

Exercises: SOLID

This document defines the exercises for ["Java OOP" course @ Software University](https://softuni.org).

Problem 1. Logger

Write a logging library for logging messages. The interface for the end-user should be as follows:

Sample Source Code
<pre>Layout simpleLayout = new SimpleLayout(); Appender consoleAppender = new ConsoleAppender(simpleLayout); Logger logger = new MessageLogger(consoleAppender); logger.logError("3/26/2015 2:08:11 PM", "Error parsing JSON."); logger.logInfo("3/26/2015 2:08:11 PM", "User Pesho successfully registered.");</pre>
Sample Output

Logger logs data and time (**String**) and a message (**String**).

Library Architecture

The library should have the following components:

- **Layouts** - define the format in which messages should be appended (e.g. **SimpleLayout** displays logs in the format "<date-time> - <report level> - <message>")
- **Appenders** - responsible for appending the messages somewhere (e.g. **Console**, **File**, etc.)
- **Loggers** - hold methods for various kinds of logging (**warnings**, **errors**, **info**, etc.)

Whenever a logger is told to **log** something, it calls all of its appenders and tells them to append the message. In turn, the appenders append the message (e.g. to the console or a file) according to the layout they have.

Requirements

Your library should correctly follow all **SOLID** principles:

- **Single Responsibility Principle** - no class or method should do more than one thing at once
- **Open-Closed Principle** - the library should be open for extension (i.e. its user should be able to create his own layouts/appenders/loggers)
- **Liskov Substitution Principle** - children classes should not break the behavior of their parent
- **Interface Segregation Principle** - the library should provide simple interfaces for the client to implement
- **Dependency Inversion** - no class/method should directly depend on concretions (only on abstractions)

Avoid code repetition. Name everything accordingly.

Implementations

The library should provide the following ready classes for the client:

- **SimpleLayout** - defines the format "<date-time> - <report level> - <message>"
- **ConsoleAppender** - appends a log to the console using the provided layout
- **FileAppender** - appends a log to a file (You need to implement a **CustomFile** class) using the provided layout
- **LogFile** - a custom file class which logs messages in a string builder using a method **write()**. It should have a **getter** for its **size** which is the **sum** of the ascii codes of all alphabet characters it contains (e.g. a-z and A-Z).
- **Logger** - a logger class which is used to log messages. Calls each of its appenders when something needs to be logged.

Sample Source Code

```
Layout simpleLayout = new SimpleLayout();
Appender consoleAppender = new ConsoleAppender(simpleLayout);

File file = new LogFile();
Appender fileAppender = new FileAppender(simpleLayout);
((FileAppender) fileAppender).setFile(file);

Logger logger = new MessageLogger(consoleAppender, fileAppender);

logger.logError("3/26/2015 2:08:11 PM", "Error parsing JSON.");
logger.logInfo("3/26/2015 2:08:11 PM", "User Pesho successfully registered.");
```

The above code should log the messages both on the **console** and in **LogFile** in the format **SimpleLayout** provides.

Extensibility

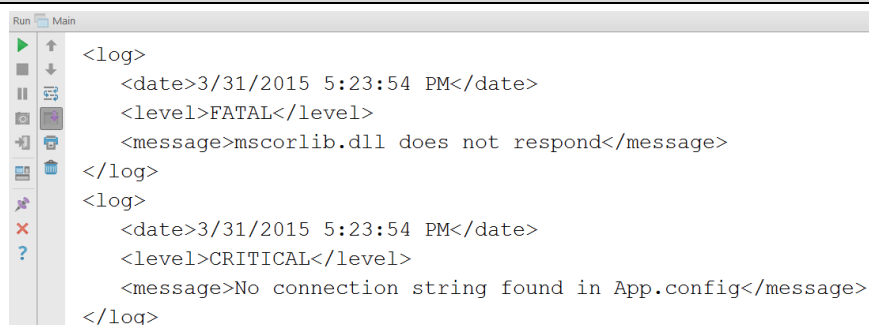
The end-user should be able to add his own **layouts/appenders/loggers** and use them. For example, he should be able to create his own **XmlLayout** and make the appenders use it, **without directly editing** the library source code.

Sample Source Code

```
Layout xmlLayout = new XmlLayout();
Appender consoleAppender = new ConsoleAppender(xmlLayout);
Logger logger = new MessageLogger(consoleAppender);

logger.logFatal("3/31/2015 5:23:54 PM", "mscorlib.dll does not respond");
logger.logCritical("3/31/2015 5:23:54 PM", "No connection string found in App.config");
```

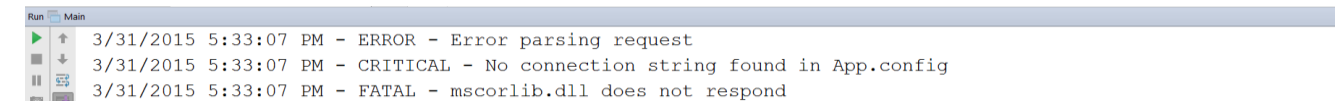
Console Output



```
<log>
  <date>3/31/2015 5:23:54 PM</date>
  <level>FATAL</level>
  <message>mscorlib.dll does not respond</message>
</log>
<log>
  <date>3/31/2015 5:23:54 PM</date>
  <level>CRITICAL</level>
  <message>No connection string found in App.config</message>
</log>
```

Report Threshold

Implement a **report level threshold** in all appenders. The appender should append only messages with report level **above or equal to** its report level threshold (by default all messages are appended). The report level is in the order **Info > Warning > Error > Critical > Fatal**.

Sample Source Code
<pre>Layout simpleLayout = new SimpleLayout(); Appender consoleAppender = new ConsoleAppender(simpleLayout); consoleAppender.setReportLevel(ReportLevel.ERROR); Logger logger = new MessageLogger(consoleAppender); logger.logInfo("3/31/2015 5:33:07 PM", "Everything seems fine"); logger.logWarning("3/31/2015 5:33:07 PM", "Warning: ping is too high - disconnect imminent"); logger.logError("3/31/2015 5:33:07 PM", "Error parsing request"); logger.logCritical("3/31/2015 5:33:07 PM", "No connection string found in App.config"); logger.logFatal("3/31/2015 5:33:07 PM", "mscorlib.dll does not respond");</pre>
Console Output


Only messages from error and above are appended.

File

A file should write all messages internally and it should keep information about its size.

Size of a file is calculated by summing ASCII codes of all alphabet characters (a-Z). For example, a file appender with simple layout and a single message **"3/31/2015 5:33:07 PM - ERROR - Error parsing request"** has size 2606 (including all characters in PM, ERROR, Error, parsing, request). In case of Xml layout, the file would have size 6632, because of the extra characters within the tags.

Controller

Implement a **Controller** which reads all appenders that a **Logger** will have and input messages from the console. Every message should be evaluated by all the appenders and logged if they meet the report level. Console appenders should write directly on the console. File appenders write (save) the messages but do not print them.

Input

On the first line you will get **N** - the number of appenders. On the next N lines, you will get information about the appenders in one of the formats below:

- "<appender type> <layout type> <REPORT LEVEL>"
- "<appender type> <layout type>"

If no report level is provided, the appender should be set to record all messages.

If there is no report level, value is **INFO**.

Next, until you get the **"END"** command you will receive messages containing report level, time and message separated by pipe "|":

- "<REPORT LEVEL>|<time>|<message>"

Output

Console appenders should print directly at the console in the layout they are provided:

- Simple layout example - "**3/31/2015 5:33:07 PM - ERROR - Error parsing request**"
- Xml layout example (date, level and message tags are indented by 1 tabulation):

```
<log>
  <date>3/31/2015 5:33:07 PM</date>
  <level>ERROR</level>
  <message>Error parsing request</message>
</log>
```

After the "END" command you should print **Logger** info which includes statistics about every appender (its type, layout, report level, messages appended and file size for file appenders):

"Logger info

Appender type: <appender type>, Layout type: <layout type>, Report level: <REPORT LEVEL>, Messages appended: <count>, File size: <size>"

Example

Input
2 ConsoleAppender SimpleLayout CRITICAL FileAppender XmlLayout INFO 3/26/2015 2:08:11 PM Everything seems fine WARNING 3/26/2015 2:22:13 PM Warning: ping is too high - disconnect imminent ERROR 3/26/2015 2:32:44 PM Error parsing request CRITICAL 3/26/2015 2:38:01 PM No connection string found in App.config FATAL 3/26/2015 2:39:19 PM mscorlib.dll does not respond END
Output
3/26/2015 2:38:01 PM - CRITICAL - No connection string found in App.config 3/26/2015 2:39:19 PM - FATAL - mscorlib.dll does not respond Logger info Appender type: ConsoleAppender, Layout type: SimpleLayout, Report level: CRITICAL, Messages appended: 2 Appender type: FileAppender, Layout type: XmlLayout, Report level: INFO, Messages appended: 5, File size: 37526