white papers, and technical tips. If you have questions, comments, or ideas about the Knowledge Base, contact the Informatica Knowledge Base team through email at KB_Feedback@informatica.com.

Informatica Support YouTube Channel

You can access the Informatica Support YouTube channel at http://www.youtube.com/user/INFASupport. The Informatica Support YouTube channel includes videos about solutions that guide you through performing specific tasks. If you have questions, comments, or ideas about the Informatica Support YouTube channel, contact the Support YouTube team through email at supportvideos@informatica.com or send a tweet to @INFASupport.

Informatica Marketplace

The Informatica Marketplace is a forum where developers and partners can share solutions that augment, extend, or enhance data integration implementations. By leveraging any of the hundreds of solutions available on the Marketplace, you can improve your productivity and speed up time to implementation on your projects. You can access Informatica Marketplace at http://www.informaticamarketplace.com.

Informatica Velocity

You can access Informatica Velocity at http://mysupport.informatica.com. Developed from the real-world experience of hundreds of data management projects, Informatica Velocity represents the collective knowledge of our consultants who have worked with organizations from around the world to plan, develop, deploy, and maintain successful data management solutions. If you have questions, comments, or ideas about Informatica Velocity, contact Informatica Professional Services at ips@informatica.com.

Informatica Global Customer Support

You can contact a Customer Support Center by telephone or through the Online Support.

Online Support requires a user name and password. You can request a user name and password at http://mysupport.informatica.com.

The telephone numbers for Informatica Global Customer Support are available from the Informatica web site at http://www.informatica.com/us/services-and-training/support-services/global-support-centers/.

CHAPTER 1

Introduction

This chapter includes the following topic:

Overview

The Ultra Messaging SNMP Agent provides access to the standard UM statistics via the industry-standard SNMP protocol. With the provided MIB, UM application monitoring can be integrated into any SNMP-compatible Network Management System (NMS).

The UM SNMP Agent provides messaging application statistics to your NMS, not network statistics. This can make your network traffic appear as falsely inflated. For example, if you have three receivers on a given machine all using a single LBT-RM transport session, the `bytes_rcved` statistic as reported by the UM SNMP Agent may be three times the number of bytes received through the network.

The UM SNMP Agent daemon uses options supplied via command line, as well as options read from an XML configuration file provided by you.

See the Ultra Messaging SNMP Agent *Release Notes* for information about enhancements and corrections.

CHAPTER 2

Structure and Operation

This chapter includes the following topics:

Overview

You can configure the UM SNMP Agent as either a master agent or a subagent. As a master agent, the UM SNMP Agent communicates directly with the NMS. When running in subagent mode, the agent relies on a third-party master agent running on the same machine. Information in this document applies generally to both modes, unless specified otherwise.

The UM SNMP Agent uses the UM Monitoring API to receive statistics from the various UM applications running on the machine. This is done by creating a monitor source and a monitor receiver, both employing the `CSV` format module and `lbmsnmp` transport module.

See Chapter 3, “Enabling SNMP Monitoring In Your Application” on page 8 for more information about enabling applications for monitoring.

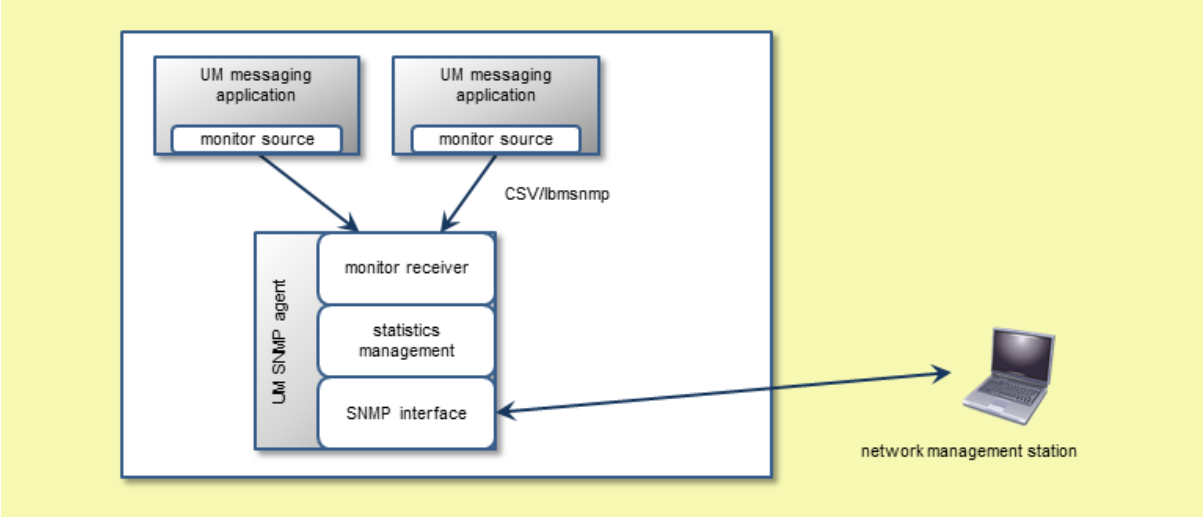
Note: The UM SNMP Agent requires Version 2c of the SNMP protocol. The Ultra Messaging MIB defines most variables as 64-bit counters, using the `Counter64` type, which is not supported by Version 1.

Master Agent Mode

Running as a master agent, the UM SNMP Agent receives SNMP queries from and sends SNMP responses to the network management station directly. The master agent mode does not support traps, however more

than one agent can instantiate on the same machine. This mode is an appropriate choice if you do not need traps and do not employ a third-party master agent.

Figure 1. Master Agent Mode



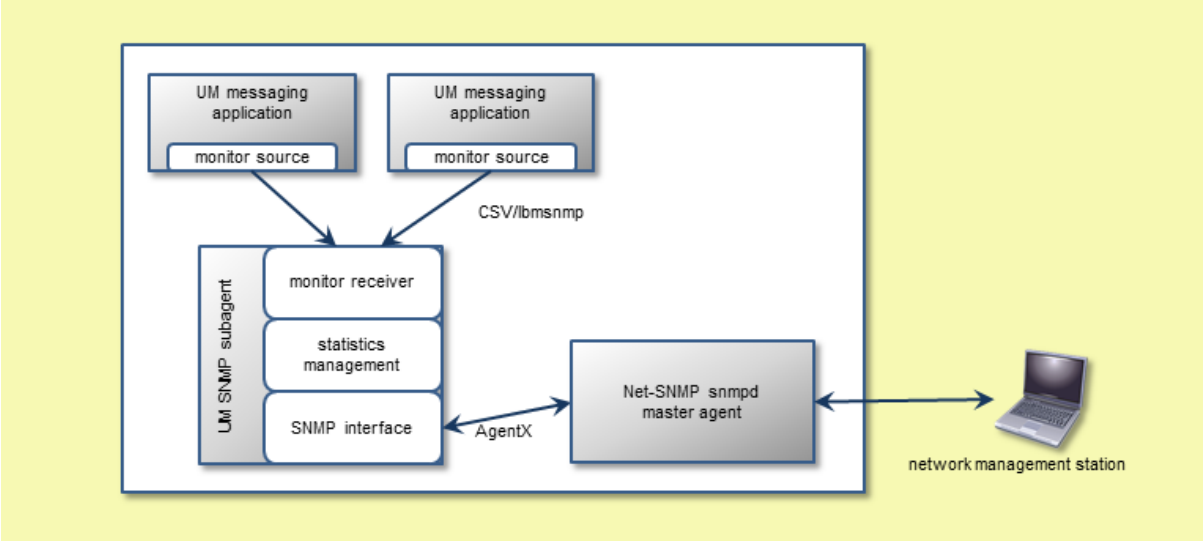
Subagent Mode

When configured as a subagent, the UM SNMP Agent provides statistics to a third-party master SNMP agent via the AgentX protocol. To more easily identify the source of monitoring data, run the master agent on the same machine as the subagent. If you run multiple instances of a UM subagent on the same machine, ensure that you also run each subagent's corresponding master agent. Selection of a third-party master agent is your choice, however Informatica recommends the Net-SNMP snmpd product, at version 5.7 or later.

Note: For AIX platforms, Informatica recommends the Net-SNMP snmpd product, at version 5.6.1.1.

The master agent receives SNMP queries from and sends SNMP responses to the network management station. In addition, the master agent can be configured to send traps to the NMS.

Figure 2. Subagent Mode



UM Monitoring API

The Ultra Messaging SNMP Agent uses the UM Monitoring API to gather statistics from the various UM applications running on the machine. It uses the `CSV` format module and `lbmsnmp` transport module. Any UM application that needs to be monitored must use these same modules. See Chapter 3, “Enabling SNMP Monitoring In Your Application” on page 8 for more information about enabling applications for monitoring.

For detailed information about adding monitoring to an application, see *UM Monitoring API* in the UM Concepts Guide. For links to all UM documentation, refer to the UM README file.

Statistics Management and MIB Structure

The statistics management module, which appears in both the Figure 1 on page 3 and Figure 2 on page 4 diagrams, maintains statistics reported via SNMP queries. Statistics maintenance is discussed in greater detail in Chapter 6, “Maintaining Statistics” on page 15.

This section discusses the following topics.

Ultra Messaging MIB

The Ultra Messaging MIB dictates the statistics available through the UM SNMP Agent and is registered under Informatica's Private Enterprise Number (29165) with the Internet Assigned Numbers Authority (IANA). The Ultra Messaging MIB resides in the `.../doc` directory and can be viewed via any standard MIB browser. Table 1 on page 5 shows a key part of the MIB structure. To see the full structure of all nodes in the OID, use your MIB browser or SNMP management tool.

Table 1. lbm-mib.mib OID Structure

node (below tnw)	sub-node	Description
tnwSource	tnwSourceLbtrm	statistics for source transports
	tnwSourceLbtru	
	tnwSourceTcp	
	tnwSourceLbtipc	
	tnwSourceLbtrdma	
	tnwSourceLbtsmx	
tnwReceiver	tnwReceiverLbtrm	statistics for receiver transports
	tnwReceiverLbtru	
	tnwReceiverTcp	
	tnwReceiverLbtipc	
	tnwReceiverLbtrdma	
	tnwReceiverLbtsmx	
tnwEventQueue	tnwEventQueueTable	statistics for event queue activity
	tnwEventQueueAgg	
	tnwEventQueueAgg32	
tnwContext	tnwContextTable	statistics for topic resolution and other activities
	tnwContextAgg	
	tnwContextMim	
	tnwContextAgg32	

Transport Statistics

The Ultra Messaging MIB includes transport statistics, organized first by source and receiver, then by transport type (LBT-RM, LBT-RU, TCP, LBT-IPC, LBT-RDMA, and LBT-SMX), as shown in the top two parts

of Table 1 on page 5. Each of these 12 sub-node entries are expanded into Entry, Table, Agg, and Agg32, as shown in the example below for the Source LBT-RM transport:

node (below tnw)	sub-node	sub-sub-node
tnwSource	tnwSourceLbtrm	tnwSourceLbtrmNumberOfEntries
		tnwwSourceLbtrmTable
		tnwwSourceLbtrmAgg
		tnwwSourceLbtrmAgg32

The Ultra Messaging MIB specifies a separate table entry for each transport session identified by a number of indexes, depending on transport type. These index nodes can include (again, depending on transport type) the session ID, process ID (which differentiates between different processes using the same transport session), and context ID (which differentiates between transport sessions within a single process).

As it receives statistics, the UM SNMP Agent updates the appropriate table entry to reflect the latest values. It also maintains a timestamp for each entry.

In addition to table entrys, transport statistics are also aggregated and presented, in most cases, as the summation of a particular variable for each table entry. In some cases (such as the LBT-RM receiver statistic minimum NAK repair time, `nak_stm_min`), summation is not appropriate. For such variables, the Agent maintains aggregate variables for minimum, maximum, and mean values reported. Aggregations are provided and grouped in both 64-bit and 32-bit formats.

Note: The 32-bit aggregate statistics, such as `tnwwSourceLbtrmAgg32` or `tnwContextAgg32` support traps on those specific statistics. For non-trapped queries, Informatica recommends using the 64-bit aggregate.

Due to the routine creation and destruction of sources and receivers, statistics for a particular transport session can cease to be relevant. The UM SNMP Agent periodically purges transport-session entries for which no statistics have been received for a period of time. The length of this period (`max_age`), as well as the frequency at which entries are checked `purge_interval`, are controlled by the UM SNMP Agent configuration file. See Chapter 5, “ Ultra Messaging SNMP Agent Configuration” on page 14.

Context and Event Queue Statistics

In addition to source and receiver transport statistics, the Ultra Messaging MIB also includes statistics regarding the following.

- Event Queue statistics that let you monitor the number of events added to or currently on the queue, and how long it takes to service them. Event types include data messages, request messages, wildcard messages, timer events and much more.
- Context statistics that help you monitor topic resolution and other activities within an UMS context, as both a table of entries and aggregated (64- and 32-bit) statistics.
- Statistics for Multicast Immediate Messages (MIM) sources and receivers.

SNMP Interface

The Ultra Messaging SNMP Agent acts as an SNMP master agent, meaning it directly receives and processes SNMP requests, and responds with SNMP responses.

Note: If you run multiple instances of the Ultra Messaging SNMP Agent, configured as master agents, on the same machine, ensure that each master agent uses a unique port. If you run multiple instances of the Ultra

Messaging SNMP Agent, configured as subagents, on the same machine, ensure that each subagent has one corresponding master agent running.

CHAPTER 3

Enabling SNMP Monitoring In Your Application

This chapter includes the following topics:

Enabling SNMP Monitoring In Your Application

This section provides a brief introduction to enabling monitoring in your applications with the use of the LBMSNMP Transport module. For detailed information about adding monitoring to an application, go to the *UMS Design Concepts* document, and see the section entitled *UMS Monitoring API*.

The monitoring API lets you develop a *monitor source*, which enables messaging applications to pass statistics to the UM SNMP Agent. A monitor source comprises three modules: control, format, and transport. For SNMP applications, the CSV format module and the LBMMON SNMP transport module will suffice.

To view the source code for all LBMMON transport modules, go to the *C Application Programmer's Interface* documentation, select the *Related Pages* tab, and see *LBMMON Example Source Code*.

We strongly recommend that your applications monitor only contexts, rather than individual sources or receivers. Monitoring a context reports statistics for all transport sessions on that context (both source and receiver). Since multiple sources or multiple receivers may share the same transport session (depending on the application's configuration), monitoring sources or receivers may generate multiple statistics for the same transport session. This can artificially inflate statistics and lead to misleading statistics analysis.

Using The LBMSNMP Transport Module

The LBMMON SNMP transport module, `lbmsnmp`, is provided for the convenience of application developers to make it easier to enable SNMP monitoring of their applications.

Creating a Monitor Source Controller

First, create a monitor source controller.

```
lbm_context_t * ctx;
lbmmon_sctl_t * sctl;

if (lbmmon_sctl_create(&sctl,
                       lbmmon_format_csv_module(),
                       NULL,
                       lbmmon_transport_lbmsnmp_module(),
                       NULL) == -1)
{
    /* report error */
}
```

Using the following modules:

lbmmon_format_csv_module()

se the `csv` format module to format the statistics.

lbmmon_transport_lbmsnmp_module()

Use the `lbmsnmp` transport module to publish the statistics.

Initiating Monitoring

Next, assuming the context has been created via a call to **lbm_context_create()**, monitoring can be initiated on the context.

```
/* Assumes the context has already been created. */

if (lbmmon_context_monitor(sctl,
                           ctx,
                           NULL,
                           10) == -1)
{
    /* report error */
}
```

With the following function parameters:

sctl

The monitor source controller used to monitor the context.

ctx

The context to be monitored.

NULL

An application-defined string to identify from which application the statistics originated. Passing `NULL` causes LBMMON to use the application's program name.

10

How frequently statistics are automatically gathered and sent.

Closing

Before the context is destroyed, it must be deregistered.

```
lbmmon_context_unmonitor(sctl, ctx);
```

Finally, before the program exits, destroy the monitor source controller.

```
lbmmon_sctl_destroy(sctl);
```

Using the UM Transport Module

If you are running versions of UMS earlier than 3.3, or UMP earlier than 2.0, you can use the `lbm` transport module to enable monitoring via the UM SNMP Agent

The last parameter to **lbmmon_sctl_create()** is a pointer to a character string containing options to be passed to the transport module. One of the options understood by the `lbm` transport module is config= *lbm-config-file*, which allows a UM configuration file to be passed to the transport module. Use this configuration file when creating the context from which statistics are published.

The functionality of the `lbmsnmp` transport module can be duplicated, using the `lbm` transport module, by specifying a UM configuration file containing:

```
context resolver_multicast_ttl 0
context resolver_multicast_address 225.200.200.200
source transport_lbtrm_multicast_address 225.200.200.201
```

CHAPTER 4

Running the Ultra Messaging SNMP Agent

This chapter includes the following topics:

Overview

Following in this section are the man pages for the agent executables listed above.

tnwmonsnmpd

{ `tnwmonsnmpd` | { { `-d` } | { `--dump-dtd` } } | { { `-h` } | { `--help` } } | { { `-v` } | { `--validate` } } | { { `--version` } } | { { `-f` } | { `--detach` } } | { *configfile* } }

Description

The tnwmonsnmpd command provides SNMP agent services and requires a configuration file. See Chapter 5, “ Ultra Messaging SNMP Agent Configuration” on page 14.

-d, --dump-dtd

Dump the DTD used to validate a configuration file to standard output. After dumping the DTD, tnwmonsnmpd exits instead of providing SNMP agent services as usual.

-v, --validate

Validate the configuration file against the DTD. After attempting validation, tnwmonsnmpd exits instead of providing SNMP agent services as usual. The exit status is 0 for a configuration file successfully validated by the DTD, and non-zero otherwise.

--version

Print the DTD version number. After printing, tnwmonsnmpd exits instead of providing SNMP agent services as usual. The exit status is 0 for a configuration file successfully validated by the DTD, and non-zero otherwise.

-f, --detach

tnwmonsnmpd normally remains attached to the controlling terminal and runs until interrupted. If the -f or --detach option is given, tnwmonsnmpd instead forks, detaches the child from the controlling terminal, and the parent exits immediately.

Note: This option is not available under Microsoft Windows.

-h, --help

Display command line help.

Exit Status

The exit status from tnwmonsnmpd is 0 for success and some non-zero value for failure.

tnwmonsnmpds

{ `tnwmonsnmpds` | { { `-d` } | { `--dump-dtd` } } | { { `-h` } | { `--help` } } | { { `-v` } | { `--validate` } } | { { `--version` } } | { { { `-s` } | { `--service=` } } | { *command* } } | { *configfile* } }

Description

The tnwmonsnmpds service provides SNMP agent services. An SNMP agent configuration file is optional. See Chapter 5, “ Ultra Messaging SNMP Agent Configuration” on page 14.

-d, --dump-dtd

Dump the DTD used to validate a configuration file to standard output. After dumping the DTD, tnwmonsnmpds exits instead of providing SNMP agent services as usual.

-v, --validate

Validate the configuration file against the DTD. After attempting validation, tnwmonsnmpds exits instead of providing SNMP agent services as usual. The exit status is 0 for a configuration file successfully validated by the DTD, and non-zero otherwise.

--version

Print the DTD version number. After printing, tnwmonsnmpd exits instead of providing SNMP agent services as usual. The exit status is 0 for a configuration file successfully validated by the DTD, and non-zero otherwise.

-h, --help

Display command line help.

-s, --service= *command*

Perform service control actions, where *command* can be:

install

Install the service, storing *configfile* in the registry as the configuration file to be used when the service starts.

remove

Delete/remove the service.

config

Update the registry to use *configfile* as the configuration file the next time the service is started.

Usage Notes

- When installing the SNMP Agent as a Microsoft Windows service, use only local disk devices and fully qualified path names for all filenames. This is required because Windows services run by default under a Local System account, which has reduced privileges and is not allowed access to network devices.
- When running tnwmonsnmpds, you can not use the Restart option from the Services window. To restart the service, stop the service, wait several seconds, then start it again. This is necessary because Windows requires extra time to release the socket.
- When starting tnwmonsnmpds, launching the service may fail, and you may see the following message:

  ```
  The service did not respond to the start or control request in a timely
  fashion.
  ```

  To avoid this problem, see the following Microsoft Knowledge Base article:

  http://support.microsoft.com/kb/922918

Exit Status

The exit status from tnwmonsnmpds is 0 for success and some non-zero value for failure.

CHAPTER 5

Ultra Messaging SNMP Agent Configuration

This chapter includes the following topic:

Overview

The UM SNMP Agent uses an XML configuration file for system-specific options. A default version of this file is not supplied in the API, thus you must create and install one before launching the daemon.

You do not have to declare the Ultra Messaging SNMP Agent DTD within the configuration file, however, you must validate your configuration file (tnwmonsnmpds --validate configfile.xml) before launching the daemon. See DTD reference for a description of the DTD for the UM SNMP Agent configuration file.

The following is an example of the UM SNMP Agent configured as a master agent.

```
<?xml version="1.0" encoding="UTF-8" ?>
<tnwmonsnmp version="1.0">
     <daemon>
          <log type="syslog"/>
          <lbm-license-file>/install/license.txt</lbm-license-file>
     </daemon>
     <monitor max-age="60" purge-interval="15"/>
     <master-agent community="public" port="11161"/>
</tnwmonsnmp>
```

The following is an example of the UM SNMP Agent configured as a subagent.

```
<?xml version="1.0" encoding="UTF-8" ?>
<tnwmonsnmp version="1.0">
     <daemon>
          <log type="console"/>
          <lbm-license-file>/install/license.txt</lbm-license-file>
     </daemon>
     <monitor max-age="60" purge-interval="15">
          <lbm-config-file>/install/lbm-config.txt </lbm-config-file>
     </monitor>
     <subagent agentx-socket="tcp:localhost:705"/>
</tnwmonsnmp>
```

Note: Your master agent must enable the Agent-X protocol.

CHAPTER 6

Maintaining Statistics

This chapter includes the following topics:

Overview

As noted in Chapter 2, “Structure and Operation” on page 2, a statistics management module within the UM SNMP Agent maintains the statistics reported via SNMP queries. This involves receiving and processing statistics packets, as well as purging statistics for entities that have ceased reporting.

Updating Statistics

The statistics management module maintains each type of statistic, whether for an LBT-RM receiver or an event queue, in the following two forms.

- A table which contains each unique instance of a statistic.

  For example, for LBT-RM receiver statistics, each instance is uniquely defined by the transport specification (source IP address, source port, session ID, multicast group, and destination port), process ID, and context ID. The combination of these elements uniquely defines a set of LBT-RM receiver statistics for a specific receiver within a specific process. Thus, if 10 LBT-RM receivers report statistics, the table contains 10 entries for `msgs_rcved`, `naks_sent`, etc, one for each LBT-RM receiver.

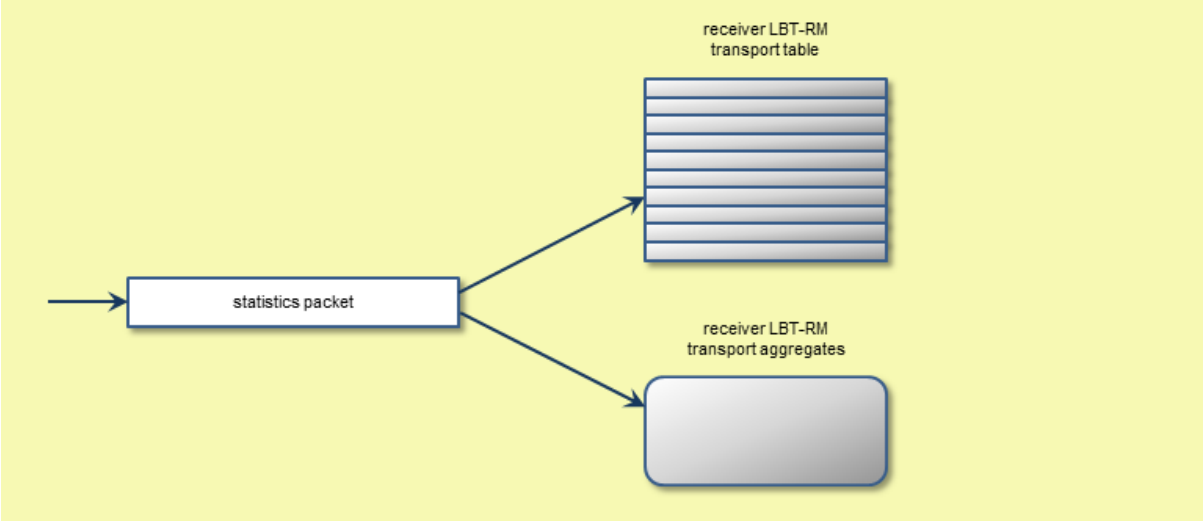
- An aggregation of each statistic for all reporters.

  Using the receiver LBT-RM transport as an example, the statistics management module maintains an aggregation of each transport statistic found in the table for all receiver LBT-RM transports. Thus, the aggregate `msgs_rcved` statistic would represent the total `msgs_rcved` for all 10 receiver LBT-RM transports.

Figure 3 on page 16 illustrates the example statistics update process for receiver LBT-RM transport statistics. The incoming statistics replace any existing entry in the table, or create a new one if none exists.

At the same time, the statistics management module applies the incoming statistics to the aggregate statistics for LBT-RM receivers.

Figure 3. Updating statistics upon receipt of a statistics packet



Aggregating Cumulative or Snapshot Statistics

For cumulative (such as `msgs_rcved`) or snapshot (such as `rctlr_rx_msgs`) statistics, the statistics management module updates the aggregates as follows:

1. Subtract the current table value from the current aggregate value.
2. Add the incoming value to the aggregate value. Removing the entry from the table.

Using the receiver LBT-RM transport example, the statistics management module performs this operation 10 times on the aggregated `msgs_rcved` statistic for each receiver LBT-RM transport. The statistics management module would also perform these 10 operations on each of the other statistics types.

Aggregating Minimum, Maximum or Mean Statistics

Statistics that report minimum, mean, and maximum values are aggregated by selecting/presenting the highest and lowest value of each field (min, mean, max) for all transports of the same type. Hence, for NAK-induced loss recovery times for multiple receiver LBT-RM transports, the aggregate statistics would be as follows:

- AggNakMinMin lowest minimum for NAK loss recovery time
- AggNakMinMax highest minimum for NAK loss recovery time
- AggNakMaxMin lowest maximum for NAK loss recovery time
- AggNakMaxMax highest maximum for NAK loss recovery time
- AggNakMMeanMin lowest mean for NAK loss recovery time
- AggNakMeanMax highest mean for NAK loss recovery time

Initializing Statistics

It should also be noted how various statistics fields are initialized within UM and the UM SNMP Agent. All statistics are unsigned integers, and are initialized in a manner that depends on the type of statistic, as follows:

counter - initialize to zero

minimum - initialize to largest unsigned integer value. For 32-bit fields, this value is 4,294,967,295 (`0xFFFFFFFF`). For 64-bit fields, which includes all MIB fields, this value is 18,446,744,073,709,551,615 (`0xFFFFFFFFFFFFFFFF`).

maximum - initialize to zero

mean - initialize to zero

Purging Statistics

Each table entry contains a timestamp indicating when the entry was last updated by a statistics packet. The management module uses this timestamp to determine when a statistics entry should be purged.

Purging Table Statistics

Periodically, as controlled by the configuration file's `<monitor>`, `purge-interval` attribute (default 15 sec; see Chapter 5, “ Ultra Messaging SNMP Agent Configuration” on page 14), the statistics management module scans each table for entries to purge. The module purges an entry whose age exceeds the `<monitor>` element's `max-age` attribute (default 60 sec).

Purging an entry involves two steps:

1. Subtract the values contributed by the entry to be purged (taking into account any wrapping that may have occurred).
2. Remove the entry from the table.

Purging Aggregated Minimum or Maximum Statistics

If a purged minimum- or maximum-statistic table entry is greater than the current aggregated lowest minimum or maximum (MinMin or MaxMin), then the aggregated value is left unchanged. However, if that purged table entry is equal to the current aggregated lowest value (it cannot be lower), then the aggregate reported lowest value is reset to its initial value, which is 18,446,744,073,709,551,615 (`0xFFFFFFFFFFFFFFFF`).

If a purged minimum- or maximum-statistic table entry is less than the current aggregated highest minimum or maximum (MinMax or MaxMax), then the aggregated value is left unchanged. However, if that purged table entry is equal to the current aggregated highest value (it cannot be higher), then the aggregate reported highest value is reset to its initial value, which is zero.

CHAPTER 7

Notices

This chapter includes the following topic:

Overview

The UM SNMP Agent makes use of the Net-SNMP software package. The following terms of use apply.

```
Various copyrights apply to this package, listed in various separate
parts below.  Please make sure that you read all the parts.

---- Part 1: CMU/UCD copyright notice: (BSD like) -----


       Copyright 1989, 1991, 1992 by Carnegie Mellon University

                     Derivative Work - 1996, 1998-2000
Copyright 1996, 1998-2000 The Regents of the University of California

                              All Rights Reserved

Permission to use, copy, modify and distribute this software and its
documentation for any purpose and without fee is hereby granted,
provided that the above copyright notice appears in all copies and
that both that copyright notice and this permission notice appear in
supporting documentation, and that the name of CMU and The Regents of
the University of California not be used in advertising or publicity
pertaining to distribution of the software without specific written
permission.

CMU AND THE REGENTS OF THE UNIVERSITY OF CALIFORNIA DISCLAIM ALL
WARRANTIES WITH REGARD TO THIS SOFTWARE, INCLUDING ALL IMPLIED
WARRANTIES OF MERCHANTABILITY AND FITNESS.  IN NO EVENT SHALL CMU OR
THE REGENTS OF THE UNIVERSITY OF CALIFORNIA BE LIABLE FOR ANY SPECIAL,
INDIRECT OR CONSEQUENTIAL DAMAGES OR ANY DAMAGES WHATSOEVER RESULTING
FROM THE LOSS OF USE, DATA OR PROFITS, WHETHER IN AN ACTION OF
CONTRACT, NEGLIGENCE OR OTHER TORTIOUS ACTION, ARISING OUT OF OR IN
CONNECTION WITH THE USE OR PERFORMANCE OF THIS SOFTWARE.


---- Part 2: Networks Associates Technology, Inc copyright notice (BSD) -----

Copyright (c) 2001-2003, Networks Associates Technology, Inc
All rights reserved.

Redistribution and use in source and binary forms, with or without
modification, are permitted provided that the following conditions are met:
```

* Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.

* Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.

* Neither the name of the Networks Associates Technology, Inc nor the names of its contributors may be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDERS AND CONTRIBUTORS ``AS IS'' AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE COPYRIGHT HOLDERS OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

---- Part 3: Cambridge Broadband Ltd. copyright notice (BSD) -----

Portions of this code are copyright (c) 2001-2003, Cambridge Broadband Ltd. All rights reserved.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

* Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.

* Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.

* The name of Cambridge Broadband Ltd. may not be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDER ``AS IS'' AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE COPYRIGHT HOLDER BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

---- Part 4: Sun Microsystems, Inc. copyright notice (BSD) -----

Copyright © 2003 Sun Microsystems, Inc., 4150 Network Circle, Santa Clara, California 95054, U.S.A. All rights reserved.

Use is subject to license terms below.

This distribution may include materials developed by third parties.

Sun, Sun Microsystems, the Sun logo and Solaris are trademarks or registered trademarks of Sun Microsystems, Inc. in the U.S. and other countries.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

* Redistributions of source code must retain the above copyright notice,
  this list of conditions and the following disclaimer.

* Redistributions in binary form must reproduce the above copyright
  notice, this list of conditions and the following disclaimer in the
  documentation and/or other materials provided with the distribution.

* Neither the name of the Sun Microsystems, Inc. nor the
  names of its contributors may be used to endorse or promote
  products derived from this software without specific prior written
  permission.

THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDERS AND CONTRIBUTORS ``AS
IS'' AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO,
THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR
PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE COPYRIGHT HOLDERS OR
CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL,
EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO,
PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS;
OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY,
WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR
OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF
ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

---- Part 5: Sparta, Inc copyright notice (BSD) -----

Copyright (c) 2003-2009, Sparta, Inc
All rights reserved.

Redistribution and use in source and binary forms, with or without
modification, are permitted provided that the following conditions are met:

* Redistributions of source code must retain the above copyright notice,
  this list of conditions and the following disclaimer.

* Redistributions in binary form must reproduce the above copyright
  notice, this list of conditions and the following disclaimer in the
  documentation and/or other materials provided with the distribution.

* Neither the name of Sparta, Inc nor the names of its contributors may
  be used to endorse or promote products derived from this software
  without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDERS AND CONTRIBUTORS ``AS
IS'' AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO,
THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR
PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE COPYRIGHT HOLDERS OR
CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL,
EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO,
PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS;
OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY,
WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR
OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF
ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

---- Part 6: Cisco/BUPTNIC copyright notice (BSD) -----

Copyright (c) 2004, Cisco, Inc and Information Network
Center of Beijing University of Posts and Telecommunications.
All rights reserved.

Redistribution and use in source and binary forms, with or without
modification, are permitted provided that the following conditions are met:

* Redistributions of source code must retain the above copyright notice,
  this list of conditions and the following disclaimer.

* Redistributions in binary form must reproduce the above copyright
  notice, this list of conditions and the following disclaimer in the
  documentation and/or other materials provided with the distribution.

* Neither the name of Cisco, Inc, Beijing University of Posts and
  Telecommunications, nor the names of their contributors may
  be used to endorse or promote products derived from this software
  without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDERS AND CONTRIBUTORS ``AS
IS'' AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO,
THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR
PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE COPYRIGHT HOLDERS OR
CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL,
EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO,
PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS;
OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY,
WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR
OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF
ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

---- Part 7: Fabasoft R&D Software GmbH & Co KG copyright notice (BSD) -----

Copyright (c) Fabasoft R&D Software GmbH & Co KG, 2003
oss@fabasoft.com
Author: Bernhard Penz

Redistribution and use in source and binary forms, with or without
modification, are permitted provided that the following conditions are met:

* Redistributions of source code must retain the above copyright notice,
  this list of conditions and the following disclaimer.

* Redistributions in binary form must reproduce the above copyright
  notice, this list of conditions and the following disclaimer in the
  documentation and/or other materials provided with the distribution.

* The name of Fabasoft R&D Software GmbH & Co KG or any of its subsidiaries,
  brand or product names may not be used to endorse or promote products
  derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDER ``AS IS'' AND ANY
EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE
IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR
PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE COPYRIGHT HOLDER BE
LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR
CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF
SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR
BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY,
WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE
OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN
IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

---- Part 8: Apple Inc. copyright notice (BSD) -----

Copyright (c) 2007 Apple Inc. All rights reserved.

Redistribution and use in source and binary forms, with or without
modification, are permitted provided that the following conditions
are met:

1. Redistributions of source code must retain the above copyright
notice, this list of conditions and the following disclaimer.
2. Redistributions in binary form must reproduce the above
copyright notice, this list of conditions and the following
disclaimer in the documentation and/or other materials provided
with the distribution.
3. Neither the name of Apple Inc. ("Apple") nor the names of its
contributors may be used to endorse or promote products derived
from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY APPLE AND ITS CONTRIBUTORS "AS IS" AND
ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO,
THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A
PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL APPLE OR ITS

CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL,
SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT
LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF
USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND
ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY,
OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT
OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF
SUCH DAMAGE.

---- Part 9: ScienceLogic, LLC copyright notice (BSD) -----

Copyright (c) 2009, ScienceLogic, LLC
All rights reserved.

Redistribution and use in source and binary forms, with or without
modification, are permitted provided that the following conditions are
met:

* Redistributions of source code must retain the above copyright notice,
  this list of conditions and the following disclaimer.

* Redistributions in binary form must reproduce the above copyright
  notice, this list of conditions and the following disclaimer in the
  documentation and/or other materials provided with the distribution.

* Neither the name of ScienceLogic, LLC nor the names of its
  contributors may be used to endorse or promote products derived
  from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDERS AND CONTRIBUTORS
``AS IS'' AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT
LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR
A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE COPYRIGHT
HOLDERS OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT,
INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING,
BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS
OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND
ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR
TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE
USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH
DAMAGE.