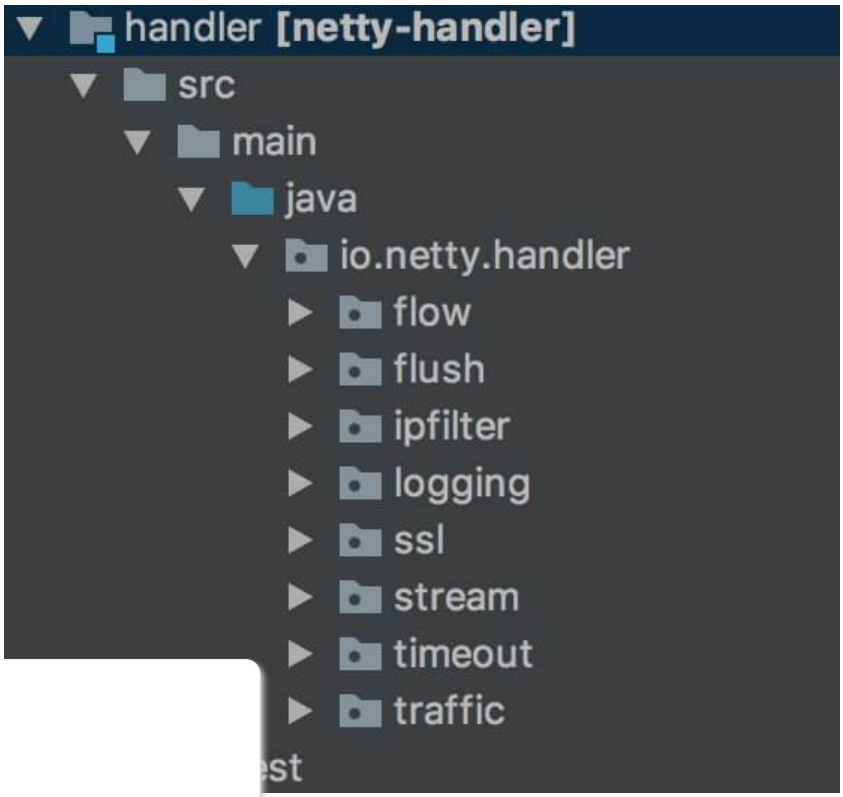
- NETTY

精尽 Netty 源码解析 —— ChannelHandler（四）之 LoggingHandler

1. 概述

在 `netty-handler` 模块中，提供了多种 ChannelHandler 的实现类。如下图所示：



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annelHandler 实现。

的 LoggerHandler 。

志级别枚举类。代码如下：

```
/**
 * Maps the regular {@link LogLevel}s with the {@link InternalLogLevel} ones.
 */
public enum LogLevel {
```

```
    TRACE(InternalLogLevel.TRACE),
    DEBUG(InternalLogLevel.DEBUG),
    INFO(InternalLogLevel.INFO),
    WARN(InternalLogLevel.WARN),
    ERROR(InternalLogLevel.ERROR);

    /**
     * Netty 内部日志级别
     */
    private final InternalLogLevel internalLevel;

    LogLevel(InternalLogLevel internalLevel) {
        this.internalLevel = internalLevel;
    }

    /**
     * For internal use only.
     *
     * <p/>Converts the specified {@link LogLevel} to its {@link InternalLogLevel} variant.
     *
     * @return the converted level.
     */
    public InternalLogLevel toInternalLevel() {
        return internalLevel;
    }

}
```

- Netty 提供了一套日志框架，方便接入 slf4j、log4j、jdk logger 等等日志框架。感兴趣的胖友，可以看看 《Netty4.x Internal Logger机制》 。😈 现在，不看也不影响对本文的理解。
- LogLevel 实现对 `io.netty.util.internal.logging.InternalLogLevel` 的一一映射。笔者暂时看不出有什么神奇的用途，难道是为了可以灵活的修改映射关系？！有了解的胖友，可以深刻教育下我噢。

3. LoggingHandler

er ，继承 ChannelDuplexHandler 类，日志处理器，对 Inbound/Outbound
试时的调试之用。

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```
annelDuplexHandler {

     */
    private static final LogLevel DEFAULT_LEVEL = LogLevel.DEBUG;

    /**
     * Netty 内部 Logger 对象
     */
```

```
    protected final InternalLogger logger;
    /**
     * Netty 内部 LogLevel 级别
     */
    protected final InternalLogLevel internalLevel;

    /**
     * 配置的 LogLevel 级别
     */
    private final LogLevel level;

    /**
     * Creates a new instance whose logger name is the fully qualified class
     * name of the instance with hex dump enabled.
     */
    public LoggingHandler() {
        this(DEFAULT_LEVEL);
    }

    /**
     * Creates a new instance whose logger name is the fully qualified class
     * name of the instance.
     *
     * @param level the log level
     */
    public LoggingHandler(LogLevel level) {
        if (level == null) {
            throw new NullPointerException("level");
        }

        // 获得 logger
        logger = InternalLoggerFactory.getInstance(getClass());
        this.level = level;
        internalLevel = level.toInternalLevel();
    }
```

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```
specified logger name and with hex dump

generate the logger for

zz) {

specified logger name.
     *
     * @param clazz the class type to generate the logger for
     * @param level the log level
     */
    public LoggingHandler(Class<?> clazz, LogLevel level) {
        if (clazz == null) {
```

```
            throw new NullPointerException("clazz");
        }
        if (level == null) {
            throw new NullPointerException("level");
        }

        // 获得 logger
        logger = InternalLoggerFactory.getInstance(clazz);
        this.level = level;
        internalLevel = level.toInternalLevel();
    }

    /**
     * Creates a new instance with the specified logger name using the default log level.
     *
     * @param name the name of the class to use for the logger
     */
    public LoggingHandler(String name) {
        this(name, DEFAULT_LEVEL);
    }

    /**
     * Creates a new instance with the specified logger name.
     *
     * @param name the name of the class to use for the logger
     * @param level the log level
     */
    public LoggingHandler(String name, LogLevel level) {
        if (name == null) {
            throw new NullPointerException("name");
        }
        if (level == null) {
            throw new NullPointerException("level");
        }

        // 获得 l
```

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`.getInstance(name);`

`alLevel();`

`vel` 级别。构造方法如果未传递 `LogLevel level` 方法参数，则使用默认值。

- `internalLevel` 属性，Netty 内部 LogLevel 级别。通过 `LogLevel#toInternalLevel()` 方法，将 `level` 转化成 `internalLevel` 。

- `logger` 属性，Netty 内部 Logger 对象。通过 `Class<?> clazz` 或 `String name` 方法参数，进行获得。

3.2 具体实现

```
@Override
public void channelRegistered(ChannelHandlerContext ctx) throws Exception {
    if (logger.isEnabled(internalLevel)) {
        logger.log(internalLevel, format(ctx, "REGISTERED"));
    }
    //
    ctx.fireChannelRegistered();
}

@Override
public void channelUnregistered(ChannelHandlerContext ctx) throws Exception {
    if (logger.isEnabled(internalLevel)) {
        logger.log(internalLevel, format(ctx, "UNREGISTERED"));
    }
    ctx.fireChannelUnregistered();
}

@Override
public void channelActive(ChannelHandlerContext ctx) throws Exception {
    // 打印日志
    if (logger.isEnabled(internalLevel)) {
        logger.log(internalLevel, format(ctx, "ACTIVE"));
    }
    // 传递 Channel active 事件，给下一个节点
    ctx.fireChannelActive();
}

@Override
public void channelInactive(ChannelHandlerContext ctx) throws Exception {
    if (logger.isEnabled(internalLevel)) {
        logger.log(internalLevel, format(ctx, "INACTIVE"));
    }
    ctx.fireChannelInactive();
}
```

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```
dlerContext ctx, Throwable cause) throws Exception {
)) {
at(ctx, "EXCEPTION", cause), cause);
```

```
HandlerContext ctx, Object evt) throws Exception {
)) {
at(ctx, "USER_EVENT", evt));
    }
    ctx.fireUserEventTriggered(evt);
}

@Override
public void bind(ChannelHandlerContext ctx, SocketAddress localAddress, ChannelPromise promise) throws
    if (logger.isEnabled(internalLevel)) {
```

```
        logger.log(internalLevel, format(ctx, "BIND", localAddress));
    }
    ctx.bind(localAddress, promise);
}

@Override
public void connect(
        ChannelHandlerContext ctx,
        SocketAddress remoteAddress, SocketAddress localAddress, ChannelPromise promise) throws Except
    if (logger.isEnabled(internalLevel)) {
        logger.log(internalLevel, format(ctx, "CONNECT", remoteAddress, localAddress));
    }
    ctx.connect(remoteAddress, localAddress, promise);
}

@Override
public void disconnect(ChannelHandlerContext ctx, ChannelPromise promise) throws Exception {
    if (logger.isEnabled(internalLevel)) {
        logger.log(internalLevel, format(ctx, "DISCONNECT"));
    }
    ctx.disconnect(promise);
}

@Override
public void close(ChannelHandlerContext ctx, ChannelPromise promise) throws Exception {
    if (logger.isEnabled(internalLevel)) {
        logger.log(internalLevel, format(ctx, "CLOSE"));
    }
    ctx.close(promise);
}

@Override
public void deregister(ChannelHandlerContext ctx, ChannelPromise promise) throws Exception {
    if (logger.isEnabled(internalLevel)) {
        logger.log(internalLevel, format(ctx, "DEREGISTER"));
```

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```
lHandlerContext ctx) throws Exception {
)) {
at(ctx, "READ COMPLETE"));

public void channelRead(ChannelHandlerContext ctx, Object msg) throws Exception {
    if (logger.isEnabled(internalLevel)) {
        logger.log(internalLevel, format(ctx, "READ", msg));
    }
    ctx.fireChannelRead(msg);
}
```

```
@Override
public void write(ChannelHandlerContext ctx, Object msg, ChannelPromise promise) throws Exception {
    if (logger.isEnabled(internalLevel)) {
        logger.log(internalLevel, format(ctx, "WRITE", msg));
    }
    ctx.write(msg, promise);
}

@Override
public void channelWritabilityChanged(ChannelHandlerContext ctx) throws Exception {
    if (logger.isEnabled(internalLevel)) {
        logger.log(internalLevel, format(ctx, "WRITABILITY CHANGED"));
    }
    ctx.fireChannelWritabilityChanged();
}

@Override
public void flush(ChannelHandlerContext ctx) throws Exception {
    if (logger.isEnabled(internalLevel)) {
        logger.log(internalLevel, format(ctx, "FLUSH"));
    }
    ctx.flush();
}
```

里面的每个方法，都是使用 `logger` 打印日志，并继续传播事件到下一个节点。

而打印的日志的格式，通过 `#format(...)` 方法，进行拼接。

3.3 format

`#format(...)` 方法，根据参数的不同，分成三种。

① `#format(ChannelHandlerContext ctx, String eventName)` 方法，代码如下：


```
rmatted message.

ent

Context ctx, String eventName) {
ing();
gth() + 1 + eventName.length())
```

② `#format(ChannelHandlerContext ctx, String eventName, Object arg)` 方法，代码如下：

```
/**
 * Formats an event and returns the formatted message.
 *
```

```
     * @param eventName the name of the event
     * @param arg       the argument of the event
     */
    protected String format(ChannelHandlerContext ctx, String eventName, Object arg) {
        if (arg instanceof ByteBuf) {
            return formatByteBuf(ctx, eventName, (ByteBuf) arg);
        } else if (arg instanceof ByteBufHolder) {
            return formatByteBufHolder(ctx, eventName, (ByteBufHolder) arg);
        } else {
            return formatSimple(ctx, eventName, arg);
        }
    }
```

- 根据参数不同，会调用不同的 format 方法。

③ `#format(ChannelHandlerContext ctx, String eventName, Object firstArg, Object secondArg)` 方法，代码如下：

```
    /**
     * Formats an event and returns the formatted message.  This method is currently only used for formatt
     * {@link ChannelOutboundHandler#connect(ChannelHandlerContext, SocketAddress, SocketAddress, ChannelP
     *
     * @param eventName the name of the event
     * @param firstArg  the first argument of the event
     * @param secondArg the second argument of the event
     */
    protected String format(ChannelHandlerContext ctx, String eventName, Object firstArg, Object secondArg
        if (secondArg == null) {
            return formatSimple(ctx, eventName, firstArg);
        }

        String chStr = ctx.channel().toString();
        String arg1Str = String.valueOf(firstArg);
        String arg2Str = secondArg.toString();
        der(
        Name.length() + 2 + arg1Str.length() + 2 + arg2Str.length());
        nd(eventName).append(": ").append(arg1Str).append(", ").append(a
```

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ctx, String eventName, ByteBuf msg) 方法，代码如下：

```
     * Generates the default log message of the specified event whose argument is a {@link ByteBuf}.
     */
    private static String formatByteBuf(ChannelHandlerContext ctx, String eventName, ByteBuf msg) {
        String chStr = ctx.channel().toString();
        int length = msg.readableBytes();
        if (length == 0) {
```

```
        StringBuilder buf = new StringBuilder(chStr.length() + 1 + eventName.length() + 4);
        buf.append(chStr).append(' ').append(eventName).append(": 0B");
        return buf.toString();
    } else {
        int rows = length / 16 + (length % 15 == 0? 0 : 1) + 4;
        StringBuilder buf = new StringBuilder(chStr.length() + 1 + eventName.length() + 2 + 10 + 1 + 2

        buf.append(chStr).append(' ').append(eventName).append(": ").append(length).append('B').append
        appendPrettyHexDump(buf, msg); // <1>

        return buf.toString();
    }
}
```

- `<1>` 处的 `appendPrettyHexDump(buf, msg)` ，实际调用的是 `ByteBufUtil#appendPrettyHexDump(StringBuilder dump, ByteBuf buf)` 方法。

如下是一个打印的示例：

> FROM 《自顶向下深入分析Netty（八）–ChannelHandler》

```
[2017-02-22 22:25:50/ DEBUG] [main] (io.netty.handler.logging.LoggingHandler:71) -
[id: 0x119b899c, embedded => embedded] RECEIVED: 0B

[2017-02-22 22:28:52/ DEBUG] [main] (io.netty.handler.logging.LoggingHandler:71) -
[id: 0x509f4ef8, embedded => embedded] RECEIVED: 33B
         +-------------------------------------------------+
         |  0  1  2  3  4  5  6  7  8  9  a  b  c  d  e  f |
+--------+-------------------------------------------------+----------------+
|00000000| 61 62 63 64 65 66 67 68 69 6a 6b 6c 6d 6e 6f 70 |abcdefghijklmnop|
|00000010| 71 72 73 74 75 76 77 78 79 7a 7b 7c 7d 7e 7f 80 |qrstuvwxyz{|}~..|
|00000020| 81                                              |.               |
+--------+-------------------------------------------------+----------------+
```

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`ntext ctx, String eventName, ByteBufHolder msg)` 方法，代码如

```
f the specified event whose argument is a {@link ByteBufHolder}.

der(ChannelHandlerContext ctx, String eventName, ByteBufHolder m
ing();

();
    if (length == 0) {
        StringBuilder buf = new StringBuilder(chStr.length() + 1 + eventName.length() + 2 + msgStr.len
        buf.append(chStr).append(' ').append(eventName).append(", ").append(msgStr).append(", 0B");
        return buf.toString();
    } else {
        int rows = length / 16 + (length % 15 == 0? 0 : 1) + 4;
```

```
        StringBuilder buf = new StringBuilder(chStr.length() + 1 + eventName.length() + 2 + msgStr.len

        buf.append(chStr).append(' ').append(eventName).append(": ").append(msgStr).append(", ").appen
        appendPrettyHexDump(buf, content);

        return buf.toString();
    }
}
```

- 和 `#formatByteBuf(ChannelHandlerContext ctx, String eventName, ByteBuf msg)` 方法，实际打印的效果，非常相似。

3.3.3 formatSimple

`#formatSimple(ChannelHandlerContext ctx, String eventName, Object msg)` 方法，代码如下：

```
/**
 * Generates the default log message of the specified event whose argument is an arbitrary object.
 */
private static String formatSimple(ChannelHandlerContext ctx, String eventName, Object msg) {
    String chStr = ctx.channel().toString();
    String msgStr = String.valueOf(msg);
    StringBuilder buf = new StringBuilder(chStr.length() + 1 + eventName.length() + 2 + msgStr.length(
    return buf.append(chStr).append(' ').append(eventName).append(": ").append(msgStr).toString();
}
```

666. 彩蛋

还是没有彩蛋。

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