Ultra Messaging (Version 6.14)

C Examples

Contents

Chapter 1

Introduction

This document lists and gives some background information on the C-language example UM programs.

For policies and procedures related to Ultra Messaging Technical Support, see UM Support.

The information in this documentation is subject to change without notice. If you find any problems in this documentation, please report them to us in writing at Informatica LLC 2100 Seaport Blvd. Redwood City, CA 94063.

Informatica products are warranted according to the terms and conditions of the agreements under which they are provided.
INFORMATICA LLC PROVIDES THE INFORMATION IN THIS DOCUMENT "AS IS" WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING WITHOUT ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND ANY WARRANTY OR CONDITION OF NON-INFRINGEMENT.

See **UM Glossary** for Ultra Messaging terminology, abbreviations, and acronyms.

1.1 C Examples Introduction

These programs were written to help in troubleshooting, testing, and demonstrating UM coding techniques. See also Java Example Source Code and C# Example Source Code.

Since the tools are written to be useful as well as instructive, they are more complex than purely-instructive examples would be, with many options to add or subtract functionality. See UMExamples for purely-instructive examples of a variety of UM use cases.

The example C programs listed here are provided in both source form and in binary executable form.

1.2 Configuring C Examples

The example programs universally provide the "-c filename" command-line option. Using that option, the example application calls the **lbm_config()** API. However, note that this API is not recommended for use with XML-format LBM configuration files, largely because you are not able to specify an application name.

To use an XML configuration file with a UM example application, set the environment variables:

- LBM_XML_CONFIG_APPNAME - Desired name of application.
- LBM_XML_CONFIG_FILENAME - Path name of XML configuration file.

In this way, UM will correctly set the example application's name and will properly load the XML configuration file.

1.3 Building C Examples

Most users are not interested in compiling these sources in their current form, but instead use them for "spare parts", extracting fragments of code as appropriate. For users who wish to build the tools, and especially for users who may want to modify the tools, we recommend creating a new directory and copying all of the doc/example directory contents into that new directory.

The "Makefile.unix" is designed to be used by making a copy of the example directory under your binary package. For example, after installing the UMP 6.13 binary and documentation packages on your Linux system, you should have two directories named "UMP_6.13" and "UM_6.13_doc". To copy and build:

```
$ mkdir UMP_6.13/doc
$ cp -r UM_6.13_doc/doc/example UMP_6.13/doc/example
$ cd UMP_6.13/doc/example
$ make -f Makefile.unix TARGET_PLATFORM=Linux-glibc-2.17-x86_64 PRODUCT=UMP
```

Note

For UM versions prior to 6.14, the above command might fail on versions of Linux that do not have the "libnsl.so" library pre-installed. For example, CentOS 8. An easy workaround is to edit "Makefile.unix" and remove "-lnsl" from the LINUX_LIBS definition.

The Windows "nmake" file "Makefile.windows" is based on older versions of Visual Studio and may not be straightforward to make work as-is. It is still included for reference purposes. For example:

```
LBMSRC_OBJS = lbmsrc.obj verifymsg.obj getopt.obj
lbmsrc.exe:
```

indicates that the "lbmsrc.exe" program requires 3 source files: "lbmsrc.c", "verifymsg.c", and "getopt.c".

1.4 Unhandled C Events

Each of the example programs is written to demonstrate a subset of UM's total available functionality. For example, some programs are written to demonstrate **Streaming** functionality (e.g. lbmsrc), while other programs are written to demonstrate **Persistence** functionality (e.g. umesrc), while still other programs are written to demonstrate **Queuing** functionality (e.g. umqsrc).

UM is generally designed to be event-driven, with events being delivered to the programs through standard callbacks, like source callbacks and receiver callbacks. There are many events which are common across all streaming, persistence, and queuing. Other events are specific to persistence, and still other events are specific to queuing.

This can lead to example programs reporting "unknown" or "unhandled" events. For example, if the "lbmsrc" streaming program is run with a configuration file that enables persistence, UM will deliver events that are specific to persistence to the "lbmsrc" program. But "lbmsrc" is designed for streaming, and does not include code cases for persistence or queuing events. Maybe you should change your configuration to disable persistence, or you should be using the "umesrc" example program.

Similarly, the "umqsrc" program expects queuing functionality, and can report unhandled events if persistence is configured. Or "umesrc" can report unhandled events if queuing is configured.

If you see an unhandled event, it is generally reported as a number. You can see which event this corresponds to by looking up the number in:

- **C Receiver Events** for subscribing programs and
- **C Source Events** for publishing programs.

Once you understand the nature of the unhandled event, you can decide how to change your configuration or choose a different program.

1.5 C Example Support Files

There are several source files in the example directory that contain useful functions to the main example programs.

`getopt.c` - utility functions to parse command-line options (for Windows).

`verifymsg.c` - utility function to help some programs create verifiable messages.

`monmodopts.h` - common include file used by many of the example programs. It includes option information for monitoring functionality.

`replgetopt.h` - common include file used by many of the example programs. It includes definitions for alternate getopt functions.

`verifymsg.h` - common include file used by many of the example programs. It includes definitions for "verifymsg.c" (which needs to be linked into many programs).

`srs_monitor_info_msg.c` - Module used by the srs_monitor_info_receiver program.

`srs_monitor_info_msg.h` - Definitions for srs_monitor_info_msg.c module.

`srs_cmd_msg.c` - Module used by the srs_cmd program.

`srs_cmd_msg.h` - Definitions for srs_cmd_msg.c module.

`Makefile.unix` - see contents for instructions of setting up environment variables.

`Makefile.windows` - see contents for instructions of setting up make variables.

`lbmmondiag.pl` - Reads UDP packets and process statistics. See `lbmmonudp.c and lbmmondiag.pl` in the UM Operations Guide.

1.6 Persistence Tutorial C Files

See **Demonstrating Persistence** for information on these files.

ume-example-src.c - Initial source application used in the tutorial.

ume-example-rcv.c - Initial receiver application used in the tutorial.

ume-example-src-2.c - Source application modified to use a UMP persistent store.

ume-example-rcv-2.c - Receiver application modified to use a UMP persistent store.

ume-example-src-3.c - Modified source application used to demonstrate persistence.

ume-example-rcv-3.c - Modified receiver application used to demonstrate persistence.

ume-example-config.xml - Elementary persistent store configuration file used for the tutorial.

1.7 C Examples

1.7.1 Example lbmhfrcv.c

Source code: lbmhfrcv.c

```
Purpose: application that receives messages from a given topic using a single
    hot-failover receiver.
Usage: lbmhfrcv [-AEhsvV] [-c filename] [-r msgs] [-U losslev] topic
       -A = display messages as ASCII text
       -c filename = Use LBM configuration file filename.
                     Multiple config files are allowed.
                     Example:  '-c file1.cfg -c file2.cfg'
       -d, --msec-delay=NUM        Implements a number of milliseconds sleep per
           message received
       -E = exit after source ends
       -h = help
       -r msgs = delete receiver after msgs messages
       -s = print statistics along with bandwidth
       -S = Exit after source ends, print throughput summary
       -v = be verbose about incoming messages (-v -v = be even more verbose)
       -V = verify message contents
```

1.7.2 Example lbmhfrcvq.c

Source code: lbmhfrcvq.c

```
Purpose: lbmhfrcv.c: application that receives messages from a given topic
    using a single hot-failover receiver and an event queue.
Usage: lbmhfrcvq [-EhsvV] [-c filename] [-r msgs] [-U losslev] topic
       -c filename = Use LBM configuration file filename.
                     Multiple config files are allowed.
                     Example:  '-c file1.cfg -c file2.cfg'
       -E = exit after source ends
       -h = help
       -r msgs = delete receiver after msgs messages
       -s = print statistics along with bandwidth
       -S = Exit after source ends, print throughput summary
       -U losslev = exit after losslev % unrecoverable loss
```

```
       -v = be verbose about incoming messages (-v -v = be even more verbose)
       -V = verify message contents
```

1.7.3 Example lbmhfsrc.c

Source code: lbmhfsrc.c

```
Purpose: application that sends to a given topic using a single hot-failover
    source.
Usage: lbmhfsrc [options] topic
Available options:
  -c filename = Use LBM configuration file filename.
                Multiple config files are allowed.
                Example:  '-c file1.cfg -c file2.cfg'
  -d delay = delay sending for delay seconds after source creation
  -h = help
  -i init = start at message init instead of 0
  -l len = send messages of len bytes
  -L linger = linger for linger seconds before closing context
  -M msgs = send msgs number of messages
  -N NUM = send on channel NUM
  -P msec = pause after each send msec milliseconds
  -R [UM]DATA/RETR = Set transport type to LBT-R[UM], set data rate limit to
                     DATA bits per second, and set retransmit rate limit to
                     RETR bits per second.  For both limits, the optional
                     k, m, and g suffixes may be used.  For example,
                     '-R 1m/500k' is the same as '-R 1000000/500000'
  -s sec = print stats every sec seconds
  -t filename = use filename contents as a recording of message sequence numbers
  -V = construct verifiable messages
  -x bits = Use 32 or 64 bits for hot-failover sequence numbers
```

1.7.4 Example lbmhfxrcv.c

Source code: lbmhfxrcv.c

```
Purpose: application that receives messages from a given topic using a single
    hot-failover receiver across contexts (HFX).
Usage: lbmhfxrcv [-aACdEfhqsSvV] [-I interface] [-c filename] [-r msgs] [-U
    losslev] topic
Available options:
  -a, --arrival-order  deliver messages in the order that they arrive.
  -A, --ascii          display messages as ASCII text (-A -A = newlines after each
      msg)
  -c, --config=FILE    Use LBM configuration file FILE.
                       Multiple config files are allowed.
                       Example:  '-c file1.cfg -c file2.cfg'
  -C, --context-stats  fetch context rather than receiver stats
  -d, --deliver-dups   Enable duplicate delivery
  -E, --exit           exit when source stops sending
  -h, --help           display this help and exit
  -I, --iface=CIDR     create a context on the interface specified by CIDR
                       Multiple interfaces are allowed.
                       Example: '-I 10.29.1.0/24 -I 10.29.2.0/24'
  -q, --eventq         use an LBM event queue
```

```
  -r, --msgs=NUM       exit after NUM messages
  -O, --orderchecks     Enable message order checking
  -s, --stats=NUM      print LBM statistics every NUM seconds
  --max-sources=NUM    allow up to NUM sources (for statistics gathering purposes)
  -S, --stop           exit when source stops sending, and print throughput summary
  -U, --losslev=NUM    exit after NUM% unrecoverable loss
  -v, --verbose        be verbose about incoming messages (-v -v = be even more
      verbose)
  -V, --verify         verify message contents

Monitoring options:
  --monitor-rcv=NUM              monitor receiver every NUM seconds
  --monitor-ctx=NUM              monitor context every NUM seconds
  --monitor-transport=TRANS      use monitor transport module TRANS
                                 TRANS may be 'lbm', 'lbmsnmp', or 'udp', default
                                     is 'lbm'
  --monitor-transport-opts=OPTS  use OPTS as transport module options
  --monitor-format=FMT           use monitor format module FMT
                                 FMT may be 'csv' or 'pb'
  --monitor-format-opts=OPTS     use OPTS as format module options
  --monitor-appid=ID             use ID as application ID string

Transport and format options are passed as name=value pairs, separated by a
    semicolon.
The entire option string should be enclosed in double-quotes.

LBM transport options:
Note that individual LBM options can be specified as <scope>|<option>=value, where
  <scope> is one of context, source, receiver, wildcard_receiver, or event_queue
  <option> is the LBM configuration option name
The vertical bar (pipe symbol) is required when specifying individual LBM options.
  config=FILE            use LBM configuration file FILE
  topic=TOPIC            send statistics on topic TOPIC
                         default is /29west/statistics
  allow_debug=VAL        VAL may be 'off' or 'on'
                         defaults to 'off'

LBMSNMP transport options:
Note that individual LBM options can be specified as <scope>|<option>=value, where
  <scope> is one of context, source, receiver, wildcard_receiver, or event_queue
  <option> is the LBM configuration option name
The vertical bar (pipe symbol) is required when specifying individual LBM options.
  config=FILE            use LBM configuration file FILE
  topic=TOPIC            send statistics on topic TOPIC
                         default is /29west/statistics

UDP transport options:
  address=IP             send statistics to address IP
  port=NUM               send to UDP port NUM
                         default is 2933
  mcgroup=GRP            send on multicast group GRP
  bcaddress=IP           send statistics to broadcast address IP
  ttl=NUM                send multicast statistics with TTL NUM
                         default is 16

CSV format options:
  separator=CHAR         separate CSV fields with character CHAR
                         defaults to ','
                         Don't use a semicolon!

PB format options:
  filters=FILE           use FILE that contains filter options
```

1.7.5 Example lbmhtrcv.c

Source code: lbmhtrcv.c

```
Purpose: application that receives from a collection of HyperTopic patterns.
Usage: lbmhtrcv [options] <patterns_file
Where 'patterns_file' is a simple text file, supplied as standard input,
      containing one pattern per line.
Available options:
  -d msec               delete hypertopic receiver every msec milliseconds
  -h, --help            display this help and exit
  -p string             set hypertopic prefix to string
  -q                    use event queue
  -s, --statistics      print statistics along with bandwidth
  -v, --verbose         be verbose about incoming messages
  -x                    exit after all receivers deleted
```

1.7.6 Example lbmimsg.c

Source code: lbmimsg.c

```
Purpose: application that sends immediate messages (either unicast or multicsat)
    as fast as possible, either to a topic, or send topicless.
Usage: lbmimsg [options] topic
       lbmimsg [options] -o
Available options:
  -c filename = Use LBM configuration file filename.
                Multiple config files are allowed.
                Example:  '-c file1.cfg -c file2.cfg'
  -d delay = delay sending for delay seconds after source creation
  -h = help
  -l len = send messages of len bytes
  -L linger = linger for linger seconds before closing context
  -M msgs = send msgs number of messages
  -n num = Append a number between 1 and num to topic
  -o = send topic-less immediate messages
  -P msec = pause after each send msec milliseconds
  -R [UM]DATA/RETR = Set transport type to LBT-R[UM], set data rate limit to
                     DATA bits per second, and set retransmit rate limit to
                     RETR bits per second.  For both limits, the optional
                     k, m, and g suffixes may be used.  For example,
                     '-R 1m/500k' is the same as '-R 1000000/500000'
  -T target = target for unicast immediate messages
```

1.7.7 Example lbmireq.c

Source code: lbmireq.c

```
Purpose: application that sends immediate message requests (multicast or unicast)
    to a given topic and waits for responses.
Usage: lbmireq [-hv] [-c filename] [-l len] [-L linger] [-P sec] [-r rate/pct]
       [-R requests] [-T target] [topic]
```

```
       -c filename = Use LBM configuration file filename.
                     Multiple config files are allowed.
                     Example:  '-c file1.cfg -c file2.cfg'
       -h = help
       -l len = send messages of len bytes
       -L linger = linger for linger seconds before closing context
       -P sec = pause sec seconds after sending request for responses to arrive
       -r [UM]DATA/RETR = Set transport type to LBT-R[UM], set data rate limit to
                          DATA bits per second, and set retransmit rate limit to
                          RETR bits per second.  For both limits, the optional
                          k, m, and g suffixes may be used.  For example,
                          '-r 1m/500k' is the same as '-r 1000000/500000'
       -R requests = number of request messages to send
       -T target = send immediate request to target
       -v = be verbose (-v -v = be even more verbose)
```

1.7.8 Example lbmlatping.c

Source code: lbmlatping.c

```
Purpose: application to measure round-trip latency of SMX.  Use with lbmlatpong.
Usage: lbmlatping [-h] [-c filename] [-l len] [-P msec]
       -c filename = Use LBM configuration file filename.
                     Multiple config files are allowed.
                     Example:  '-c file1.cfg -c file2.cfg'
       -h = help
       -l len = use len length messages
       -P usec = pause after each send usec microseconds
                 (only accurate to milliseconds on windows)
```

1.7.9 Example lbmlatpong.c

Source code: lbmlatpong.c

```
Purpose: application to measure round-trip latency of SMX.  Use with lbmlatping.
Usage: lbmlatpong [-h] [-c filename]
       -c filename = Use LBM configuration file filename.
                     Multiple config files are allowed.
                     Example:  '-c file1.cfg -c file2.cfg'
       -h = help
```

1.7.10 Example lbmmon.c

Source code: lbmmon.c

```
Purpose: example LBM statistics monitoring application.
Usage: lbmmon [options]
Available options:
  -c, --config=FILE          Use LBM configuration file FILE.
                             Multiple config files are allowed.
                             Example:  '-c file1.cfg -c file2.cfg'
```

```
  -h, --help                 display this help and exit
  -t, --transport=TRANS      use transport module TRANS
                             TRANS may be 'lbm', 'udp', or 'lbmsnmp', default is
                                 'lbm'
      --transport-opts=OPTS  use OPTS as transport module options
                             See the 'UM Operations Guide' section 'Monitoring
                                 Transport Modules'.
  -f, --format=FMT           use format module FMT
                             FMT may be 'csv' or 'pb'
      --format-opts=OPTS     use OPTS as format module options
                             See the 'UM Operations Guide' section 'Monitoring
                                 Format Modules'.

Transport and format options are passed as name=value pairs, separated by a
    semicolon.
The entire option string should be enclosed in double-quotes.

LBM transport options:
Note that individual LBM options can be specified as <scope>|<option>=value, where
  <scope> is one of context, source, receiver, wildcard_receiver, or event_queue
  <option> is the LBM configuration option name
The vertical bar (pipe symbol) is required when specifying individual LBM options.
  config=FILE            use LBM configuration file FILE
  topic=TOPIC            receive statistics on topic TOPIC
                         default is /29west/statistics
  wctopic=PATTERN        receive statistics on wildcard topic PATTERN
                         See https://communities.informatica.com/infakb/faq/5/Pages/
                             80075.aspx
                         for guidelines on using wildcard topics. Also make sure
                             the statistics
                         topic namespace is disjoint from the data topic namespace.

LBMSNMP transport options:
Note that individual LBM options can be specified as <scope>|<option>=value, where
  <scope> is one of context, source, receiver, wildcard_receiver, or event_queue
  <option> is the LBM configuration option name
The vertical bar (pipe symbol) is required when specifying individual LBM options.
  config=FILE            use LBM configuration file FILE
  topic=TOPIC            receive statistics on topic TOPIC
                         default is /29west/statistics
  wctopic=PATTERN        receive statistics on wildcard topic PATTERN
                         See https://communities.informatica.com/infakb/faq/5/Pages/
                             80075.aspx
                         for guidelines on using wildcard topics. Also make sure
                             the statistics
                         topic namespace is disjoint from the data topic namespace.

UDP transport options:
  port=NUM               receive on UDP port NUM
                         default is 2933
  interface=IP           receive multicast on interface IP
                         default is INADDR_ANY (0.0.0.0)
  mcgroup=GRP            receive on multicast group GRP

CSV format options:
  separator=CHAR         separate CSV fields with character CHAR
                         defaults to ','
                         Don't use a semicolon!
  passthrough=VAL        VAL may be 'off', 'on' or 'convert'
                         defaults to 'off'

PB format options:
  passthrough=VAL        VAL may be 'off', 'on' or 'convert'
```

```
                        defaults to 'off'
```

1.7.11 Example lbmmon_cmd.c

Source code: lbmmon_cmd.c

```
Purpose: send unicast immediate control requests to an LBMMON publisher.
Usage: lbmmon_cmd -T target_string -C command [options]
Available options:
  -c filename = Use LBM configuration file filename.
                Multiple config files are allowed.
                Example:  '-c file1.cfg -c file2.cfg'
  -C command  = command to send [required]
  -d          = dump default filter options to stdout
  -D data     = data for command (either -D or -F, not both)
                Example: '-C SET_INTERVAL -D 30'
  -F filename = filename for command (either -D or -F, not both)
                Example: '-C SET_FILTER_OPTIONS -F filter.cfg'
  -h          = help
  -I id       = Application ID of node for command
                Example: '-C SNAP -N UMESTORE -I storeName'
  -L linger   = linger for linger seconds before closing context
  -N node     = node type for command
                Example: '-C SNAP -N CONTEXT'
  -P sec      = pause for sec seconds after sending request to wait for response
  -T target   = target string for unicast immediate requests [required]
```

1.7.12 Example lbmmoncache.c

Source code: lbmmoncache.c

```
Purpose: example LBM statistics monitoring application.
Usage: lbmmoncache [options]
Available options:
  -c, --config=FILE          Use LBM configuration file FILE.
                             Multiple config files are allowed.
                             Example:  '-c file1.cfg -c file2.cfg'
  -C, --cache-size=size      Set the cache size to 'size' entries
  -h, --help                 display this help and exit
  -t, --transport=TRANS      use transport module TRANS
                             TRANS may be 'lbm', 'udp', or 'lbmsnmp', default is
                                 'lbm'
      --transport-opts=OPTS  use OPTS as transport module options
  -f, --format=FMT           use format module FMT
                             FMT may be 'csv'
      --format-opts=OPTS     use OPTS as format module options

Transport and format options are passed as name=value pairs, separated by a
    semicolon.
The entire option string should be enclosed in double-quotes.

LBM transport options:
Note that individual LBM options can be specified as <scope>|<option>=value, where
  <scope> is one of context, source, receiver, wildcard_receiver, or event_queue
  <option> is the LBM configuration option name
```

```
The vertical bar (pipe symbol) is required when specifying individual LBM options.
  config=FILE             use LBM configuration file FILE
  topic=TOPIC             receive statistics on topic TOPIC
                          default is /29west/statistics
  wctopic=PATTERN         receive statistics on wildcard topic PATTERN
                          See https://communities.informatica.com/infakb/faq/5/Pages/
                              80075.aspx
                          for guidelines on using wildcard topics. Also make sure
                              the statistics
                          topic namespace is disjoint from the data topic namespace.

LBMSNMP transport options:
Note that individual LBM options can be specified as <scope>|<option>=value, where
  <scope> is one of context, source, receiver, wildcard_receiver, or event_queue
  <option> is the LBM configuration option name
The vertical bar (pipe symbol) is required when specifying individual LBM options.
  config=FILE             use LBM configuration file FILE
  topic=TOPIC             receive statistics on topic TOPIC
                          default is /29west/statistics
  wctopic=PATTERN         receive statistics on wildcard topic PATTERN
                          See https://communities.informatica.com/infakb/faq/5/Pages/
                              80075.aspx
                          for guidelines on using wildcard topics. Also make sure
                              the statistics
                          topic namespace is disjoint from the data topic namespace.

UDP transport options:
  port=NUM                receive on UDP port NUM
                          default is 2933
  interface=IP            receive multicast on interface IP
                          default is INADDR_ANY (0.0.0.0)
  mcgroup=GRP             receive on multicast group GRP

CSV format options:
  separator=CHAR          separate CSV fields with character CHAR
                          defaults to ','
                          Don't use a semicolon!
  passthrough=VAL         VAL may be 'off', 'on' or 'convert'
                          defaults to 'off'

PB format options:
  passthrough=VAL         VAL may be 'off', 'on' or 'convert'
                          defaults to 'off'
```

1.7.13 Example lbmmondata.c

Source code: lbmmondata.c

```
Purpose: example LBM statistics monitoring application.
Usage: lbmmondata [-c filename] [-t topicname]
       -c filename = Use LBM configuration file filename.
                     Multiple config files are allowed.
                     Example:  '-c file1.cfg -c file2.cfg'
       -t topicname = use topic topicname to receive statistics
```

1.7.14 Example lbmmonudp.c

Source code: lbmmonudp.c

```
Purpose: application that receives LBM statistics and forwards as CSV over UDP.
Usage: lbmmonudp [options]
Available options:
  -3, --force-32bit          force all data values to fit within 32 bits
                             default is to use native data size
                             applies only to 64-bit platforms
  -a, --address=IP           send CSV data to unicast address IP
  -b, --broadcast=IP         send CSV data to broadcast address IP
  -f, --format=FMT           use monitor format module FMT
                             FMT may be 'csv'
      --format-opts=OPTS     use OPTS as format module options
  -h, --help                 display this help and exit
  -i, --interface=IP         send multicast via interface IP
  -m, --multicast=GRP        send CSV data to multicast group GRP
  -p, --port=NUM             send CSV data on UDP port NUM
                             default is port 1234
  -t, --transport=TRANS      use monitor transport module TRANS
                             TRANS may be 'lbm' or 'udp', default is 'lbm'
      --transport-opts=OPTS  use OPTS as transport module options
  -T, --ttl=NUM              send multicast with TTL NUM
                             default is 1

Transport and format options are passed as name=value pairs, separated by a
    semicolon.
The entire option string should be enclosed in double-quotes.

LBM transport options:
Note that individual LBM options can be specified as <scope>|<option>=value, where
  <scope> is one of context, source, receiver, wildcard_receiver, or event_queue
  <option> is the LBM configuration option name
The vertical bar (pipe symbol) is required when specifying individual LBM options.
  config=FILE            use LBM configuration file FILE
  topic=TOPIC            receive statistics on topic TOPIC
                         default is /29west/statistics
  wctopic=PATTERN        receive statistics on wildcard topic PATTERN
                         See https://communities.informatica.com/infakb/faq/5/Pages/
                             80075.aspx
                         for guidelines on using wildcard topics. Also make sure
                             the statistics
                         topic namespace is disjoint from the data topic namespace.

LBMSNMP transport options:
Note that individual LBM options can be specified as <scope>|<option>=value, where
  <scope> is one of context, source, receiver, wildcard_receiver, or event_queue
  <option> is the LBM configuration option name
The vertical bar (pipe symbol) is required when specifying individual LBM options.
  config=FILE            use LBM configuration file FILE
  topic=TOPIC            receive statistics on topic TOPIC
                         default is /29west/statistics
  wctopic=PATTERN        receive statistics on wildcard topic PATTERN
                         See https://communities.informatica.com/infakb/faq/5/Pages/
                             80075.aspx
                         for guidelines on using wildcard topics. Also make sure
                             the statistics
                         topic namespace is disjoint from the data topic namespace.

UDP transport options:
  port=NUM               receive on UDP port NUM
                         default is 2933
  interface=IP           receive multicast on interface IP
```

```
                          default is INADDR_ANY (0.0.0.0)
  mcgroup=GRP             receive on multicast group GRP

CSV format options:
  separator=CHAR          separate CSV fields with character CHAR
                          defaults to ‘,’
                          Don’t use a semicolon!
  passthrough=VAL         VAL may be ‘off’, ‘on’ or ’convert’
                          defaults to ‘off’

PB format options:
  passthrough=VAL         VAL may be ‘off’, ‘on’ or ’convert’
                          defaults to ‘off’
```

1.7.15 Example lbmmrcv.c

Source code: lbmmrcv.c

```
Purpose: application that receives messages from a set of one or more topics.
Usage: lbmmrcv [options]
  -B, --bufsize=#          Set receive socket buffer size to # (in MB)
  -c, --config=FILE        Use LBM configuration file FILE.
                           Multiple config files are allowed.
                           Example:  ’-c file1.cfg -c file2.cfg’
  -C, --contexts=NUM       use NUM lbm_context_t objects
  -E, --exit               exit and end upon receiving End-of-Stream notification
  -e, --end-flag=FILE      clean up and exit when file FILE is created
  -h, --help               display this help and exit
  -i, --initial-topic=NUM  use NUM as initial topic number
  -o, --regid-offset=offset  use offset to calculate Registration ID
                             (as source registration ID + offset)
                             offset of 0 forces creation of regid by store
  -L, --linger=NUM         linger for NUM seconds after done
  -r, --root=STRING        use topic names with root of STRING
  -R, --receivers=NUM      create NUM receivers
  -s, --statistics         print statistics along with bandwidth
  -v, --verbose            be verbose
  -V, --verify             verify message contents

Monitoring options:
  --monitor-rcv=NUM              monitor receiver every NUM seconds
  --monitor-ctx=NUM              monitor context every NUM seconds
  --monitor-transport=TRANS      use monitor transport module TRANS
                                 TRANS may be ‘lbm’, ‘lbmsnmp’, or ‘udp’, default
                                     is ‘lbm’
  --monitor-transport-opts=OPTS  use OPTS as transport module options
  --monitor-format=FMT           use monitor format module FMT
                                 FMT may be ‘csv’ or ‘pb’
  --monitor-format-opts=OPTS     use OPTS as format module options
  --monitor-appid=ID             use ID as application ID string

Transport and format options are passed as name=value pairs, separated by a
    semicolon.
The entire option string should be enclosed in double-quotes.

LBM transport options:
Note that individual LBM options can be specified as <scope>|<option>=value, where
  <scope> is one of context, source, receiver, wildcard_receiver, or event_queue
  <option> is the LBM configuration option name
The vertical bar (pipe symbol) is required when specifying individual LBM options.
```

```
  config=FILE            use LBM configuration file FILE
  topic=TOPIC            send statistics on topic TOPIC
                         default is /29west/statistics
  allow_debug=VAL        VAL may be 'off' or 'on'
                         defaults to 'off'

LBMSNMP transport options:
Note that individual LBM options can be specified as <scope>|<option>=value, where
  <scope> is one of context, source, receiver, wildcard_receiver, or event_queue
  <option> is the LBM configuration option name
The vertical bar (pipe symbol) is required when specifying individual LBM options.
  config=FILE            use LBM configuration file FILE
  topic=TOPIC            send statistics on topic TOPIC
                         default is /29west/statistics

UDP transport options:
  address=IP             send statistics to address IP
  port=NUM               send to UDP port NUM
                         default is 2933
  mcgroup=GRP            send on multicast group GRP
  bcaddress=IP           send statistics to broadcast address IP
  ttl=NUM                send multicast statistics with TTL NUM
                         default is 16

CSV format options:
  separator=CHAR         separate CSV fields with character CHAR
                         defaults to ','
                         Don't use a semicolon!

PB format options:
  filters=FILE           use FILE that contains filter options
```

1.7.16 Example lbmmrcvq.c

Source code: lbmmrcvq.c

```
Purpose: application that receives messages from a set of one or more topics
    using event queues.
Usage: lbmmrcvq [options]
  -B, --bufsize=#          Set receive socket buffer size to # (in MB)
  -c, --config=FILE        Use LBM configuration file FILE.
                           Multiple config files are allowed.
                           Example:  '-c file1.cfg -c file2.cfg'
  -C, --contexts=NUM       use NUM lbm_context_t objects
  -h, --help               display this help and exit
  -i, --initial-topic=NUM  use NUM as initial topic number
  -L, --linger=NUM         linger for NUM seconds after done
  -r, --root=STRING        use topic names with root of STRING
  -R, --receivers=NUM      create NUM receivers
  -s, --statistics         print statistics along with bandwidth
  -v, --verbose            be verbose

Monitoring options:
  --monitor-rcv=NUM              monitor receiver every NUM seconds
  --monitor-ctx=NUM              monitor context every NUM seconds
  --monitor-transport=TRANS      use monitor transport module TRANS
                                 TRANS may be 'lbm', 'lbmsnmp', or 'udp', default
                                     is 'lbm'
  --monitor-transport-opts=OPTS  use OPTS as transport module options
  --monitor-format=FMT           use monitor format module FMT
```

```
                                FMT may be 'csv' or 'pb'
  --monitor-format-opts=OPTS    use OPTS as format module options
  --monitor-appid=ID            use ID as application ID string
  --monitor-evq=NUM             monitor event queue every NUM seconds

Transport and format options are passed as name=value pairs, separated by a
    semicolon.
The entire option string should be enclosed in double-quotes.

LBM transport options:
Note that individual LBM options can be specified as <scope>|<option>=value, where
  <scope> is one of context, source, receiver, wildcard_receiver, or event_queue
  <option> is the LBM configuration option name
The vertical bar (pipe symbol) is required when specifying individual LBM options.
  config=FILE           use LBM configuration file FILE
  topic=TOPIC           send statistics on topic TOPIC
                        default is /29west/statistics
  allow_debug=VAL       VAL may be 'off' or 'on'
                        defaults to 'off'

LBMSNMP transport options:
Note that individual LBM options can be specified as <scope>|<option>=value, where
  <scope> is one of context, source, receiver, wildcard_receiver, or event_queue
  <option> is the LBM configuration option name
The vertical bar (pipe symbol) is required when specifying individual LBM options.
  config=FILE           use LBM configuration file FILE
  topic=TOPIC           send statistics on topic TOPIC
                        default is /29west/statistics

UDP transport options:
  address=IP            send statistics to address IP
  port=NUM              send to UDP port NUM
                        default is 2933
  mcgroup=GRP           send on multicast group GRP
  bcaddress=IP          send statistics to broadcast address IP
  ttl=NUM               send multicast statistics with TTL NUM
                        default is 16

CSV format options:
  separator=CHAR        separate CSV fields with character CHAR
                        defaults to ','
                        Don't use a semicolon!

PB format options:
  filters=FILE          use FILE that contains filter options
```

1.7.17 Example lbmmreq.c

Source code: lbmmreq.c

```
Purpose: application that sends request messages to a single topic
    and processes responses.
Usage: lbmmreq [options] topic
Available options:
  -c filename = Use LBM configuration file filename.
                Multiple config files are allowed.
                Example:  '-c file1.cfg -c file2.cfg topicname'
  -d delay = delay sending for delay seconds after source creation
  -h = help
  -l len = send messages of len bytes
```

```
  -r rate/pct = send with LBT-RM at rate and retransmission pct%
  -R requests = send requests number of requests
  -v = be verbose (-v -v = be even more verbose)
```

1.7.18 Example lbmmsrc.c

Source code: lbmmsrc.c

```
Purpose: send messages on multiple topics, optionally by multiple threads.
    Topic names generated as a root, a dot, and by an integer.
    By default, the first topic created will be '29west.example.multi.0'
Usage: lbmmsrc [options]
Available options:
  -b, --batch=NUM           send messages in batch sizes of NUM between each pause
  -c, --config=FILE         Use LBM configuration file FILE.
                            Multiple config files are allowed.
                            Example:  '-c file1.cfg -c file2.cfg'
  -d, --delay=NUM           delay sending for delay seconds after source creation
  -h, --help                display this help and exit
  -i, --initial-topic=NUM   use NUM as initial topic number [0]
  -j, --late-join=NUM       enable Late Join with specified retention buffer size
      (in bytes)
  -l, --length=NUM          send messages of length NUM bytes
  -L, --linger=NUM          linger for NUM seconds after done
  -M, --messages=NUM        send maximum of NUM messages
  -P, --pause=NUM           pause NUM milliseconds after each send
  -r, --root=STRING         use topic names with root of STRING
      [29west.example.multi]
  -R, --rate=[UM]DATA/RETR  Set transport type to LBT-R[UM], set data rate limit to
                            DATA bits per second, and set retransmit rate limit to
                            RETR bits per second.  For both limits, the optional
                            k, m, and g suffixes may be used.  For example,
                            '-R 1m/500k' is the same as '-R 1000000/500000'
  -s, --statistics=NUM      print stats every NUM seconds
  -S, --sources=NUM         use NUM sources
  -T, --threads=NUM         use NUM threads
  -v, --verbose             be verbose
  -V, --verifiable_msg      construct verifiable messages

Monitoring options:
  --monitor-src=NUM              monitor source every NUM seconds
  --monitor-ctx=NUM              monitor context every NUM seconds
  --monitor-transport=TRANS      use monitor transport module TRANS
                                 TRANS may be 'lbm', 'lbmsnmp', or 'udp', default
                                     is 'lbm'
  --monitor-transport-opts=OPTS  use OPTS as transport module options
  --monitor-format=FMT           use monitor format module FMT
                                 FMT may be 'csv' or 'pb'
  --monitor-format-opts=OPTS     use OPTS as format module options
  --monitor-appid=ID             use ID as application ID string

Transport and format options are passed as name=value pairs, separated by a
    semicolon.
The entire option string should be enclosed in double-quotes.

LBM transport options:
Note that individual LBM options can be specified as <scope>|<option>=value, where
  <scope> is one of context, source, receiver, wildcard_receiver, or event_queue
  <option> is the LBM configuration option name
The vertical bar (pipe symbol) is required when specifying individual LBM options.
```

```
  config=FILE            use LBM configuration file FILE
  topic=TOPIC            send statistics on topic TOPIC
                         default is /29west/statistics
  allow_debug=VAL        VAL may be 'off' or 'on'
                         defaults to 'off'

LBMSNMP transport options:
Note that individual LBM options can be specified as <scope>|<option>=value, where
  <scope> is one of context, source, receiver, wildcard_receiver, or event_queue
  <option> is the LBM configuration option name
The vertical bar (pipe symbol) is required when specifying individual LBM options.
  config=FILE            use LBM configuration file FILE
  topic=TOPIC            send statistics on topic TOPIC
                         default is /29west/statistics

UDP transport options:
  address=IP             send statistics to address IP
  port=NUM               send to UDP port NUM
                         default is 2933
  mcgroup=GRP            send on multicast group GRP
  bcaddress=IP           send statistics to broadcast address IP
  ttl=NUM                send multicast statistics with TTL NUM
                         default is 16

CSV format options:
  separator=CHAR         separate CSV fields with character CHAR
                         defaults to ','
                         Don't use a semicolon!

PB format options:
  filters=FILE           use FILE that contains filter options
```

1.7.19 Example lbmpong.c

Source code: lbmpong.c

```
Purpose: application that measures round trip message latency.
Usage: lbmpong [-ChIqRv] [-c filename] [-i msgs] [-l len] [-M msgs] [-P msec] [-r
    rate/pct] [-s seed] [-t secs] [-T topic] id
       -c filename = Use LBM configuration file filename.
                     Multiple config files are allowed.
                     Example:  '-c file1.cfg -c file2.cfg'
       -C = collect RTT data
       -h = help
       -i msgs = send and ignore msgs messages to warm up
       -o offset = use offset to calculate Registration ID
                   (as source registration ID + offset)
                   offset of 0 forces creation of regid by store
       -I = Use MIM
       -l len = use len length messages
       -M msgs = stop after receiving msgs messages
       -P msec = pause after each send msec milliseconds
       -q = use an LBM event queue
       -r [UM]DATA/RETR = Set transport type to LBT-R[UM], set data rate limit to
                          DATA bits per second, and set retransmit rate limit to
                          RETR bits per second.  For both limits, the optional
                          k, m, and g suffixes may be used.  For example,
                          '-r 1m/500k' is the same as '-r 1000000/500000'
       -R = perform RTT measurement per message
       -s seed = init randomization of contents of message payload
```

```
       -t secs = run for secs seconds
       -T topic = topic name prefix (appended with '/' and id) [lbmpong]
       -v = be verbose about each message
       id = either 'ping' or 'pong'
```

1.7.20 Example lbmprice.c

Source code: lbmprice.c

```
Purpose: simulated price source and receiver for demonstration.
Usage: lbmprice -s [-h] [-c filename]
       -c filename = Use LBM configuration file filename.
                     Multiple config files are allowed.
                     Example:  '-c file1.cfg -c file2.cfg'
       -h = help
       -H = act has Hot Failover relay for a price source
       -l pct = induce random receiver loss of pct percent
       -n ms = set receiver NAK generation interval to ms milliseconds
       -s = act as a price source (acts as a receiver by default)
       -t ttl = set resolver (and multicast source) ttl to ttl
       -v = be verbose

Alternate usage: lbmprice [-h] [-c filename]
       -c filename = read config file
       -h = help
       -H = use Hot Failover receiver
       -l pct = induce random receiver loss of pct percent, print max latency
       -n ms = set receiver NAK generation interval to ms milliseconds
       -o mode = set ordered delivery mode (1=ordered, 0=arrival order)
       -t ttl = set resolver (and multicast source) ttl to ttl
       -v = be verbose
```

1.7.21 Example lbmrcv.c

Source code: lbmrcv.c

```
Purpose: application that receives messages from a given topic.
Usage: lbmrcv [-ACEfhqsSvV] [-c filename] [-r msgs] [-U losslev] topic
Available options:
  -A, --ascii          display messages as ASCII text (-A -A = newlines after each
      msg)
  -c, --config=FILE    Use LBM configuration file FILE.
                       Multiple config files are allowed.
                       Example:  '-c file1.cfg -c file2.cfg'
  -C, --context-stats  fetch context rather than receiver stats
  -E, --exit           exit when source stops sending
  -f, --failover       use a hot-failover receiver
  -h, --help           display this help and exit
  -q, --eventq         use an LBM event queue
  -r, --msgs=NUM       exit after NUM messages
  -O, --orderchecks     Enable message order checking
  -N, --channel=NUM    subscribe to channel NUM
  -s, --stats=NUM      print LBM statistics every NUM seconds
  --max-sources=NUM    allow up to NUM sources (for statistics gathering purposes)
  -S, --stop           exit when source stops sending, and print throughput summary
```

```
  -U, --losslev=NUM    exit after NUM% unrecoverable loss
  -v, --verbose        be verbose about incoming messages (-v -v = be even more
      verbose)
  -V, --verify         verify message contents

Monitoring options:
  --monitor-rcv=NUM              monitor receiver every NUM seconds
  --monitor-ctx=NUM              monitor context every NUM seconds
  --monitor-transport=TRANS      use monitor transport module TRANS
                                 TRANS may be 'lbm', 'lbmsnmp', or 'udp', default
                                     is 'lbm'
  --monitor-transport-opts=OPTS  use OPTS as transport module options
  --monitor-format=FMT           use monitor format module FMT
                                 FMT may be 'csv' or 'pb'
  --monitor-format-opts=OPTS     use OPTS as format module options
  --monitor-appid=ID             use ID as application ID string

Transport and format options are passed as name=value pairs, separated by a
    semicolon.
The entire option string should be enclosed in double-quotes.

LBM transport options:
Note that individual LBM options can be specified as <scope>|<option>=value, where
  <scope> is one of context, source, receiver, wildcard_receiver, or event_queue
  <option> is the LBM configuration option name
The vertical bar (pipe symbol) is required when specifying individual LBM options.
  config=FILE            use LBM configuration file FILE
  topic=TOPIC            send statistics on topic TOPIC
                         default is /29west/statistics
  allow_debug=VAL        VAL may be 'off' or 'on'
                         defaults to 'off'

LBMSNMP transport options:
Note that individual LBM options can be specified as <scope>|<option>=value, where
  <scope> is one of context, source, receiver, wildcard_receiver, or event_queue
  <option> is the LBM configuration option name
The vertical bar (pipe symbol) is required when specifying individual LBM options.
  config=FILE            use LBM configuration file FILE
  topic=TOPIC            send statistics on topic TOPIC
                         default is /29west/statistics

UDP transport options:
  address=IP             send statistics to address IP
  port=NUM               send to UDP port NUM
                         default is 2933
  mcgroup=GRP            send on multicast group GRP
  bcaddress=IP           send statistics to broadcast address IP
  ttl=NUM                send multicast statistics with TTL NUM
                         default is 16

CSV format options:
  separator=CHAR         separate CSV fields with character CHAR
                         defaults to ','
                         Don't use a semicolon!

PB format options:
  filters=FILE           use FILE that contains filter options
```

1.7.22 Example lbmrcvq.c

Source code: lbmrcvq.c

```
Purpose: application that receives messages from a given topic using an event
    queue.
Usage: lbmrcvq [options] topic
Available options:
  -c, --config=FILE     Use LBM configuration file FILE.
  -C, --context-stats   fetch context rather than receiver stats
                        Multiple config files are allowed.
                        Example:  '-c file1.cfg -c file2.cfg'
  -E, --exit            exit after source ends
  -h, --help            display this help and exit
  -r NUM                delete receiver after NUM messages
  -s, --stats=NUM       print LBM statistics every NUM seconds
  -S, --stop            exit after source ends, print throughput summary
  -v, --verbose         be verbose about incoming messages (-v -v = be even more
      verbose)
  -V, --verify          verify message contents

Monitoring options:
  --monitor-rcv=NUM              monitor receiver every NUM seconds
  --monitor-ctx=NUM              monitor context every NUM seconds
  --monitor-transport=TRANS      use monitor transport module TRANS
                                 TRANS may be 'lbm', 'lbmsnmp', or 'udp', default
                                     is 'lbm'
  --monitor-transport-opts=OPTS  use OPTS as transport module options
  --monitor-format=FMT           use monitor format module FMT
                                 FMT may be 'csv' or 'pb'
  --monitor-format-opts=OPTS     use OPTS as format module options
  --monitor-appid=ID             use ID as application ID string
  --monitor-evq=NUM              monitor event queue every NUM seconds

Transport and format options are passed as name=value pairs, separated by a
    semicolon.
The entire option string should be enclosed in double-quotes.

LBM transport options:
Note that individual LBM options can be specified as <scope>|<option>=value, where
  <scope> is one of context, source, receiver, wildcard_receiver, or event_queue
  <option> is the LBM configuration option name
The vertical bar (pipe symbol) is required when specifying individual LBM options.
  config=FILE            use LBM configuration file FILE
  topic=TOPIC            send statistics on topic TOPIC
                         default is /29west/statistics
  allow_debug=VAL        VAL may be 'off' or 'on'
                         defaults to 'off'

LBMSNMP transport options:
Note that individual LBM options can be specified as <scope>|<option>=value, where
  <scope> is one of context, source, receiver, wildcard_receiver, or event_queue
  <option> is the LBM configuration option name
The vertical bar (pipe symbol) is required when specifying individual LBM options.
  config=FILE            use LBM configuration file FILE
  topic=TOPIC            send statistics on topic TOPIC
                         default is /29west/statistics

UDP transport options:
  address=IP             send statistics to address IP
  port=NUM               send to UDP port NUM
                         default is 2933
  mcgroup=GRP            send on multicast group GRP
  bcaddress=IP           send statistics to broadcast address IP
```

```
  ttl=NUM                 send multicast statistics with TTL NUM
                          default is 16

CSV format options:
  separator=CHAR          separate CSV fields with character CHAR
                          defaults to ‘,’
                          Don’t use a semicolon!

PB format options:
  filters=FILE            use FILE that contains filter options
```

1.7.23 Example lbmrcvxsp.c

Source code: lbmrcvxsp.c

```
Purpose: application that receives messages from a given topic, mapping transports
    to various XSPs.
Usage: lbmrcv [-ACdDEhPrRsSv] [-c filename] [-r msgs] topic
Available options:
  -A, --ascii                     display messages as ASCII text (-A -A = newlines
      after each msg)
  -c, --config=FILE               Use LBM configuration file FILE.
                                  Multiple config files are allowed.
                                  Example:  ’-c file1.cfg -c file2.cfg’
  -C, --context-stats             fetch context rather than receiver stats
  -d, --defer-xsp-deletion        don’t delete xsps until shutdown
  -D, --default-xsp               use the default XSP for all transports
  -E, --exit                      exit when source stops sending
  -h, --help                      display this help and exit
  -P, --round-robin-preallocate   preallocate the XSPs - use with -R
  -Q, --sequential-xsps           use sequential mode for XSPs
  -r, --msgs=NUM                  exit after NUM messages
  -R, --round-robin=NUM           use a simple round-robin method for assigning
      transports to NUM XSPs.
                                  (this is the DEFAULT for this application, with a
                                      NUM of 3
  -s, --stats=NUM                 print LBM statistics every NUM seconds
  -S, --stop                      exit when source stops sending, and print
      throughput summary
  -v, --verbose                   be verbose about incoming messages (-v -v = be
      even more verbose)
  -V, --verify                    verify message contents
```

1.7.24 Example lbmreq.c

Source code: lbmreq.c

```
Purpose: application that sends requests on a single topic and waits for
    responses.
Usage: lbmreq [options] topic
Available options:
  -c filename = Use LBM configuration file filename.
                Multiple config files are allowed.
                Example:  ’-c file1.cfg -c file2.cfg’
  -d sec = delay sending for delay seconds after source creation
```

```
  -h = help
  -l len = send messages of len bytes
  -L linger = linger for linger seconds before closing context
  -P sec = pause sec seconds after sending request for responses to arrive
  -r [UM]DATA/RETR = Set transport type to LBT-R[UM], set data rate limit to
                     DATA bits per second, and set retransmit rate limit to
                     RETR bits per second.  For both limits, the optional
                     k, m, and g suffixes may be used.  For example,
                     '-r 1m/500k' is the same as '-r 1000000/500000'
  -R requests = send requests number of requests
  -q = Use Event Queue
  -v = be verbose (-v -v = be even more verbose)
```

1.7.25 Example lbmresp.c

Source code: lbmresp.c

```
Purpose: application that receives request messages on a single topic and
    and sends responses back
Usage: lbmresp [-Ehsv] [-c filename] [-l len] [-r responses] [-f topic] topic
       -c filename = Use LBM configuration file filename.
                     Multiple config files are allowed.
                     Example:  '-c file1.cfg -c file2.cfg'
       -E = end after end-of-stream
       -h = help
       -l len = use len bytes for the length of each response
       -r responses = send responses messages for each request
       -s = be silent about incoming messages
       -v = be verbose (-v -v = be even more verbose)
       -f = forward request to responders listening on given topic
```

1.7.26 Example lbmresping.c

Source code: lbmresping.c

```
Purpose: Application that tests the operation of lbm topic resolution by creating
    a source and reporting time required for it to resolve and join the
    source.
Usage: lbmresping [-h] [-c filename] [unicast_resolver_host]
       -c filename = Use LBM configuration file filename.
                     Multiple config files are allowed.
                     Example:  '-c file1.cfg -c file2.cfg'
       -h = help
```

1.7.27 Example lbmrespq.c

Source code: lbmrespq.c

```
Purpose: application that receives request messages on a single topic and
    and sends responses back, using an event queue.
Usage: lbmrespq [-hs] [-c filename] [-r msgs] topic
```

```
       -c filename = Use LBM configuration file filename.
                     Multiple config files are allowed.
                     Example:  '-c file1.cfg -c file2.cfg'
       -h = help
       -P msecs = pause msecs milliseconds before sending response
       -r msgs = delete receiver after msgs request messages
       -s = be silent about requests/sec rate
       -v = be verbose (-v -v = be even more verbose)
```

1.7.28 Example lbmspike.c

Source code: lbmspike.c

```
Purpose: application that generates & receives message spikes for
    performance testing.
Usage: lbmspike -R [-dhq] [-c filename] [-o ord] [-u bufsiz] [topic]
       -c filename = Use LBM configuration file filename.
                     Multiple config files are allowed.
                     Example:  '-c file1.cfg -c file2.cfg'
       -d = dump message time stamps to a file
       -h = help
       -o ord = set receiver ordered delivery to ord
       -q = processess received messages on an event queue
       -R = role is receiver (default role is source)
       -u bufsiz = UDP buffer size for LBT-RM

Alternate usage: lbmspike [-dhLn] [-B bghumms] [-c filename] [-l len] [-M msgs] [-r
    rate/pct] [-v recovms] [topic]
       -B bghumms = milliseconds between "background hum" messages
       -c filename = read config file filename
       -d = dump message time stamps to a file
       -h = help
       -l len = use len length messages
       -L = use TCP-LB
       -M msgs = stop after receiving msgs messages
       -n = use non-blocking writes
       -r [UM]DATA/RETR = Set transport type to LBT-R[UM], set data rate limit to
                          DATA bits per second, and set retransmit rate limit to
                          RETR bits per second.  For both limits, the optional
                          k, m, and g suffixes may be used.  For example,
                          '-r 1m/500k' is the same as '-r 1000000/500000'
       -v recovms = milliseconds after spike to allow for recovery
```

1.7.29 Example lbmsrc.c

Source code: lbmsrc.c

```
Purpose: application that sends to a single topic as fast possible.
Usage: lbmsrc [options] topic
Available options:
  -c, --config=FILE         Use LBM configuration file FILE.
                            Multiple config files are allowed.
                            Example:  '-c file1.cfg -c file2.cfg'
  -d, --delay=NUM           delay sending for NUM seconds after source creation
  -h, --help                display this help and exit
```

```
  -j, --late-join=NUM       enable Late Join with specified retention buffer size
      (in bytes)
  -l, --length=NUM          send messages of NUM bytes
  -L, --linger=NUM          linger for NUM seconds before closing context
  -M, --messages=NUM        send NUM messages
  -n, --non-block           use non-blocking I/O
  -N, --channel=NUM         send on channel NUM
  -P, --pause=NUM           pause NUM milliseconds after each send
  -R, --rate=[UM]DATA/RETR  Set transport type to LBT-R[UM], set data rate limit to
                            DATA bits per second, and set retransmit rate limit to
                            RETR bits per second.  For both limits, the optional
                            k, m, and g suffixes may be used.  For example,
                            '-R 1m/500k' is the same as '-R 1000000/500000'
  -s, --statistics=NUM      print statistics every NUM seconds
  -v, --verbose             be verbose about each message
  -V, --verifiable          construct verifiable messages

Monitoring options:
  --monitor-src=NUM              monitor source every NUM seconds
  --monitor-ctx=NUM              monitor context every NUM seconds
  --monitor-transport=TRANS      use monitor transport module TRANS
                                 TRANS may be 'lbm', 'lbmsnmp', or 'udp', default
                                     is 'lbm'
  --monitor-transport-opts=OPTS  use OPTS as transport module options
  --monitor-format=FMT           use monitor format module FMT
                                 FMT may be 'csv' or 'pb'
  --monitor-format-opts=OPTS     use OPTS as format module options
  --monitor-appid=ID             use ID as application ID string

Transport and format options are passed as name=value pairs, separated by a
    semicolon.
The entire option string should be enclosed in double-quotes.

LBM transport options:
Note that individual LBM options can be specified as <scope>|<option>=value, where
  <scope> is one of context, source, receiver, wildcard_receiver, or event_queue
  <option> is the LBM configuration option name
The vertical bar (pipe symbol) is required when specifying individual LBM options.
  config=FILE            use LBM configuration file FILE
  topic=TOPIC            send statistics on topic TOPIC
                         default is /29west/statistics
  allow_debug=VAL        VAL may be 'off' or 'on'
                         defaults to 'off'

LBMSNMP transport options:
Note that individual LBM options can be specified as <scope>|<option>=value, where
  <scope> is one of context, source, receiver, wildcard_receiver, or event_queue
  <option> is the LBM configuration option name
The vertical bar (pipe symbol) is required when specifying individual LBM options.
  config=FILE            use LBM configuration file FILE
  topic=TOPIC            send statistics on topic TOPIC
                         default is /29west/statistics

UDP transport options:
  address=IP             send statistics to address IP
  port=NUM               send to UDP port NUM
                         default is 2933
  mcgroup=GRP            send on multicast group GRP
  bcaddress=IP           send statistics to broadcast address IP
  ttl=NUM                send multicast statistics with TTL NUM
                         default is 16

CSV format options:
```

```
  separator=CHAR          separate CSV fields with character CHAR
                          defaults to ',’
                          Don’t use a semicolon!

PB format options:
  filters=FILE            use FILE that contains filter options
```

1.7.30 Example lbmssrc.c

Source code: lbmssrc.c

```
Purpose: application that uses Smart Source to send to a single topic.
Usage: lbmssrc [options] topic
Available options:
  -a, --available-data-space  print the length of available data space
  -b, --user-supplied-buffer  send messages using a user-supplied buffer
  -c, --config=FILE           Use LBM configuration file FILE.
                              Multiple config files are allowed.
                              Example:  ’-c file1.cfg -c file2.cfg’
  -d, --delay=NUM             delay sending for NUM seconds after source creation
  -h, --help                  display this help and exit
  -i, --int-mprop=VAL,KEY     send integer message property value VAL with name KEY
  -j, --late-join=NUM         enable Late Join with specified retention buffer count
  -l, --length=NUM            send messages of NUM bytes
  -L, --linger=NUM            linger for NUM seconds before closing context
  -M, --messages=NUM          send NUM messages
  -N, --channel=NUM           send on channel NUM
  -S, --perf-stats=NUM,OT     print performance stats every NUM messages sent
                              If optional OT is given, override the default 10 usec
                                  Outlier Threshold
  -P, --pause=NUM             pause NUM milliseconds after each send
  -s, --statistics=NUM        print statistics every NUM seconds
  -v, --verbose               be verbose; add per message data
  -V, --verifiable            construct verifiable messages

Monitoring options:
  --monitor-src=NUM               monitor source every NUM seconds
  --monitor-ctx=NUM               monitor context every NUM seconds
  --monitor-transport=TRANS       use monitor transport module TRANS
                                  TRANS may be ‘lbm’, ‘lbmsnmp’, or ‘udp’, default
                                      is ‘lbm’
  --monitor-transport-opts=OPTS   use OPTS as transport module options
  --monitor-format=FMT            use monitor format module FMT
                                  FMT may be ‘csv’ or ‘pb’
  --monitor-format-opts=OPTS      use OPTS as format module options
  --monitor-appid=ID              use ID as application ID string

Transport and format options are passed as name=value pairs, separated by a
    semicolon.
The entire option string should be enclosed in double-quotes.

LBM transport options:
Note that individual LBM options can be specified as <scope>|<option>=value, where
  <scope> is one of context, source, receiver, wildcard_receiver, or event_queue
  <option> is the LBM configuration option name
The vertical bar (pipe symbol) is required when specifying individual LBM options.
  config=FILE             use LBM configuration file FILE
  topic=TOPIC             send statistics on topic TOPIC
                          default is /29west/statistics
  allow_debug=VAL         VAL may be ‘off’ or ‘on’
```

```
                        defaults to 'off'

LBMSNMP transport options:
Note that individual LBM options can be specified as <scope>|<option>=value, where
  <scope> is one of context, source, receiver, wildcard_receiver, or event_queue
  <option> is the LBM configuration option name
The vertical bar (pipe symbol) is required when specifying individual LBM options.
  config=FILE           use LBM configuration file FILE
  topic=TOPIC           send statistics on topic TOPIC
                        default is /29west/statistics

UDP transport options:
  address=IP            send statistics to address IP
  port=NUM              send to UDP port NUM
                        default is 2933
  mcgroup=GRP           send on multicast group GRP
  bcaddress=IP          send statistics to broadcast address IP
  ttl=NUM               send multicast statistics with TTL NUM
                        default is 16

CSV format options:
  separator=CHAR        separate CSV fields with character CHAR
                        defaults to ','
                        Don't use a semicolon!

PB format options:
  filters=FILE          use FILE that contains filter options
```

1.7.31 Example lbmssrcreq.c

Source code: lbmssrcreq.c

```
Purpose: application that sends requests on a single topic and waits for
    responses.
Usage: lbmssrcreq [options] topic
Available options:
  -a, --available-data-space  print the length of available data space
  -b, --user-supplied-buffer  send messages using a user-supplied buffer
  -c filename = Use LBM configuration file filename.
                Multiple config files are allowed.
                Example:  '-c file1.cfg -c file2.cfg'
  -d sec = delay sending for delay seconds after source creation
  -h = help
  -l len = send messages of len bytes
  -L linger = linger for linger seconds before closing context
  -P sec = pause sec seconds after sending request for responses to arrive
  -r [UM]DATA/RETR = Set transport type to LBT-R[UM], set data rate limit to
                     DATA bits per second, and set retransmit rate limit to
                     RETR bits per second.  For both limits, the optional
                     k, m, and g suffixes may be used.  For example,
                     '-r 1m/500k' is the same as '-r 1000000/500000'
  -R requests = send requests number of requests
  -v = be verbose (-v -v = be even more verbose)
```

1.7.32 Example lbmstrm.c

Source code: lbmstrm.c

```
Purpose: application that sends messages to one or more topics at a
    specified rate.
Usage: lbmstrm [options]
  Topic names generated as a root, followed by a dot, followed by an integer.
  By default, the first topic created will be '29west.example.multi.0'
Available options:
  -c, --config=FILE         Use LBM configuration file FILE.
                            Multiple config files are allowed.
                            Example:  '-c file1.cfg -c file2.cfg'
  -h, --help                display this help and exit
  -H, --hf                  Use hot failover sources
  -i, --initial-topic=NUM   use NUM as initial topic number [0]
  -j, --late-join=NUM       enable Late Join with specified retention buffer size
      (in bytes)
  -l, --length=NUM          send messages of length NUM bytes [25]
  -L, --linger=NUM          linger for NUM seconds after done [10]
  -m, --message-rate=NUM    send at NUM messages per second [10000]
  -M, --messages=NUM        send maximum of NUM messages [10000000]
  -r, --root=STRING         use topic names with root of STRING
      [29west.example.multi]
  -R, --rate=[UM]DATA/RETR  Set transport type to LBT-R[UM], set data rate limit to
                            DATA bits per second, and set retransmit rate limit to
                            RETR bits per second.  For both limits, the optional
                            k, m, and g suffixes may be used.  For example,
                            '-R 1m/500k' is the same as '-R 1000000/500000'
  -s, --statistics=NUM      print stats every NUM seconds
  -S, --sources=NUM         use NUM sources [100]
  -t, --tight               tight loop (cpu-bound) for even message spacing
  -T, --threads=NUM         use NUM threads [1]
  -x, --bits=NUM            use NUM bits for hot failover sequence number size (32
      or 64)
```

1.7.33 Example lbmtrreq.c

Source code: lbmtrreq.c

```
Purpose: application that invokes the Topic Resolution Request API.
Usage: lbmtrreq [options]
Available options:
  -c, --config=FILE     Use LBM configuration file FILE.
                        Multiple config files are allowed.
                        Example:  '-c file1.cfg -c file2.cfg'
  -a, --adverts         Request Advertisements
  -q, --queries         Request Queries
  -w, --wildcard        Request Wildcard Queries
  -A, --ctx-ads         Request Context Advertisements
  -Q, --ctx-queries     Request Context Queries
  -I, --gw-interest     Request Gateway Interest
  -i, --interval=NUM    Interval between request
  -d, --duration=NUM    Minimum duration of requests
  -L, --linger=NUM      Linger for NUM seconds before closing context
```

1.7.34 Example lbmwrcv.c

Source code: lbmwrcv.c

```
Purpose: application that receives messages from a wildcard receiver.
Usage: lbmwrcv [options] pattern
Available options:
  -c, --config=FILE     Use LBM configuration file FILE.
                        Multiple config files are allowed.
                        Example:  '-c file1.cfg -c file2.cfg'
  -D, --deregister      Send Deregistration after receiving 1000 messages
  -E, --exit            exit after source ends
  -h, --help            display this help and exit
  -q                    Use event queue
  -r NUM                delete receiver after NUM messages
  -N, --channel=NUM     subscribe to channel NUM
  -s, --statistics      print statistics along with bandwidth
  -v, --verbose         be verbose about incoming messages (-v -v = be even more
     verbose)

Monitoring options:
  --monitor-ctx=NUM              monitor context every NUM seconds
  --monitor-transport=TRANS      use monitor transport module TRANS
                                 TRANS may be 'lbm', 'lbmsnmp', or 'udp', default
                                     is 'lbm'
  --monitor-transport-opts=OPTS  use OPTS as transport module options
  --monitor-format=FMT           use monitor format module FMT
                                 FMT may be 'csv' or 'pb'
  --monitor-format-opts=OPTS     use OPTS as format module options
  --monitor-appid=ID             use ID as application ID string

Transport and format options are passed as name=value pairs, separated by a
    semicolon.
The entire option string should be enclosed in double-quotes.

LBM transport options:
Note that individual LBM options can be specified as <scope>|<option>=value, where
  <scope> is one of context, source, receiver, wildcard_receiver, or event_queue
  <option> is the LBM configuration option name
The vertical bar (pipe symbol) is required when specifying individual LBM options.
  config=FILE            use LBM configuration file FILE
  topic=TOPIC            send statistics on topic TOPIC
                         default is /29west/statistics
  allow_debug=VAL        VAL may be 'off' or 'on'
                         defaults to 'off'

LBMSNMP transport options:
Note that individual LBM options can be specified as <scope>|<option>=value, where
  <scope> is one of context, source, receiver, wildcard_receiver, or event_queue
  <option> is the LBM configuration option name
The vertical bar (pipe symbol) is required when specifying individual LBM options.
  config=FILE            use LBM configuration file FILE
  topic=TOPIC            send statistics on topic TOPIC
                         default is /29west/statistics

UDP transport options:
  address=IP             send statistics to address IP
  port=NUM               send to UDP port NUM
                         default is 2933
  mcgroup=GRP            send on multicast group GRP
  bcaddress=IP           send statistics to broadcast address IP
  ttl=NUM                send multicast statistics with TTL NUM
                         default is 16
```

```
CSV format options:
  separator=CHAR          separate CSV fields with character CHAR
                          defaults to ‘,’
                          Don’t use a semicolon!

PB format options:
  filters=FILE            use FILE that contains filter options
```

1.7.35 Example lbmwrcvq.c

Source code: lbmwrcvq.c

```
Purpose: application that receives messages from a wildcard receiver, using an
    event queue.
Usage: lbmwrcvq [options] pattern
Available options:
  -c, --config=FILE     Use LBM configuration file FILE.
                        Multiple config files are allowed.
                        Example:  ’-c file1.cfg -c file2.cfg’
  -E, --exit            exit after source ends
  -h, --help            display this help and exit
  -r NUM                delete receiver after NUM messages
  -s, --statistics      print statistics along with bandwidth
  -v, --verbose         be verbose about incoming messages (-v -v = be even more
      verbose)

Monitoring options:
  --monitor-ctx=NUM               monitor context every NUM seconds
  --monitor-transport=TRANS       use monitor transport module TRANS
                                  TRANS may be ‘lbm’, ‘lbmsnmp’, or ‘udp’, default
                                      is ‘lbm’
  --monitor-transport-opts=OPTS   use OPTS as transport module options
  --monitor-format=FMT            use monitor format module FMT
                                  FMT may be ‘csv’ or ‘pb’
  --monitor-format-opts=OPTS      use OPTS as format module options
  --monitor-appid=ID              use ID as application ID string
  --monitor-evq=NUM               monitor event queue every NUM seconds

Transport and format options are passed as name=value pairs, separated by a
    semicolon.
The entire option string should be enclosed in double-quotes.

LBM transport options:
Note that individual LBM options can be specified as <scope>|<option>=value, where
  <scope> is one of context, source, receiver, wildcard_receiver, or event_queue
  <option> is the LBM configuration option name
The vertical bar (pipe symbol) is required when specifying individual LBM options.
  config=FILE             use LBM configuration file FILE
  topic=TOPIC             send statistics on topic TOPIC
                          default is /29west/statistics
  allow_debug=VAL         VAL may be ‘off’ or ‘on’
                          defaults to ‘off’

LBMSNMP transport options:
Note that individual LBM options can be specified as <scope>|<option>=value, where
  <scope> is one of context, source, receiver, wildcard_receiver, or event_queue
  <option> is the LBM configuration option name
The vertical bar (pipe symbol) is required when specifying individual LBM options.
  config=FILE             use LBM configuration file FILE
  topic=TOPIC             send statistics on topic TOPIC
```

```
                        default is /29west/statistics

UDP transport options:
  address=IP            send statistics to address IP
  port=NUM              send to UDP port NUM
                        default is 2933
  mcgroup=GRP           send on multicast group GRP
  bcaddress=IP          send statistics to broadcast address IP
  ttl=NUM               send multicast statistics with TTL NUM
                        default is 16

CSV format options:
  separator=CHAR        separate CSV fields with character CHAR
                        defaults to ',’
                        Don’t use a semicolon!

PB format options:
  filters=FILE          use FILE that contains filter options
```

1.7.36 Example minrcv.c

Source code: minrcv.c

```
minrcv.c: minimal application that receives messages from a given topic.
```

1.7.37 Example minrcv.cpp

Source code: minrcv.cpp

```
 minimal C++ application that receives messages from a given topic.
```

1.7.38 Example minsrc.c

Source code: minsrc.c

```
minsrc.c: minimal application that sends to a given topic.
```

1.7.39 Example srs_cmd.c

Source code: srs_cmd.c

```
Purpose: send unicast immediate command messages to an SRS daemon.
Usage: srs_cmd [options] [command_string]
Available options:
  -c filename = Use LBM configuration file filename.
                Multiple config files are allowed.
                Example:  '-c file1.cfg -c file2.cfg'
```

```
  -h = help
  -L linger = linger for linger seconds before closing context
  -T target = target for unicast immediate messages (required)
*********************************************************************************
*        help (print this message): h                                           *
*          quit (exit application): q                                           *
*               report SRS version: version                                     *
* set category publishing interval: srs_stats 0 | 200-N                         *
*                                   um_client_stats 0 | 200-N                   *
*                                   connection_events 0 | 200-N                 *
*                                   srs_error_stats 0 | 200-N                   *
*                                   um_client_error_stats 0 | 200-N             *
*                                   config_opts 0 | 200-N                       *
*                                   internal_config_opts 0 | 200-N              *
*     set all publishing intervals: interval 0 | 200-N                          *
*                 snapshot category: snap srs_stats | um_client_stats |         *
*                                   connection_events | srs_error_stats |      *
*                                   um_client_error_stats | config_opts |      *
*                                   internal_config_opts                        *
*          snapshot all categories: snap                                        *
*********************************************************************************
```

1.7.40 Example srs_monitor_info_receiver.c

Source code: srs_monitor_info_receiver.c

```
Purpose: receive SRS monitor info messages on the specified topic.
Usage: srs_monitor_info_receiver [options] topic
Available options:
  -c, --config=FILE    Use LBM configuration file filename.
                       Multiple config files are allowed.
                       Example:  '-c file1.cfg -c file2.cfg'
  -E, --exit           exit upon EOS reception
  -h, --help           help
  -L, --linger         linger for linger seconds before closing context
```

1.7.41 Example srs_monitor_info_receiver_json.c

Source code: srs_monitor_info_receiver_json.c

```
Purpose: receive SRS monitor info messages on the specified topic.
Usage: srs_monitor_info_receiver [options] topic
Available options:
  -c, --config=FILE    Use LBM configuration file filename.
                       Multiple config files are allowed.
                       Example:  '-c file1.cfg -c file2.cfg'
  -E, --exit           exit upon EOS reception
  -h, --help           help
  -L, --linger         linger for linger seconds before closing context
```

1.7.42 Example tnwgdcmd.c

Source code: tnwgdcmd.c

```
Purpose: application sends unicast immediate command messages to a tnwgd publishing
    daemon.
Usage: tnwgdcmd -T target_string -c config_file [command_string]
Available options:
  -c filename = Use LBM configuration file filename.
                Multiple config files are allowed.
                Example:  '-c file1.cfg -c file2.cfg'
  -h = help
  -L linger = linger for linger seconds before closing context
  -T target = target for unicast immediate messages (mandatory)
********************************************************************************
* help (print this message): h                                                 *
*   quit (exit application): q                                                 *
*   set publishing interval: (0-N = interval in seconds)                       *
*                            ri 0-N       (routing info)                       *
*                            gcfg 0-N     (gateway config)                     *
*          ["portal name"]   pcfg 0-N     (portal config)                      *
*          ["portal name"]   pstat 0-N    (portal stats)                       *
*                            mallinfo 0-N (malloc info)                        *
*                                                                              *
*   snapshot all groups (and all portals) : snap                               *
*   snapshot single group: snap (ri|gcfg|pcfg|pstat|mallinfo)                  *
*   snapshot single portal: "portal name" snap pcfg|pstat                      *
*   Print the current version of the monitor: version                          *
********************************************************************************
```

1.7.43 Example tnwgdmon.c

Source code: tnwgdmon.c

```
Purpose: application that receives DRO daemon messages on the specified publishing
    topic.
Usage: tnwgdmon [-Ehv] [-c filename] publishing_topic
Available options:
  -c, --config=FILE    Use LBM configuration file FILE.
                       Multiple config files are allowed.
                       Example:  '-c file1.cfg -c file2.cfg'
  -E, --exit           exit when source stops sending
  -h, --help           display this help and exit
  -v, --verbose        be verbose about incoming messages (-v -v = be even more
      verbose)
```

1.7.44 Example ume-example-rcv-2.c

Source code: ume-example-rcv-2.c

```
ume-example-rcv-2.c: - Persistent example receiver program.
See Persistence Guide document.
```

1.7.45 Example ume-example-rcv-3.c

Source code: ume-example-rcv-3.c

```
ume-example-rcv-3.c: - Persistent example receiver program.
See Persistence Guide document.
```

1.7.46 Example ume-example-rcv.c

Source code: ume-example-rcv.c

```
ume-example-rcv.c: - Persistent example receiver program.
See Persistence Guide document.
```

1.7.47 Example ume-example-src-2.c

Source code: ume-example-src-2.c

```
ume-example-src-2.c: - Persistent example source program.
See Persistence Guide document.
```

1.7.48 Example ume-example-src-3.c

Source code: ume-example-src-3.c

```
ume-example-src-3.c: - Persistent example source program.
See Persistence Guide document.
```

1.7.49 Example ume-example-src.c

Source code: ume-example-src.c

```
ume-example-src.c: - Persistent example receiver program.
See Persistence Guide document.
```

1.7.50 Example umedcmd.c

Source code: umedcmd.c See **umedcmd Man Page** for usage information.

1.7.51 Example umedmon.c

Source code: umedmon.c

```
Purpose: application that receives umestore daemon messages on the specified
    publishing topic.
Usage: umedmon [-Ehv] [-c filename] publishing_topic
Available options:
  -c, --config=FILE    Use LBM configuration file FILE.
                       Multiple config files are allowed.
                       Example:  '-c file1.cfg -c file2.cfg'
  -E, --exit           exit when source stops sending
  -h, --help           display this help and exit
  -v, --verbose        be verbose about incoming messages (-v -v = be even more
      verbose)
```

1.7.52 Example umercv.c

Source code: umercv.c

```
Purpose: application that receives persisted messages from a given topic.
Usage: umercv [options] topic
Available options:
  -A, --ascii                 display messages as ASCII text (-A -A for newlines
      after each msg)
  -c, --config=FILE           Use LBM configuration file FILE.
                              Multiple config files are allowed.
                              Example:  '-c file1.cfg -c file2.cfg'
  -D, --deregister=NUM        Deregister the receiver after receiving NUM messages
  -E, --exit                  exit after source ends
  -e, --explicit-ack=N        send an Explicit ACK every N messages
  -h, --help                  display this help and exit
  --max-sources=num           allow num sources (for statistics gathering purposes)
  -i, --regid-offset=offset   use offset to calculate Registration ID
                              (as source registration ID + offset)
                              offset of 0 forces creation of regid by store
  -N, --seqnum=X              display recovery sequence number info and set low
      seqnum to low+X
  -r, --msgs=NUM              delete receiver after NUM messages
      --session-id=NUM        Use NUM as a Session ID rather than using a
          Registration ID
                              (regid-offset will be ignored)
  -s, --statistics=NUM        print statistics every NUM seconds, along with
      bandwidth
  -S, --stop                  exit after source ends, print throughput summary
  -u, --uregid=num            set User settable Registration ID to num for context
  -v, --verbose               be verbose about incoming messages
                              (-v -v = be even more verbose)
  -V, --verify                verify message contents
  -x, --no-exit-on-reg-error  don't exit on registration error (default is to exit)
```

1.7.53 Example umesnaprepo.c

Source code: umesnaprepo.c See **umesnaprepo Man Page** for usage information.

1.7.54 Example umesrc.c

Source code: umesrc.c

```
Purpose: application that sends persisted messages to a given topic at a
    specified rate.
Usage: umesrc [options] topic
Available options:
  -c, --config=FILE         Use LBM configuration file FILE.
                            Multiple config files are allowed.
                            Example:  '-c file1.cfg -c file2.cfg'
  -d, --delay=NUM           delay sending for NUM seconds after source creation
  -D, --deregister           deregister the source after sending messages
  -h, --help                display this help and exit
  -j, --late-join           turn on UME late join
  -f, --flight-size=NUM     allow NUM unstabilized messages in flight (determines
     message rate)
  -l, --length=NUM          send messages of NUM bytes
  -L, --linger=NUM          linger for NUM seconds before closing context
  -M, --messages=NUM        send NUM messages
  -m, --message-rate=NUM    send at NUM messages per second if allowed by the
     flight size setting
  -N, --seqnum-info         display sequence number information from source events
  -n, --non-block           use non-blocking I/O
  -P, --pause=NUM           pause NUM milliseconds after each send
  -R, --rate=[UM]DATA/RETR  Set transport type to LBT-R[UM], set data rate limit to
                            DATA bits per second, and set retransmit rate limit to
                            RETR bits per second.  For both limits, the optional
                            k, m, and g suffixes may be used.  For example,
                            '-R 1m/500k' is the same as '-R 1000000/500000'
  -s, --statistics=NUM      print statistics every NUM seconds
  -S, --store=IP            use specified UME store
  -t, --storename=NAME      use specified UME store
  -v, --verbose             print additional info in verbose form
  -V, --verifiable          construct verifiable messages
```

1.7.55 Example umessrc.c

Source code: umessrc.c

```
Purpose: application that uses Smart Source sends to a given topic. Understands
    persistence.
Usage: umessrc [options] topic
Available options:
  -a, --available-data-space  print the length of available data space
  -b, --user-supplied-buffer  send messages using a user-supplied buffer
  -c, --config=FILE           Use LBM configuration file FILE.
                              Multiple config files are allowed.
                              Example:  '-c file1.cfg -c file2.cfg'
  -d, --delay=NUM             delay sending for NUM seconds after smart source
     creation
  -D, --deregister             deregister the smart source after sending messages
  -h, --help                  display this help and exit
  -i, --int-mprop=VAL,KEY     send integer message property value VAL with name KEY
  -j, --late-join             turn on UME late join
```

```
  -f, --flight-size=NUM       allow NUM unstabilized messages in flight (determines
     message rate)
  -l, --length=NUM            send messages of NUM bytes
  -L, --linger=NUM            linger for NUM seconds before closing context
  -M, --messages=NUM          send NUM messages
  -m, --message-rate=NUM      send at NUM messages per second if allowed by the
     flight size setting
  -N, --channel=NUM           send on channel NUM
  -n, --non-block             use non-blocking I/O
  -P, --pause=NUM             pause NUM milliseconds after each send
  -Q, --seqnum-info           display sequence number information from smart source
     events
  -s, --statistics=NUM        print statistics every NUM seconds
  -S, --store=IP              use specified UME store
  -t, --storename=NAME        use specified UME store
  -v, --verbose               print additional info in verbose form
  -V, --verifiable            construct verifiable messages

Monitoring options:
  --monitor-src=NUM              monitor source every NUM seconds
  --monitor-ctx=NUM              monitor context every NUM seconds
  --monitor-transport=TRANS      use monitor transport module TRANS
                                 TRANS may be 'lbm', 'lbmsnmp', or 'udp', default
                                     is 'lbm'
  --monitor-transport-opts=OPTS  use OPTS as transport module options
  --monitor-format=FMT           use monitor format module FMT
                                 FMT may be 'csv' or 'pb'
  --monitor-format-opts=OPTS     use OPTS as format module options
  --monitor-appid=ID             use ID as application ID string

Transport and format options are passed as name=value pairs, separated by a
    semicolon.
The entire option string should be enclosed in double-quotes.

LBM transport options:
Note that individual LBM options can be specified as <scope>|<option>=value, where
  <scope> is one of context, source, receiver, wildcard_receiver, or event_queue
  <option> is the LBM configuration option name
The vertical bar (pipe symbol) is required when specifying individual LBM options.
  config=FILE            use LBM configuration file FILE
  topic=TOPIC            send statistics on topic TOPIC
                         default is /29west/statistics
  allow_debug=VAL        VAL may be 'off' or 'on'
                         defaults to 'off'

LBMSNMP transport options:
Note that individual LBM options can be specified as <scope>|<option>=value, where
  <scope> is one of context, source, receiver, wildcard_receiver, or event_queue
  <option> is the LBM configuration option name
The vertical bar (pipe symbol) is required when specifying individual LBM options.
  config=FILE            use LBM configuration file FILE
  topic=TOPIC            send statistics on topic TOPIC
                         default is /29west/statistics

UDP transport options:
  address=IP             send statistics to address IP
  port=NUM               send to UDP port NUM
                         default is 2933
  mcgroup=GRP            send on multicast group GRP
  bcaddress=IP           send statistics to broadcast address IP
  ttl=NUM                send multicast statistics with TTL NUM
                         default is 16
```

```
CSV format options:
  separator=CHAR          separate CSV fields with character CHAR
                          defaults to ‘,’
                          Don’t use a semicolon!

PB format options:
  filters=FILE            use FILE that contains filter options
```

1.7.56 Example umestored_example.c

Source code: umestored_example.c

```
umestored_example.c: application that shows how to call the
  umestored_main API to start a UMP store daemon.
```

1.7.57 Example umqrcv.c

Source code: umqrcv.c

```
Purpose: application that receives brokered queuing messages from a single topic.
Usage: umqrcv [options] topic
Available options:
  -A, --ascii            display messages as ASCII text (-A -A for newlines after
     each msg)
  -B, --broker=address   use broker given by address
  -c, --config=FILE      use FILE as LBM configuration file
  -D, --dereg            deregister upon exit
  -d, --delay=NUM         delay receiver creation NUM seconds from context creation
  -E, --exit             exit after source ends
  -h, --help             display this help and exit
  -I, --type-id=ID       set Receiver Type ID to ID
  --max-sources=num      allow num sources (for statistics gathering purposes)
  -r, --msgs=NUM         delete receiver after NUM messages
  -s, --statistics=NUM   print statistics every NUM seconds, along with bandwidth
  -S, --stop             exit after source ends, print throughput summary
  -X, --index            reserve given index if possible, or leave blank to reserve
     random index
  -v, --verbose          be verbose about incoming messages
                         (-v -v = be even more verbose)
  -V, --verify           verify message contents

Monitoring options:
  --monitor-rcv=NUM               monitor receiver every NUM seconds
  --monitor-ctx=NUM               monitor context every NUM seconds
  --monitor-transport=TRANS       use monitor transport module TRANS
                                  TRANS may be ‘lbm’, ‘lbmsnmp’, or ‘udp’, default
                                     is ‘lbm’
  --monitor-transport-opts=OPTS   use OPTS as transport module options
  --monitor-format=FMT            use monitor format module FMT
                                  FMT may be ‘csv’ or ‘pb’
  --monitor-format-opts=OPTS      use OPTS as format module options
  --monitor-appid=ID              use ID as application ID string

Transport and format options are passed as name=value pairs, separated by a
    semicolon.
```

```
The entire option string should be enclosed in double-quotes.

LBM transport options:
Note that individual LBM options can be specified as <scope>|<option>=value, where
  <scope> is one of context, source, receiver, wildcard_receiver, or event_queue
  <option> is the LBM configuration option name
The vertical bar (pipe symbol) is required when specifying individual LBM options.
  config=FILE            use LBM configuration file FILE
  topic=TOPIC            send statistics on topic TOPIC
                         default is /29west/statistics
  allow_debug=VAL        VAL may be 'off' or 'on'
                         defaults to 'off'

LBMSNMP transport options:
Note that individual LBM options can be specified as <scope>|<option>=value, where
  <scope> is one of context, source, receiver, wildcard_receiver, or event_queue
  <option> is the LBM configuration option name
The vertical bar (pipe symbol) is required when specifying individual LBM options.
  config=FILE            use LBM configuration file FILE
  topic=TOPIC            send statistics on topic TOPIC
                         default is /29west/statistics

UDP transport options:
  address=IP             send statistics to address IP
  port=NUM               send to UDP port NUM
                         default is 2933
  mcgroup=GRP            send on multicast group GRP
  bcaddress=IP           send statistics to broadcast address IP
  ttl=NUM                send multicast statistics with TTL NUM
                         default is 16

CSV format options:
  separator=CHAR         separate CSV fields with character CHAR
                         defaults to ','
                         Don't use a semicolon!

PB format options:
  filters=FILE           use FILE that contains filter options
```

1.7.58 Example umqsrc.c

Source code: umqsrc.c

```
Purpose: umqsrc.c: application that sends brokered queuing messages to a single
    topic at a specified rate.
Usage: umqsrc [options] topic
Available options:
  -A, --appsets=CFG          use ULB Application Sets given by CFG
  -B, --broker=address       use broker given by address
  -c, --config=FILE          use LBM configuration file FILE
  -d, --delay=NUM            delay sending for NUM seconds after source creation
  -h, --help                 display this help and exit
  -f, --flight-size=NUM      allow NUM unstabilized messages in flight (determines
      message rate)
  -i, --ids                  display Message IDs for sent message
  -l, --length=NUM           send messages of NUM bytes
  -L, --linger=NUM           linger for NUM seconds before closing context
  -M, --messages=NUM         send NUM messages
  -m, --message-rate=NUM     send at NUM messages per second
  -N, --seq-num              display sequence number information
```

```
  -n, --non-block           use non-blocking I/O
  -P, --pause=NUM           pause NUM milliseconds after each send
  -R, --rate=[UM]DATA/RETR  Set transport type to LBT-R[UM], set data rate limit to
                            DATA bits per second, and set retransmit rate limit to
                            RETR bits per second.  For both limits, the optional
                            k, m, and g suffixes may be used.  For example,
                            '-R 1m/500k' is the same as '-R 1000000/500000'
  -s, --statistics=NUM      print statistics every NUM seconds
  -v, --verbose             print additional info in verbose form
  -V, --verifiable          construct verifiable messages
  -X, --index               Send messages on specified index for ULB sources
  -Y, --broker-index         Send messages on specified named index for broker
      sources
```

1.8 Example Protocol Files

Google protocol buffer definition files. See **Monitoring Formats**.

1.8.1 Example dro_mon.proto

Source code: dro_mon.proto

1.8.2 Example um_mon_attributes.proto

Source code: um_mon_attributes.proto

1.8.3 Example um_mon_control.proto

Source code: um_mon_control.proto

1.8.4 Example ump_mon.proto

Source code: ump_mon.proto

1.8.5 Example ums_mon.proto

Source code: ums_mon.proto