



Log System

Administrator Manual

Software Version 1.9.0



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Log System – Administrator Manual
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Content

Preface	5
Features	5
See Also	5
The Log System	7
Messages	7
Levels	7
Sources	8
Time Stamp	9
Message Text	9
Level Filter	10
Configuration	11
Basic Structure	13
The FileWriter List	17
The LogFilePath Value	17
The SourcePath Value	17
The LevelFilter Value	18
The MaximumSize Value	18
The Rotation Value	19
The LineFormat Value	19
The TruncateFile Value	21
The Filter List	23
The SourcePaths Value	23
The LevelFilter Value	24

Additional Values	25
The CreateConsoleWriter Value	25

Preface

The “*EducateIT Log System*” is embedded in the software you got from our company. The system allows the software to write log messages in an efficient and fast way. For you as the user of the system, it provides a powerful configuration to specify log files and a format. It also provides options to create a new log file after a given amount of time to limit the size.

The first version of this system has a limited number of features. Be aware that later versions of the system may contain more features and functions you are probably interested in. Make sure you read the manual of a later version of the shipped software if the version of this system changed.

Features

- Fast log mechanism for the software.
- Stable and efficient.
- Simple configuration to write log files.
- Different log levels and logger hierarchy to filter messages of no interest.
- Trace sections to enable additional logged information for rare used areas or for generated information which could slow down the system.
- Log file rotation based on time.

See Also

The log system uses the *Configuration B* system for the configuration. To understand all aspects of the configuration, it is recommended to read the document “*Configuration B - Administrator Manual*”. You should get this document along with this manual. If not, please request it from us.

The Log System

Writing log messages from system has many benefits:

- Events are recorded in chronological order.
- Network access for example is documented for later review.
- Problems and warnings are reported to the administrator of the system who can take action to solve the problem.
- Developers can trace problems to the source, checking the log entries of a problem case.

The *EducateIT Log System* was created with all of these uses in mind.

Messages

In case of an event a *log message* is sent to the log system. Each log message gets a *time stamp* with the current time and date. It contains the *message text* itself and a *log level*.

These messages are collected and can be sent to various *log writers* in the system. See [Illustration 1 on page 7](#) for the different parts of a log message.

Levels

Each message is sent with a given *log level*. This level is an indicator of the importance of a message. [Illustration 2 on page 8](#) shows the log levels and their importance.

Usually messages with “information” character are the ones you always like to have in a log file. They contain for example the start and end times of important components or of the application itself, or they contain incoming connections.

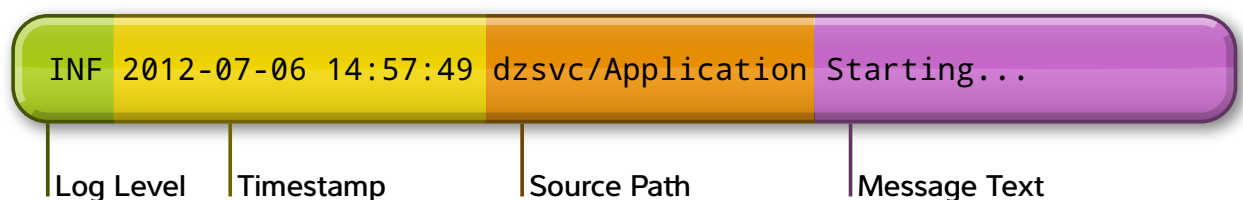


Illustration 1 The different parts of a log message.

Messages with “errors” are very important messages as well. But probably you like to keep the main log file free from error messages and write them into a second log file.

“Warnings” are not as important as “errors”. You probably can even ignore those, they should not be a serious problem for a running system, but are strong indicators for problems with the configuration or the system.

And the least important log level is the “trace” level, which is practically only used by the developer to find problems in the software. You should filter them for productive systems.

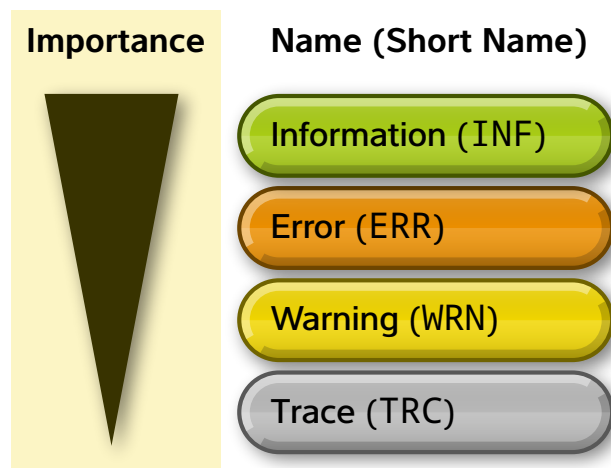


Illustration 2 The log levels and their importance.

The “importance” of these levels is used if you apply *filters* to *log sources* or *log writers*. They are explained in a later section in this manual.

Sources

An application usually consists of many components which can contain nested smaller components and so on. But log messages are generated at many different places. To organize the messages generated at all this places, each message has a *source path*. This source path is a logical grouping of all log messages done by the developer.

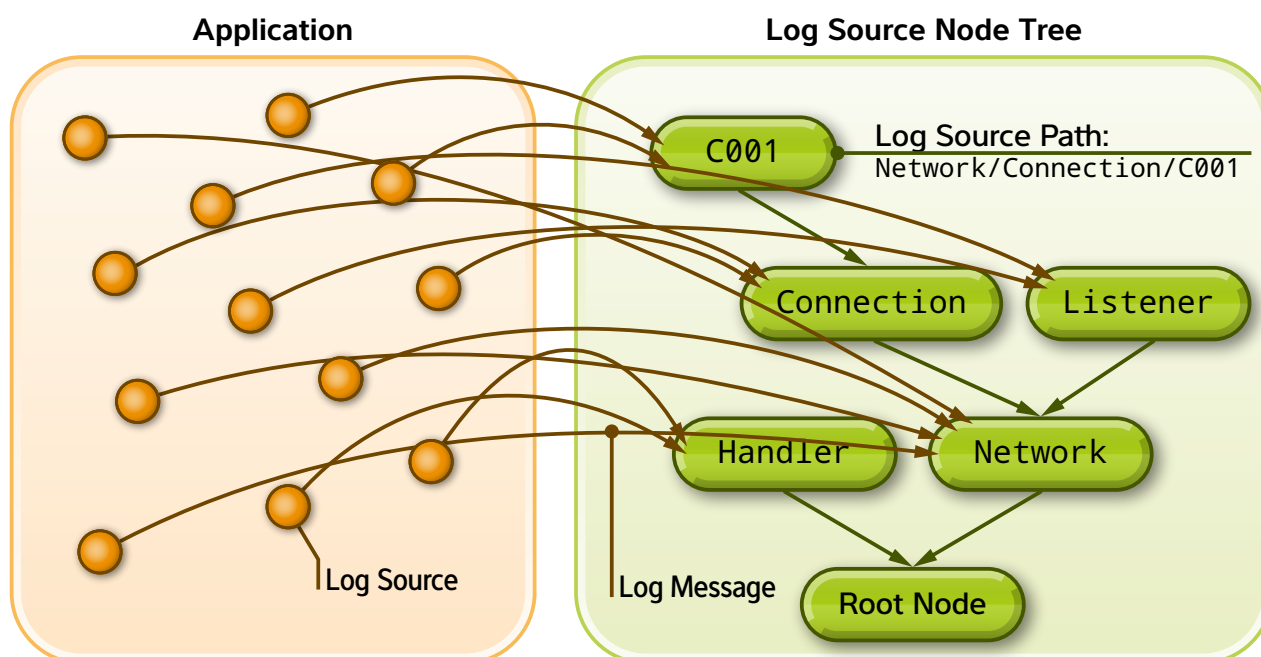


Illustration 3 Log message sources and the source node tree.

Each element of a such source path is building a node in the log system wide “source node tree”. This tree has a root node which is the base for each source path. Nodes at the same level with the same name are merged together. By processing all source paths in the application, a tree of nodes is created – all based on a single root node.

Have a look at [Illustration 3 on page 8](#). It shows the application with all different log sources on the left side. Each of these sources is bound to a node in the log source node tree on the right side. There is one root node for the whole log system. The root node is always represented by an empty source path.

To build the source path, the names are read from the root node up to the node where the log source is attached to. A slash character separates the names. The source path of the top most node is shown in the illustration.

Time Stamp

The time stamp is a snapshot of the current date and time when the log message was created. While processing and writing of a log message can take some time, the time stamp always represents the time of creation.

This can lead to confusing situations on systems with a heavy load. Because this log system favours speed before accuracy while processing log messages, it is possible that the written log entries are not in the exact order of the time stamp. If this is a requirement for your project you have to post process the log files sorting the log messages by time.

Just to make things clear: I am referring here to disorder in the range of milliseconds, not seconds or even minutes. If you are only interested in the rough order of seconds or even minutes, this will never be a problem for you.

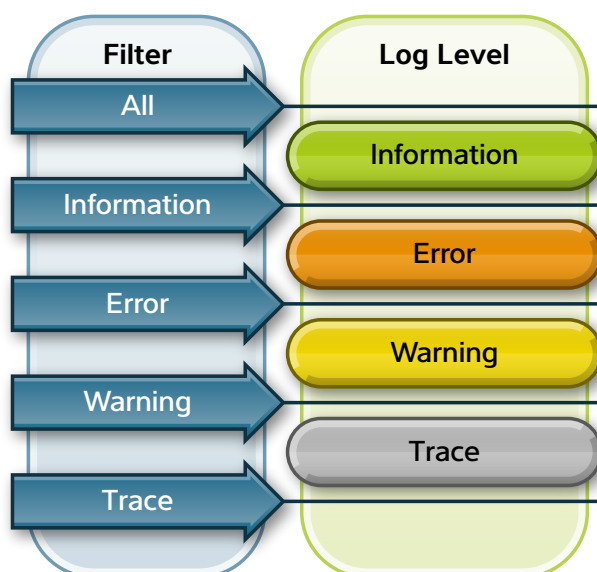


Illustration 4 The different filter level.

Message Text

The content of each message is just a line of text. This text has no fixed format, nor any restrictions.

Be aware that the whole log system is using Unicode text. The log message therefore can contain any Unicode character. This is the reason why log files of the system are encoded as *UTF-8* by default.

Level Filter

To filter messages based on the log level you have to use a log level filter. There are five different possible values for a level filter which are shown in [Illustration 4 on page 9](#). To keep the naming as similar as possible with the level itself, they express the sentence “Filter everything below ...”. They only exception is the filter “All”, which filters all log messages.

See [Illustration 5 on page 10](#) for four examples of how the filter value affects the different log level. The transparent log levels are filtered out.

The default filter in the configuration is always “Trace” which allows all log messages passing through.

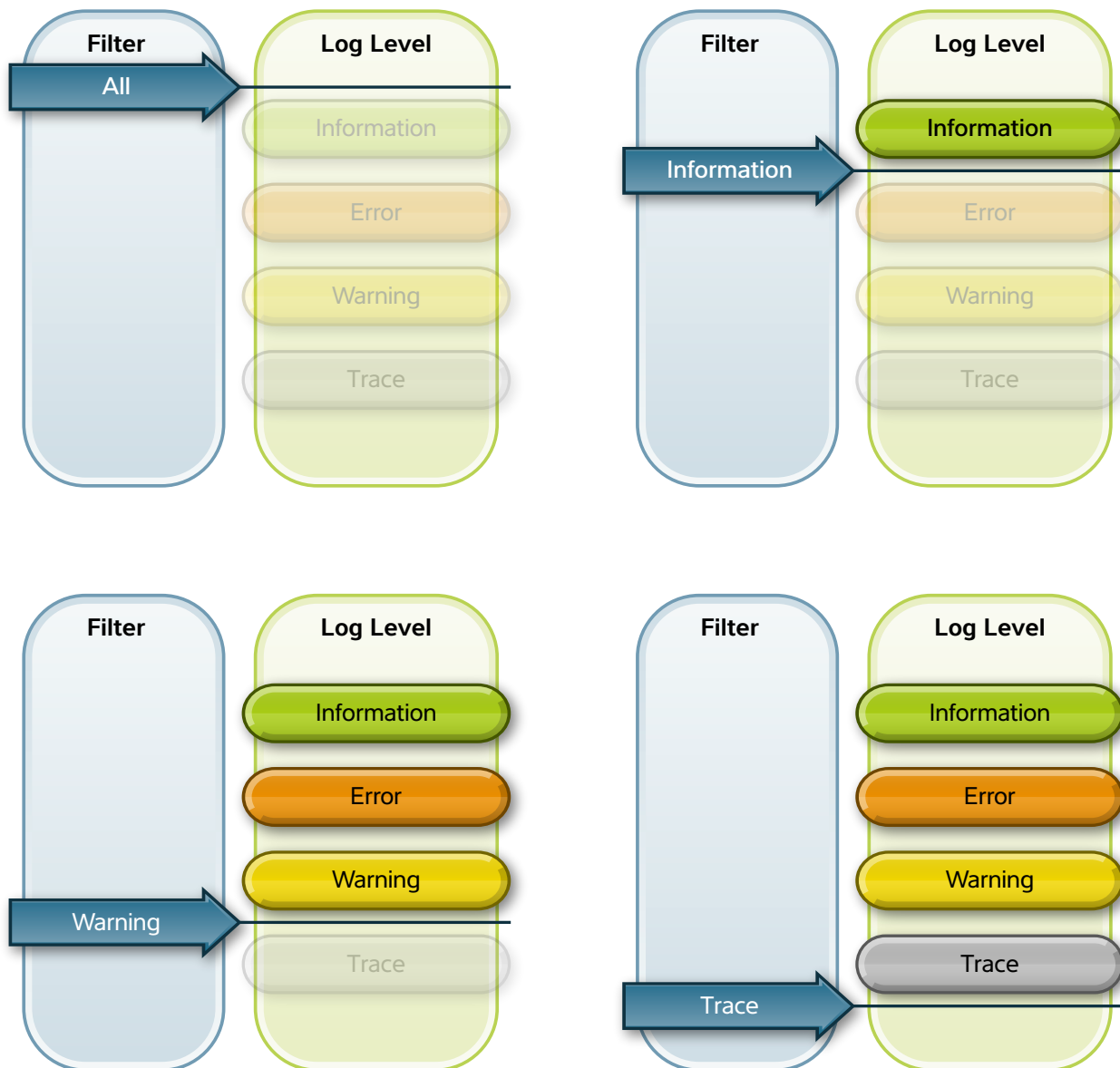


Illustration 5 Four examples how the filter value affects the log messages.

Chapter 1: Configuration

Basic Structure

Each software which uses the *Log System* along with the *Configuration B* system is supporting the “Log” module in the configuration file. This module is optional. If there is no such module defined in the configuration, logging is disabled for the given software.

Listing 2 on page 15 shows the structure of the log module in an application configuration and Illustration 6 on page 14 shows the visualization of the configuration module. Most of the values are optional and have well defined defaults. For this reason, the log configuration is in the most cases very simple.

See Listing 1 on page 13 for a minimal example. This example writes all log messages into the specified file.

Listing 3 on page 15 shows a realistic configuration of the log system. It defines a log file which is rotated daily. It also limits the log up to warning messages.

The lists and values of the shown structure are explained in detail in the following sections.

```
<Module name="Log">
  <List name="FileWriter">
    <ListEntry>
      <Value name="LogFilePath">C:\LogFiles\project.log</Value>
    </ListEntry>
  </List>
</Module>
```

Listing 1 Simple configuration with one file writer.

Module	Log
Value	CreateConsoleWriter Optional Boolean
Default	Yes
List	EnabledTraceSections Optional
Definition	Value List Definition
Constraints	Has to match the following case insensitive regular expression: \w+
List	FileWriter Optional
Definition	List Entry Definition
Value	LevelFilter Optional String
Constraints	Has to be one of the following values: All, Information, Error, Warning, Trace
Default	Trace
Value	LineFormat Optional String
Value	LogFilePath String
Value	MaximumSize Optional Integer
Default	-1
Value	Rotation Optional String
Constraints	Has to be one of the following values: NoRotation, Hourly, Daily, Weekly, Monthly
Default	NoRotation
Value	SourcePath Optional String
Value	TimeZone Optional String
Value	TruncateFile Optional Boolean
Default	No
List	Filter Optional
Definition	List Entry Definition
Value	LevelFilter String
Constraints	Has to be one of the following values: All, Information, Error, Warning, Trace

Illustration 6 The Log module configuration.

```

<Module name="Log">
  <List name="FileWriter">
    <ListEntry>
      <Value name="LogFilePath">C:\LogFiles\project.log</Value>
      <Value name="LevelFilter">Warning</Value>
      <Value name="Rotation">Daily</Value>
    </ListEntry>
  </List>
</Module>

```

Listing 3 Realistic configuration of the log module.

```

<?xml version="1.0" encoding="UTF-8" ?>
<Configuration
  version="1"
  xmlns="http://educateit.ch/software/BlueStone/Configuration/1"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">

  <Module name="Application">
    ... application configuration ...
  </Module>

  ... additional modules ...

  <Module name="Log">

    <List name="FileWriter">
      <ListEntry>
        <Value name="LogFilePath">...</Value>
        <Value name="SourcePath">...</Value>
        <Value name="LevelFilter">...</Value>
        <Value name="MaximumSize">...</Value>
        <Value name="Rotation">...</Value>
        <Value name="LineFormat">...</Value>
        <Value name="TruncateFile">...</Value>
        <Value name="TimeZone">...</Value>
      </ListEntry>
      ...
    </List>

    <List name="Filter">
      <ListEntry>
        <Value name="SourcePaths">...</Value>
        <Value name="LevelFilter">...</Value>
      </ListEntry>
      ...
    </List>

    <Value name="CreateConsoleWriter">...</Value>

  </Module>

</Configuration>

```

Listing 2 Structure of the log module in a configuration file.

The FileWriter List

This is an optional list which defines one or more log files to write. Each entry requires an absolute path to the log file which is specified in the `LogFilePath` value. All other values are optional and have well defined defaults.

The LogFilePath Value

This is the only required value for a log file writer entry. It has to be an absolute path to the log file. All directories to the file have to exist. You should also specify a suffix for the file, like “.log” or “.txt”.

For Windows, it is not necessary to use the back-slash as path separator. You can use the slash like on all other operating systems.

The following listing shows an example how the log file path can be defined:

```
<ListEntry>
  <Value name="LogFilePath">e:/Test/application.log</Value>
</ListEntry>
```

This example is also a valid entry to write a log file. All other values are optional and can be omitted.

The SourcePath Value

Inside of each software are a number of log sources. If you specify a source path to a source node with this value, this log file writer is limited to log output from the given source node and sub nodes.

The default is an empty value, which addresses the root source node and therefore logs the messages from the whole system.

In the example below, only messages from the component manager are logged:

```
<ListEntry>
  <Value name="LogFilePath">e:/Test/application.log</Value>
  <Value name="SourcePath">dzcore/ComponentManager</Value>
</ListEntry>
```

If there were source nodes below the component manager, for example in the path “dzcore/ComponentManager/example” these messages were written as well.

The source path must not start or end in a slash character, and must not contain whitespace.

The LevelFilter Value

With this value you can set a filter for the log writer. The different filter values are explained in “[Level Filter](#)” on page 10. This filter affects only the messages written to the file defined in this entry. You also can not undo the effect of a filter you already have put on a log source node.

The following example writes only “Information” and “Error” messages into the log file:

```
<ListEntry>
  <Value name="LogFilePath">e:/Test/application.log</Value>
  <Value name="LevelFilter">Error</Value>
</ListEntry>
```

The MaximumSize Value

This optional value sets an maximum size of the log file. If you set a maximum size, the log file is rotated when it exceeds the given size. The given size is in bytes, but can add the suffix “kb”, “mb” or “gb” to specify kilobytes, megabytes or gigabytes.

The special value -1 disables the rotation based on size. This is the default if you omit this value.

In the following example, the log file is rotated when it exceeds 120 megabytes:

```
<ListEntry>
  <Value name="LogFilePath">e:/Test/application.log</Value>
  <Value name="MaximumSize">120mb</Value>
</ListEntry>
```

If this option is enabled by setting a limit, the log system adds a suffix to the file name. The example above would generate names as shown in the next block:

```
application-00001.log
application-00002.log
application-00003.log
...
```

Rotation	Pattern	Example for file “application.log”
Hourly	_yyyyMMdd_hh	application_20120501_10.log
Daily	_yyyyMMdd	application_20120501.log
Weekly	_yyyy_ww	application_2012_17.log
Monthly	_yyyymm	application_201205.log

Table 1 The suffixes added to the log file name, depending on the “Rotation” value.

The Rotation Value

This optional value enables time based rotation of the log file. You can choose “Hourly”, “Daily”, “Weekly” and “Monthly”. The special value “NoRotation” disables the time based rotation. This is the default if you omit this value.

If rotation is enabled for a log file, the system adds a suffix to the end of the file name. [Table 1 on page 18](#) is showing the pattern of the suffix and an example how the name of a log file could look like using this pattern.

Be aware that rotating a log file is not done at the exact millisecond when the time or date changes. It is always possible that there is one or more message left in the old log file which would belong to the rotated file. This behaviour exists, because the log system favours speed before accuracy.

The LineFormat Value

This optional value defines the format of the line which is written to a log file. The format is a string which can contain any characters and special placeholders which are replaced by the different attributes of a log message.

The following example shows the default format for a log line, expressed as a line format text:

```
{level} {datetime} {source} {message}
```

Using this format, a written log line can look like this:

```
INF 2012-07-06 14:57:49 dzsvc/Application Starting App...
```

Everything outside the placeholder is copied without modification into the resulting line. In our example above, these are just the spaces between the placeholder.

The Format of a Placeholder

Each placeholder is enclosed into curly brackets. It starts with the placeholder identifier. For example “level” or “datetime”. Some placeholder are supporting additional parameter, they are separated with the pipe character (“|”). Each parameter starts with the parameter name, followed by an equal sign, which is followed by the parameter value.

The next example shows the basic format of a parameter:

```
{name} ← Simple  
{name|paramName=value} ← One Parameter  
{name|p1=value|p2=value|p3=value} ← Multiple Parameter
```

The level Placeholder

This placeholder is replaced by the level of the log message. It is supporting two parameter to control the output format for the level. The parameter “case” changes the use of upper and lower case letters and the parameter “format”, which changes the way that the level is written to the log.

Table 2 on page 20 shows combinations of the two parameters, and how the “Information” and “Warning” level is rendered. The line in orange with the bold text is the default for these parameters if you omit them.

```
{level}  
{level|case=Upper|format=Short1}
```

The datetime Placeholder

Use this placeholder to add the time and date to the log file. It has one parameter “format” where you can define the format of the date and time.

The date and time format is defined by using one or more letter combinations explained in Table 3 on page 21. All other characters are just treated as text. Any sequence of characters enclosed in single quotes are treated as text.

```
{datetime}  
{datetime|format=yyyyMMdd hhmmss}
```

The source Placeholder

This placeholder inserts the source path of the message. There are no parameters for this placeholder.

Mixed	Full	Information	Warning
Upper		INFORMATION	WARNING
Lower		information	warning
Mixed	Short1	I	W
Upper		I	W
Lower		i	w
Mixed	Short3	INF	WRN
Upper		INF	WRN
Lower		inf	wrn

Table 2 Combinations of the two parameter of the level placeholder and the result.

The message Placeholder

Use the message placeholder to insert the log message itself into the log line. This placeholder has no parameter.

The TruncateFile Value

This value is usually just used for testing. If the value is set to Yes, each file is “truncated” (reset to zero length) before any writing begins. The default value is No and in a productive environment you should omit this value or set it to No.

d	The day as number without a leading zero (1 to 31).
dd	The day as number with a leading zero (01 to 31).
ddd	The abbreviated localized day name (for example ‘Mon’ to ‘Sun’).
dddd	The long localized day name (for example ‘Monday’ to ‘Sunday’).
M	The month as number without a leading zero (1-12).
MM	The month as number with a leading zero (01-12).
MMM	The abbreviated localized month name (for example ‘Jan’ to ‘Dec’).
MMMM	The long localized month name (for example ‘January’ to ‘December’).
yy	The year as two digit number (00-99).
yyyy	The year as four digit number.
h	The hour without a leading zero (0 to 23 or 1 to 12 if AM/PM display).
hh	The hour with a leading zero (00 to 23 or 01 to 12 if AM/PM display).
H	The hour without a leading zero (0 to 23, even with AM/PM display).
HH	The hour with a leading zero (00 to 23, even with AM/PM display).
m	The minute without a leading zero (0 to 59).
mm	The minute with a leading zero (00 to 59).
s	The second without a leading zero (0 to 59).
ss	The second with a leading zero (00 to 59).
z	The milliseconds without leading zeroes (0 to 999).
zzz	The milliseconds with leading zeroes (000 to 999).
AP or A	Interpret as an AM/PM time. AP must be either “AM” or “PM”.
ap or a	Interpret as an AM/PM time. ap must be either “am” or “pm”.

Table 3 A table with all valid date and time format expressions.

The TimeZone Value

The optional `TimeZone` value controls the time zone for any time values written into the log file. If you omit this value, the time-zone will always be *UTC*.

There is the special value `System`, which always uses the time-zone from the local system for the log file.

You find a list of supported time-zones in “[Supported Time Zones](#)” on page 26. This list may change in future releases of our software, it is always updated to the latest list provided by the *IANA*.

The Filter List

This optional list defines one or more filters on selected source paths. Each entry on the list has two required values. The “SourcePaths” value which defines a list of source paths to apply the filter to, and the “LevelFilter” value which filters messages based on the message level.

Illustration 7 on page 23 shows the log system with five different messages on the left, sent to different nodes in the system in the middle. All messages which reach the log writer end up in the log file.

In Illustration 8 on page 24 an “Error” level filter is applied on the “Network/Connection” source path. And in Illustration 9 on page 24 the level filter is set to “All”.

The SourcePaths Value

This value needs one or more source paths, separated with whitespace. The filter is applied to all this source paths.

```
<ListEntry>  
  <Value name="SourcePaths">Network/Connection</Value>  
  ...  
</ListEntry>
```

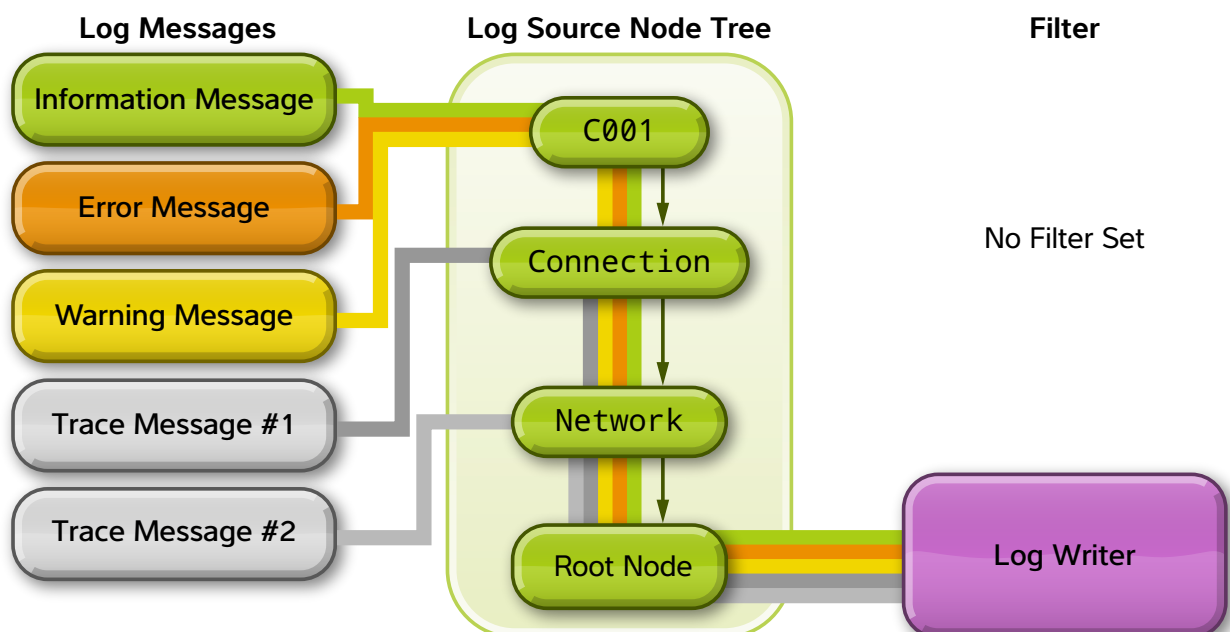


Illustration 7 Log system with five messages and without a filter.

The LevelFilter Value

This value sets which levels shall be filtered at the selected source nodes. The meaning of the filter value is explained in section “Level Filter” on page 10 in detail.

```
<ListEntry>  
  ...  
  <Value name="LevelFilter">Error</Value>  
</ListEntry>
```

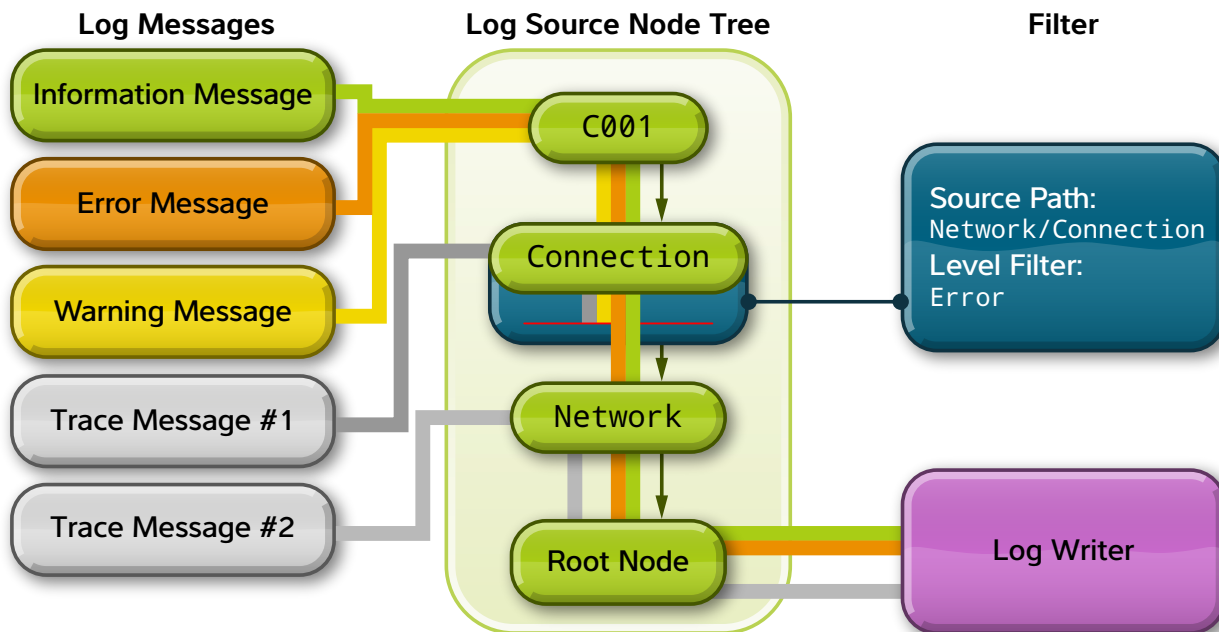


Illustration 9 Log system with five messages and with an “Error” filter on one node.

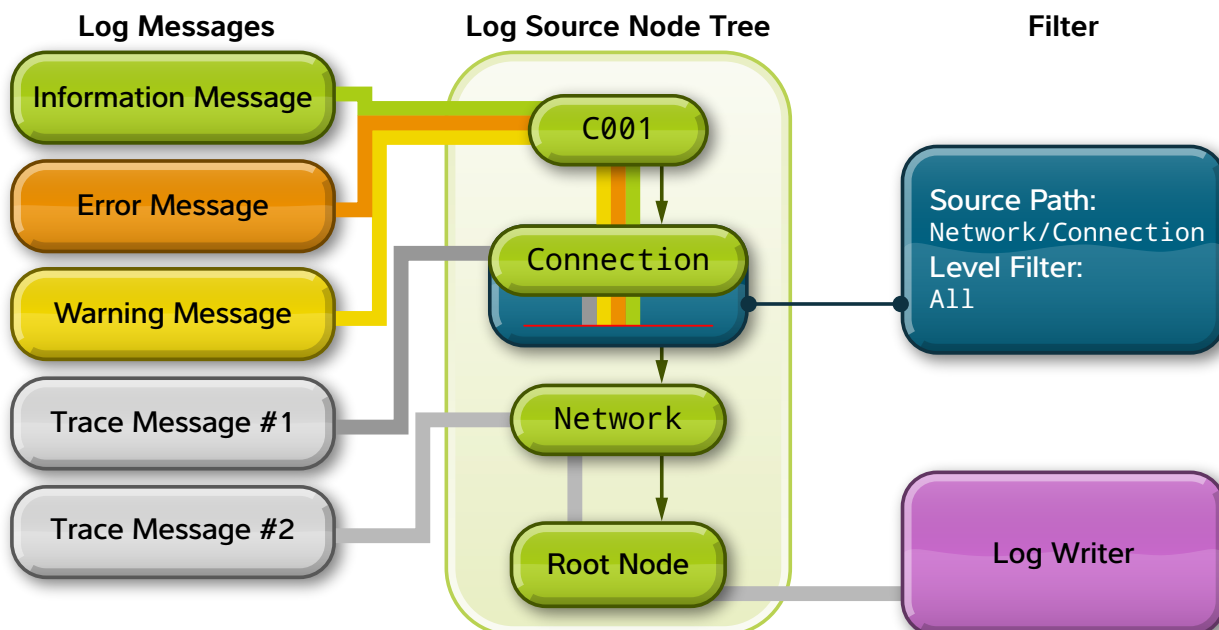


Illustration 8 Log system with five messages and with the level filter “All” on one node.

Additional Values

This section describes additional values of the configuration system. Currently there are the following values:

The CreateConsoleWriter Value

This value is only used for testing. It controls if a console writer should be created at the application start. You are advised to omit this value for productive environments.

The EnabledTraceSections List

You can enable trace sections with this optional list. Each entry in this list enables a given trace section. This feature is only used for testing. In a productive environment no trace sections shall be enabled.

```
<Module name="Log">
  <List name="FileWriter">
    <ListEntry>
      <Value name="LogFilePath">C:/application.log</Value>
    </ListEntry>
  </List>
  <List name="EnabledTraceSections">
    <Value>msgKeepAlive</Value>
  </List>
</Module>
```

Supported Time Zones

Africa/Abidjan	America/Argentina/Rio_Gallegos	America/Indiana/Petersburg	America/Santa_Isabel
Africa/Accra	America/Argentina/Salta	America/Indiana/Tell_City	America/Santarem
Africa/Addis_Ababa	America/Argentina/San_Juan	America/Indiana/Vevay	America/Santiago
Africa/Algiers	America/Argentina/San_Luis	America/Indiana/Vincennes	America/Santo_Domingo
Africa/Asmera	America/Argentina/Tucuman	America/Indiana/Winamac	America/Sao_Paulo
Africa/Bamako	America/Argentina/Ushuaia	America/Indianapolis	America/Scoresbysund
Africa/Bangui	America/Aruba	America/Inuvik	America/Sitka
Africa/Banjul	America/Asuncion	America/Iqaluit	America/St_Barthelemy
Africa/Bissau	America/Bahia	America/Jamaica	America/St_Johns
Africa/Blantyre	America/Bahia_Banderas	America/Jujoy	America/St_Kitts
Africa/Brazzaville	America/Barbados	America/Juneau	America/St_Lucia
Africa/Bujumbura	America/Belem	America/Kentucky/Monticello	America/St_Thomas
Africa/Cairo	America/Belize	America/Kralendijk	America/St_Vincent
Africa/Casablanca	America/Blanc-Sablon	America/La_Paz	America/Swift_Current
Africa/Ceuta	America/Boa_Vista	America/Lima	America/Tegucigalpa
Africa/Conakry	America/Bogota	America/Los_Angeles	America/Thule
Africa/Dakar	America/Boise	America/Louisville	America/Thunder_Bay
Africa/Dar_es_Salaam	America/Buenos_Aires	America/Lower_Princes	America/Tijuana
Africa/Djibouti	America/Cambridge_Bay	America/Maceio	America/Toronto
Africa/Douala	America/Campo_Grande	America/Managua	America/Tortola
Africa/El_Aaiun	America/Cancun	America/Manaus	America/Vancouver
Africa/Freetown	America/Caracas	America/Marigot	America/Whitehorse
Africa/Gaborone	America/Catamarca	America/Martinique	America/Winnipeg
Africa/Harare	America/Cayenne	America/Matamoros	America/Yakutat
Africa/Johannesburg	America/Cayman	America/Mazatlan	America/Yellowknife
Africa/Juba	America/Chicago	America/Mendoza	Antarctica/Casey
Africa/Kampala	America/Chihuahua	America/Menominee	Antarctica/Davis
Africa/Khartoum	America/Coral_Harbour	America/Merida	Antarctica/DumontDURville
Africa/Kigali	America/Cordoba	America/Mexico_City	Antarctica/Macquarie
Africa/Kinshasa	America/Costa_Rica	America/Moncton	Antarctica/Mawson
Africa/Lagos	America/Creston	America/Monterrey	Antarctica/McMurdo
Africa/Libreville	America/Cuiaba	America/Montevideo	Antarctica/Palmer
Africa/Lome	America/Curacao	America/Montreal	Antarctica/Rothera
Africa/Luanda	America/Danmarkshavn	America/Montserrat	Antarctica/Syowa
Africa/Lubumbashi	America/Dawson	America/Nassau	Antarctica/Vostok
Africa/Lusaka	America/Dawson_Creek	America/New_York	Arctic/Longyearbyen
Africa/Malabo	America/Denver	America/Nipigon	Asia/Aden
Africa/Maputo	America/Detroit	America/Nome	Asia/Almaty
Africa/Maseru	America/Dominica	America/Noronha	Asia/Amman
Africa/Mbabane	America/Edmonton	America/North_Dakota/Beulah	Asia/Anadyr
Africa/Mogadishu	America/Eirunepe	America/North_Dakota/Center	Asia/Aqtai
Africa/Monrovia	America/El_Salvador	America/North_Dakota/New_Salem	Asia/Aqtobe
Africa/Nairobi	America/Fortaleza	America/Ojinaga	Asia/Ashgabat
Africa/Ndjamena	America/Glace_Bay	America/Panama	Asia/Baghdad
Africa/Niamey	America/Godthab	America/Pangnirtung	Asia/Bahrain
Africa/Nouakchott	America/Goose_Bay	America/Paramaribo	Asia/Baku
Africa/Ouagadougou	America/Grand_Turk	America/Phoenix	Asia/Bangkok
Africa/Porto-Novo	America/Grenada	America/Port-au-Prince	Asia/Beirut
Africa/Sao_Tome	America/Guadeloupe	America/Port_of_Spain	Asia/Bishkek
Africa/Tripoli	America/Guatemala	America/Porto_Velho	Asia/Brunei
Africa/Tunis	America/Guayaquil	America/Puerto_Rico	Asia/Calcutta
Africa/Windhoek	America/Guyana	America/Rainy_River	Asia/Chita
America/Anchorage	America/Halifax	America/Rankin_Inlet	Asia/Choibalsan
America/Anguilla	America/Havana	America/Recife	Asia/Colombo
America/Antigua	America/Hermosillo	America/Regina	Asia/Damascus
America/Araguaina	America/Indiana/Knox	America/Resolute	Asia/Dhaka
America/Argentina/La_Rioja	America/Indiana/Marengo	America/Rio_Branco	Asia/Dili

Asia/Dubai	Australia/Broken_Hill	Europe/Paris	Pacific/Truk
Asia/Dushanbe	Australia/Currie	Europe/Podgorica	Pacific/Wake
Asia/Hong_Kong	Australia/Darwin	Europe/Prague	Pacific/Wallis
Asia/Hovd	Australia/Hobart	Europe/Riga	UTC
Asia/Irkutsk	Australia/Lindeman	Europe/Rome	UTC+00:00
Asia/Jakarta	Australia/Melbourne	Europe/Samara	UTC+01:00
Asia/Jayapura	Australia/Perth	Europe/San_Marino	UTC+02:00
Asia/Jerusalem	Australia/Sydney	Europe/Sarajevo	UTC+03:00
Asia/Kabul	CST6CDT	Europe/Simferopol	UTC+03:30
Asia/Kamchatka	EST5EDT	Europe/Skopje	UTC+04:00
Asia/Karachi	Etc/GMT	Europe/Sofia	UTC+04:30
Asia/Katmandu	Etc/GMT+1	Europe/Stockholm	UTC+05:00
Asia/Khandyga	Etc/GMT+10	Europe/Tallinn	UTC+05:30
Asia/Krasnoyarsk	Etc/GMT+11	Europe/Tirane	UTC+05:45
Asia/Kuala_Lumpur	Etc/GMT+12	Europe/Uzhgorod	UTC+06:00
Asia/Kuching	Etc/GMT+2	Europe/Vaduz	UTC+06:30
Asia/Kuwait	Etc/GMT+3	Europe/Vatican	UTC+07:00
Asia/Macau	Etc/GMT+4	Europe/Vienna	UTC+08:00
Asia/Magadan	Etc/GMT+5	Europe/Vilnius	UTC+09:00
Asia/Makassar	Etc/GMT+6	Europe/Volgograd	UTC+09:30
Asia/Manila	Etc/GMT+7	Europe/Warsaw	UTC+10:00
Asia/Muscat	Etc/GMT-1	Europe/Zagreb	UTC+11:00
Asia/Nicosia	Etc/GMT-10	Europe/Zapozhrye	UTC+12:00
Asia/Novokuznetsk	Etc/GMT-11	Europe/Zurich	UTC+13:00
Asia/Novosibirsk	Etc/GMT-12	Indian/Antananarivo	UTC+14:00
Asia/Omsk	Etc/GMT-13	Indian/Chagos	UTC-00:00
Asia/Oral	Etc/GMT-14	Indian/Christmas	UTC-01:00
Asia/Phnom_Penh	Etc/GMT-2	Indian/Cocos	UTC-02:00
Asia/Pontianak	Etc/GMT-3	Indian/Comoro	UTC-03:00
Asia/Pyongyang	Etc/GMT-4	Indian/Kerguelen	UTC-03:30
Asia/Qatar	Etc/GMT-5	Indian/Mahe	UTC-04:00
Asia/Qyzylorda	Etc/GMT-6	Indian/Maldives	UTC-04:30
Asia/Rangoon	Etc/GMT-7	Indian/Mauritius	UTC-05:00
Asia/Riyadh	Etc/GMT-8	Indian/Mayotte	UTC-06:00
Asia/Saigon	Etc/GMT-9	Indian/Reunion	UTC-07:00
Asia/Sakhalin	Europe/Amsterdam	MST7MDT	UTC-08:00
Asia/Samarkand	Europe/Andorra	PST8PDT	UTC-09:00
Asia/Seoul	Europe/Athens	Pacific/Apia	UTC-10:00
Asia/Shanghai	Europe/Belgrade	Pacific/Auckland	UTC-11:00
Asia/Singapore	Europe/Berlin	Pacific/Bougainville	UTC-12:00
Asia/Srednekolymsk	Europe/Bratislava	Pacific/Efate	UTC-13:00
Asia/Taipei	Europe/Brussels	Pacific/Enderbury	UTC-14:00
Asia/Tashkent	Europe/Bucharest	Pacific/Fakaofu	
Asia/Tbilisi	Europe/Budapest	Pacific/Fiji	
Asia/Tehran	Europe/Busingen	Pacific/Funafuti	
Asia/Thimphu	Europe/Chisinau	Pacific/Galapagos	
Asia/Tokyo	Europe/Copenhagen	Pacific/Guadalcanal	
Asia/Ulaanbaatar	Europe/Dublin	Pacific/Guam	
Asia/Urumqi	Europe/Gibraltar	Pacific/Honolulu	
Asia/Ust-Nera	Europe/Guernsey	Pacific/Johnston	
Asia/Vientiane	Europe/Helsinki	Pacific/Kiritimati	
Asia/Vladivostok	Europe/Isle_of_Man	Pacific/Kosrae	
Asia/Yakutsk	Europe/Istanbul	Pacific/Kwajalein	
Asia/Yekaterinburg	Europe/Jersey	Pacific/Majuro	
Asia/Yerevan	Europe/Kaliningrad	Pacific/Midway	
Atlantic/Azores	Europe/Kiev	Pacific/Nauru	
Atlantic/Bermuda	Europe/Lisbon	Pacific/Niue	
Atlantic/Canary	Europe/Ljubljana	Pacific/Noumea	
Atlantic/Cape_Verde	Europe/London	Pacific/Pago_Pago	
Atlantic/Faeroe	Europe/Luxembourg	Pacific/Palau	
Atlantic/Madeira	Europe/Madrid	Pacific/Ponape	
Atlantic/Reykjavik	Europe/Malta	Pacific/Port_Moresby	
Atlantic/South_Georgia	Europe/Mariehamn	Pacific/Rarotonga	
Atlantic/St_Helena	Europe/Minsk	Pacific/Saipan	
Atlantic/Stanley	Europe/Monaco	Pacific/Tahiti	
Australia/Adelaide	Europe/Moscow	Pacific/Tarawa	
Australia/Brisbane	Europe/Oslo	Pacific/Tongatapu	



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