Standard logger

Introduction to Java Logging

Logs are records of a software application which we choose to save to a file or display in a console.

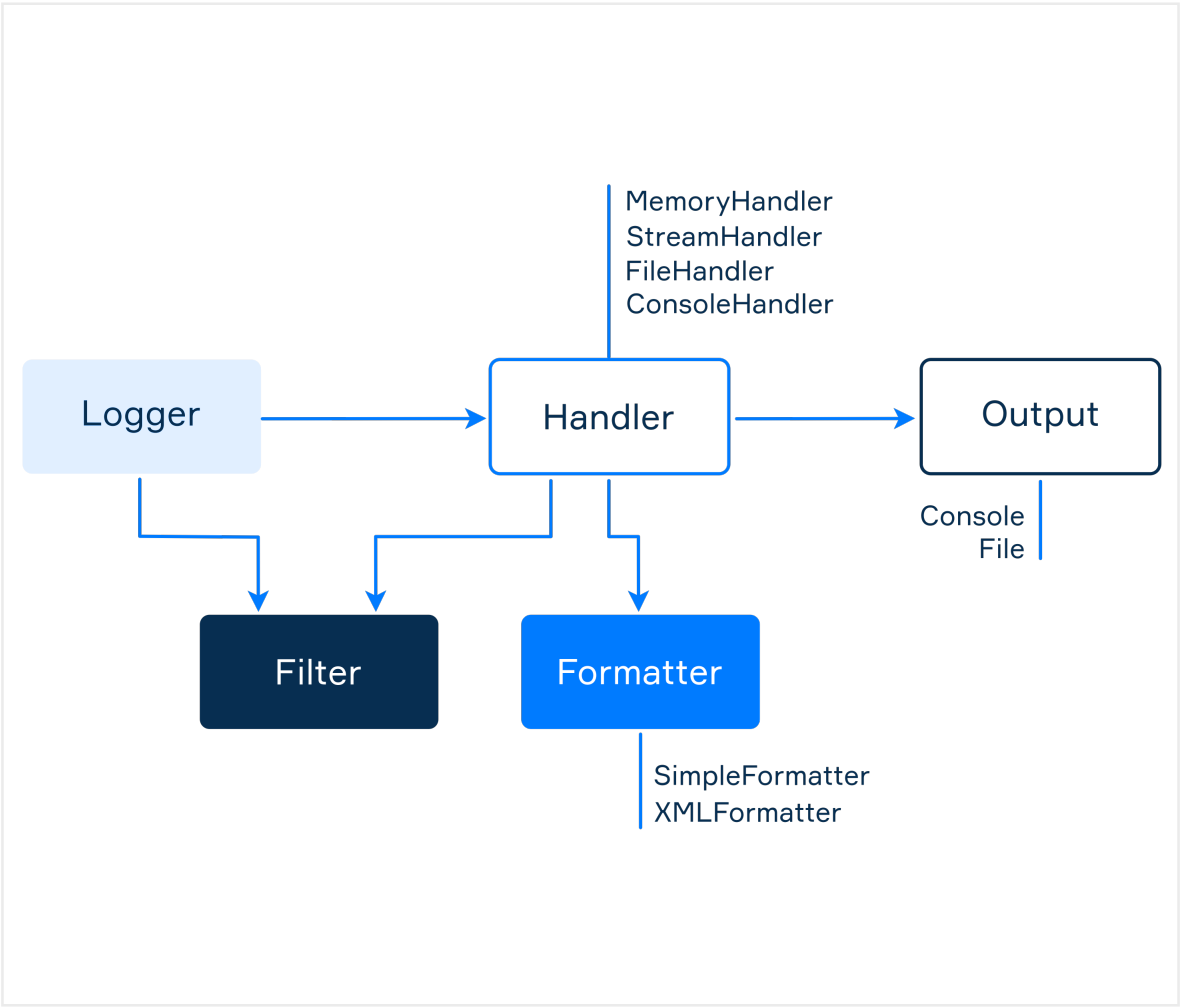
These records could be anything such as an event in the application, a value of a variable, an error or an exception in the application.

Logs are mostly used for debugging purposes.

Today, we learn about the java.util.logging package which is responsible for giving the developers logging capabilities within the standard Java SDK. There are several components you need to learn when working with Java Logging.

Those
are Logger, FileHandler, ConsoleHandler, SimpleFormatter, XMLFormatter, Level, LogRecord, and LogManager.

The following images show how Loggers, Handlers, Filters, and Formatters work together.



Logger class

The Logger class is the most important and fundamental component in the logging package. The standard practice is to create a logger instance for each class. The Logger class introduces several methods to print log messages. The log() method is one of them. Check the following example.

```
import java.util.logging.*;

public class Main {
    public static void main(String[] args) {
        Logger logger = Logger.getLogger(Main.class.getName());
        logger.log(Level.WARNING, "Hello " + logger.getName());
    }
}
```

It will output

```
WARNING: Hello Main
```

Every log message is related to a certain log level. In this example, it is **Warning**. Java uses **Info** as its **default log level**. There are **seven** log levels in the Java logging package. The list below shows them from the highest to the lowest severity.

- **SEVERE**

- **WARNING**
- **INFO**
- **CONFIG**
- **FINE**
- **FINER**
- **FINEST**

Following image show integer values of the Log Levels.

Log Level	Value
SEVERE	1000
WARNING	900
INFO	800
CONFIG	700
FINE	500
FINER	400
FINEST	300

The Logger class contains methods such as info(), config() where you don't have to provide a **log level** as an attribute.
Check the following example.

```
import java.util.logging.*;

public class Main {
    public static void main(String[] args) {
        Logger logger = Logger.getLogger( Main.class.getName());
        logger.severe("Severe Log");
        logger.warning("Warning Log");
        logger.info("Info Log");
    }
}
```

The output will be

```
Apr 04, 2019 10:01:34 PM Main main
SEVERE: Severe Log
Apr 04, 2019 10:01:34 PM Main main
WARNING: Warning Log
Apr 04, 2019 10:01:34 PM Main main
INFO: Info Log
```

Handlers and Formatters

Handlers are responsible for taking actual logs to the outside world. There is an abstract class called **Handler** in java.util.logging package. It is extended by five concrete classes. The two most important classes among them are ConsoleHandler and FileHandler. ConsoleHandler writes log messages to System.err while FileHandler writes log messages to a file.

Usually, a **Handler** uses a **Formatter** to format the log message. There are two types of Formatters in the logging package. Those are SimpleFormatter and XMLFormatter. Of course, both of them extend the **Formatter** abstract class in the logging package.

Check the following example to understand **Handlers** and **Formatters**.

```
import java.util.logging.*;

public class Main {
   public static void main(String[] args) throws Exception {
      Logger logger = Logger.getLogger(Main.class.getName());
      Handler fileHandler = new FileHandler("default.log");
      logger.addHandler(fileHandler);
      fileHandler.setFormatter(new XMLFormatter());
      logger.info("Info log message");
   }
}
```

t will create a log file called **default.log**. Default.log file will contain the following XML text.

```
<?xml version="1.0" encoding="UTF-8" standalone="no"?>
<!DOCTYPE log SYSTEM "logger.dtd">
<log>
<record>
 <date>2019-04-04T22:26:35</date>
 <millis>1554416795693</millis>
 <sequence>0</sequence>
 <logger>Main</logger>
 <level>INFO</level>
 <class>Main</class>
 <method>main</method>
 <thread>1</thread>
 <message>Info log message</message>
</record>
</log>
```

Filters

When we are developing a software application, we write as many log

messages as possible. But we don’t want all the log messages to be executed every time the application runs. It will waste resources and also it can create unnecessarily long log files. That’s when we use filters.

Let’s say you want to print only info messages. For that, first, you have to create a **custom filter** class by implementing the Filter **interface** in the logging package.

```
class FilterExample implements Filter {
   public boolean isLoggable(LogRecord record) {
      if (record.getLevel() != Level.INFO) {
         return false;
      }
      return true;
   }
}
```

Create an object of FilterExample class and use setFilter() method of the Logger instance to set the filter:

```
public class Main {
   public static void main(String[] args) throws Exception {
      Logger logger = Logger.getLogger( Main.class.getName());
      Filter filter = new FilterExample();
      logger.setFilter(filter);
      logger.severe("Severe Log");
      logger.info("Info Log");
      logger.warning("Warning Log");
   }
}
```

When this code is executed, only the Info log message will be printed.

Conclusion

Let's summarize what we learned in this lesson. First, java.util.logging is a part of the Java SDK and it is responsible for giving logging capabilities to developers. We discussed several components in the logging package. Logger instances are responsible for creating log messages. We usually create a Logger instance for every class that we are going to add logs. Handlers are responsible for sending log messages out of the application. If you want to print log messages to the console, use ConsoleHandler. If you want to write log messages to a file, use FileHandler. Formatters format log messages. If you want to log messages in XML format, use XMLFormatter. Finally, we discussed Filters which help you to manage which logs are to be executed when the application runs.