Netty

NIO 기반 고성능 네트워크 어플리케이션 프레임워크

Netty

약 100여 개의 조직에서 사용 중

Asynchronous Event-driven

- 이벤트에 기반하여 요청을 비동기 처리
- Reactor Pattern, EventHandler, EventListener, Future, Callback 등을 사용하여 구현

thread-based vs event-driven (Server Model)

thread-based	event-driven
thread context	state machine/continuation
synchronous/blocking	asynchronous/non-blocking
thread-per-connection	events and associated handlers

Reactor Pattern

동시에 서버로 들어온 **Request**를 처리하기 위한 **Event Handling Pattern**

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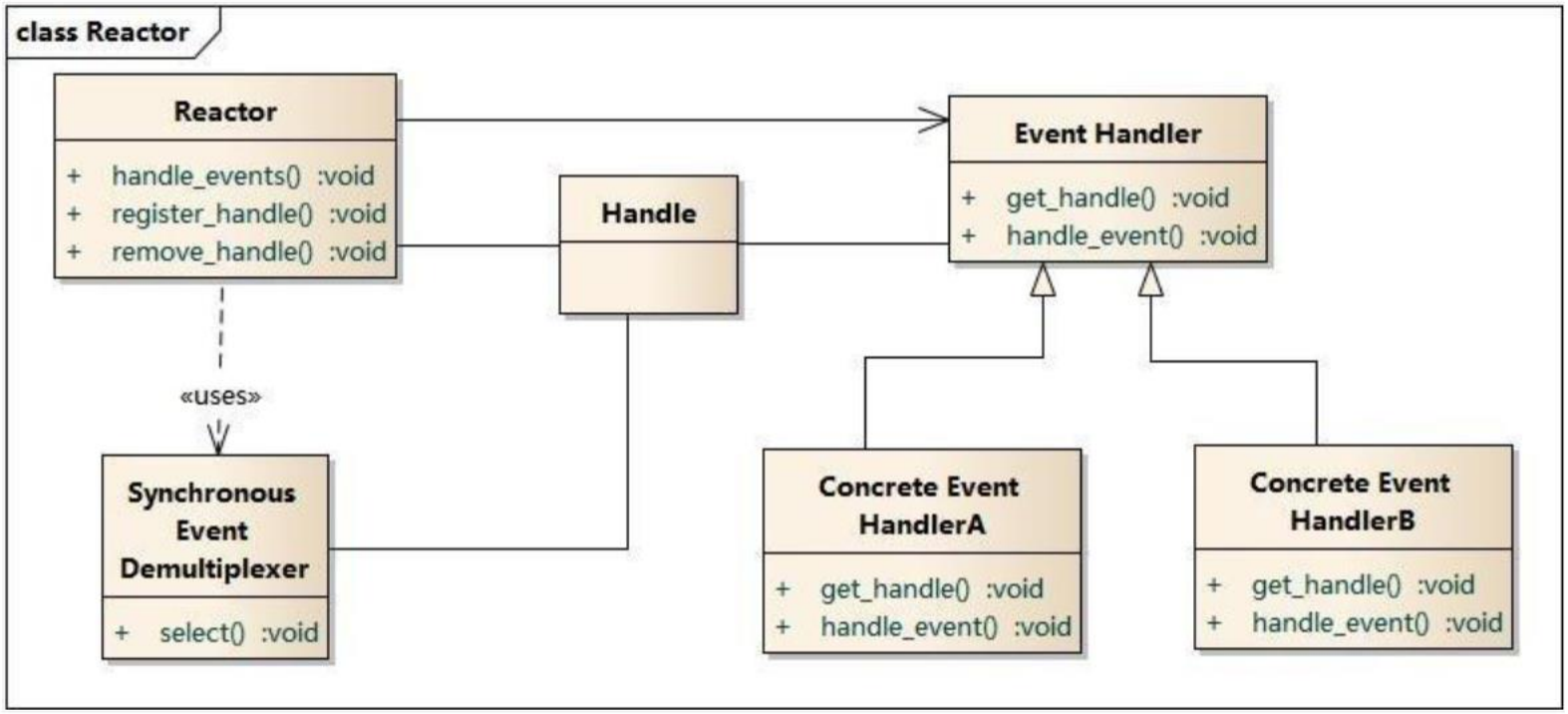
Reactor pattern structure



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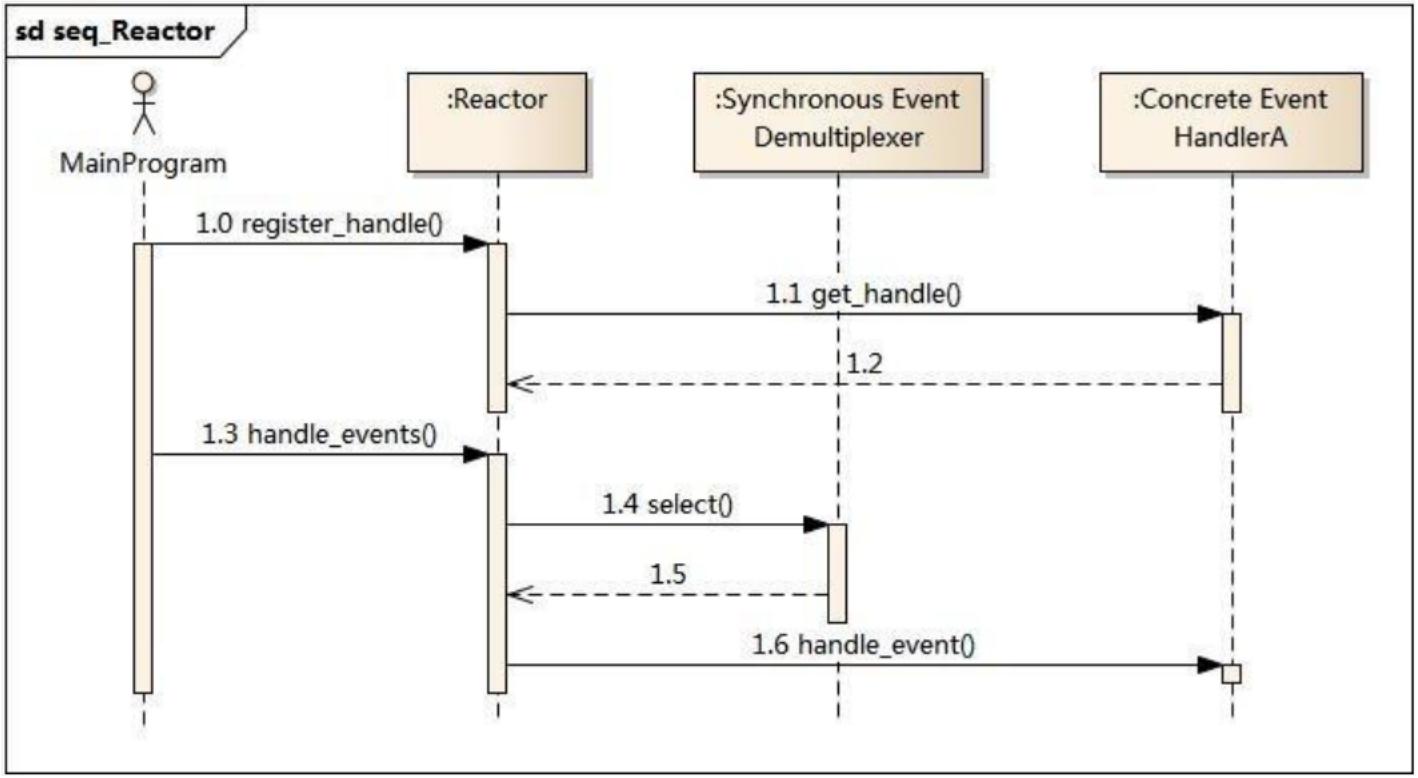
Reactor sequence diagram



The application launches and registers the event handler of interest to the Reactor;
calls Reactor to enter an infinite event loop, waiting for the registered event to arrive;
The event arrives, select returns, and Reactor distributes the event to the previously registered callback function.

Threading Model

EventLoop: 연결의 수명 기간 동안 발생하는 이벤트를 처리하는 작업을 나타내는 프로그래밍 구조

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Bootstrap

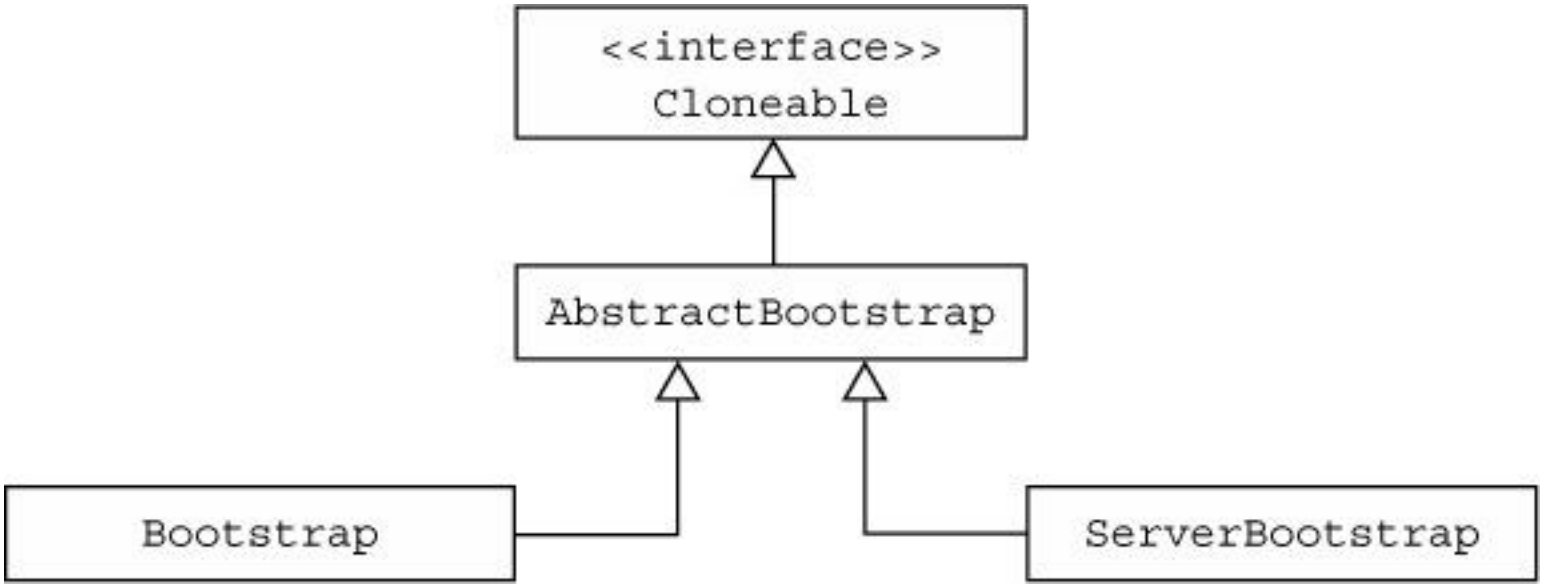
EventLoop

ChannelHandler
ChannelPipeline

Bootstrap

Netty

Bootstrap



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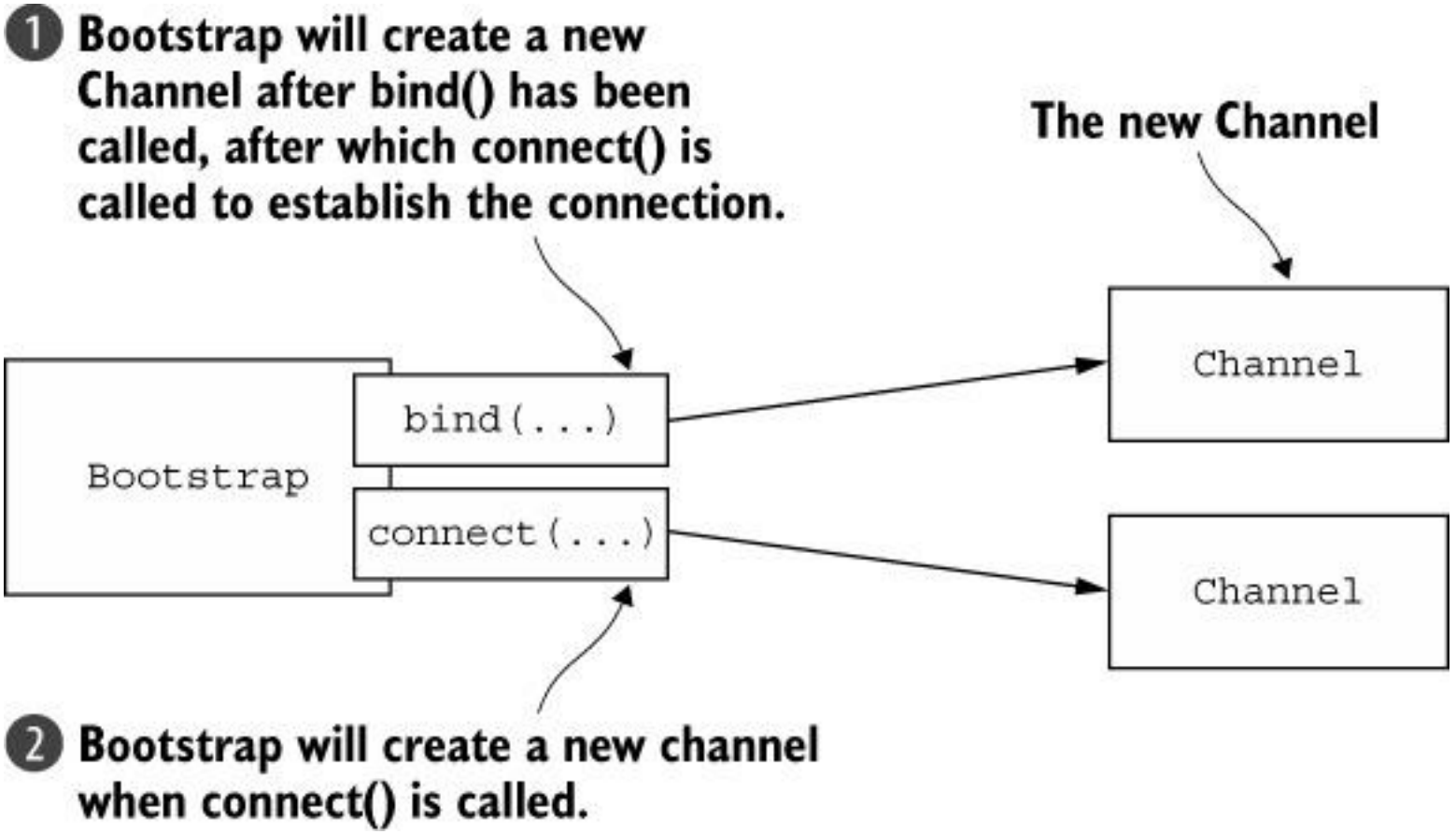
Bootstrap



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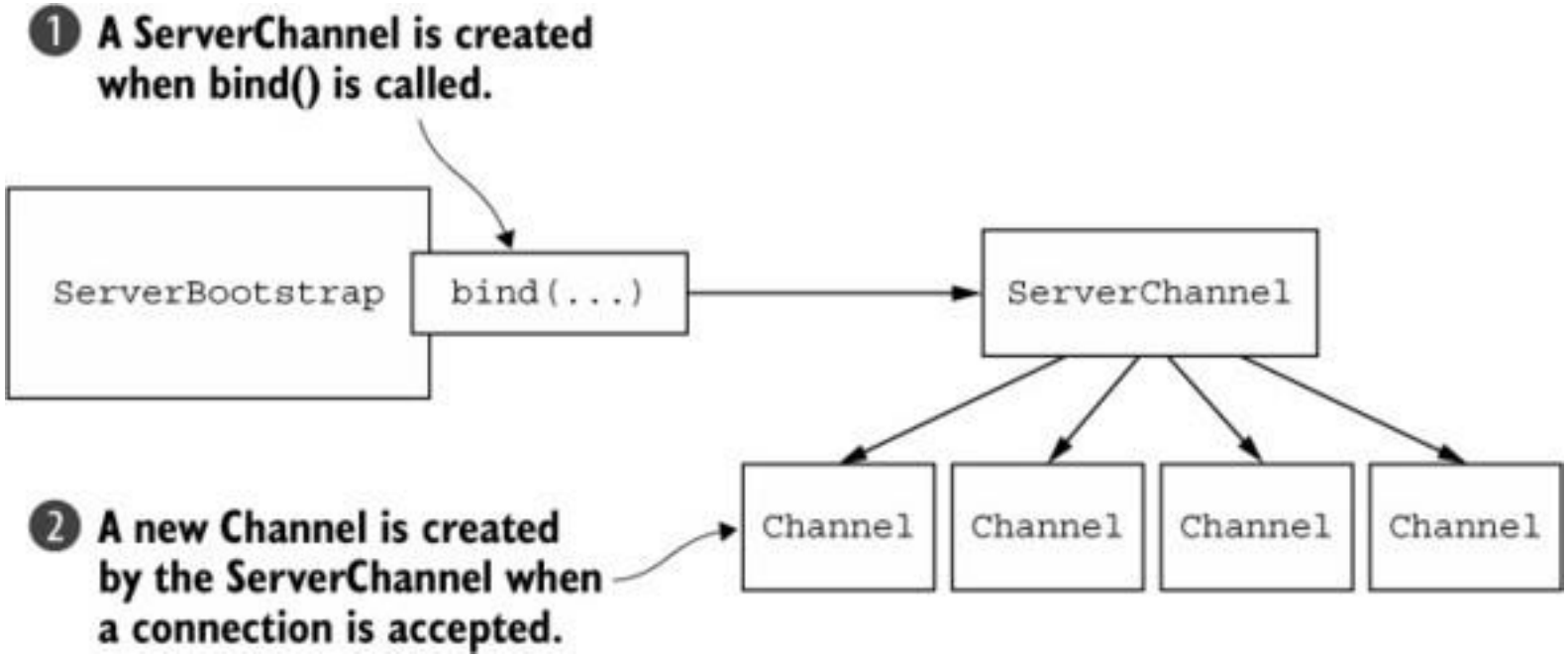
Bootstrap



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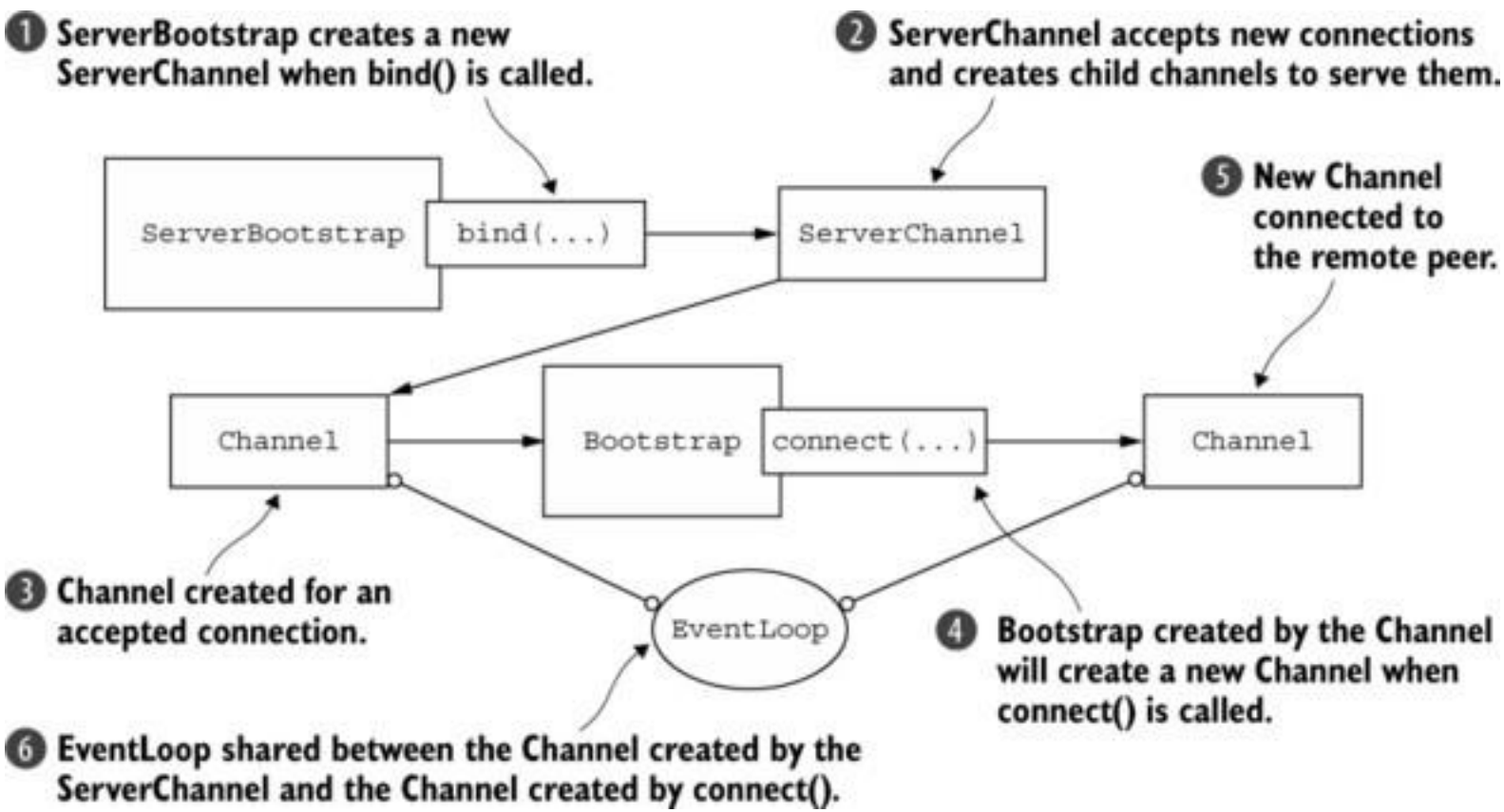
Bootstrap



EventLoop

EventLoop

- Netty는 **event loop** 기반 프레임워크 : Event Queue + Event Loop
- **single thread event loop** 기반 프레임워크 : **node.js**
- **multi thread event loop** 기반 프레임워크 : **Netty, Vert.x**

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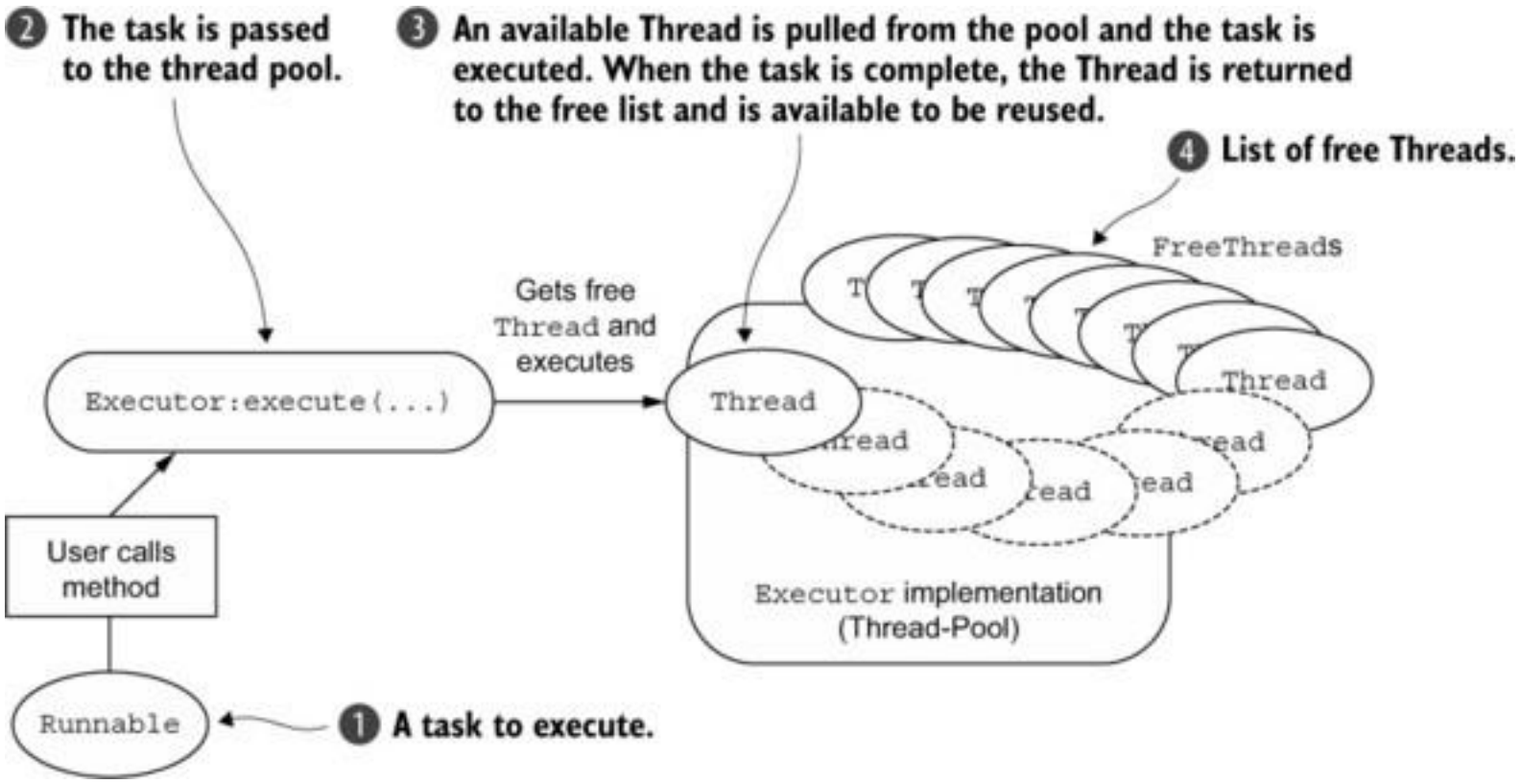
EventLoop



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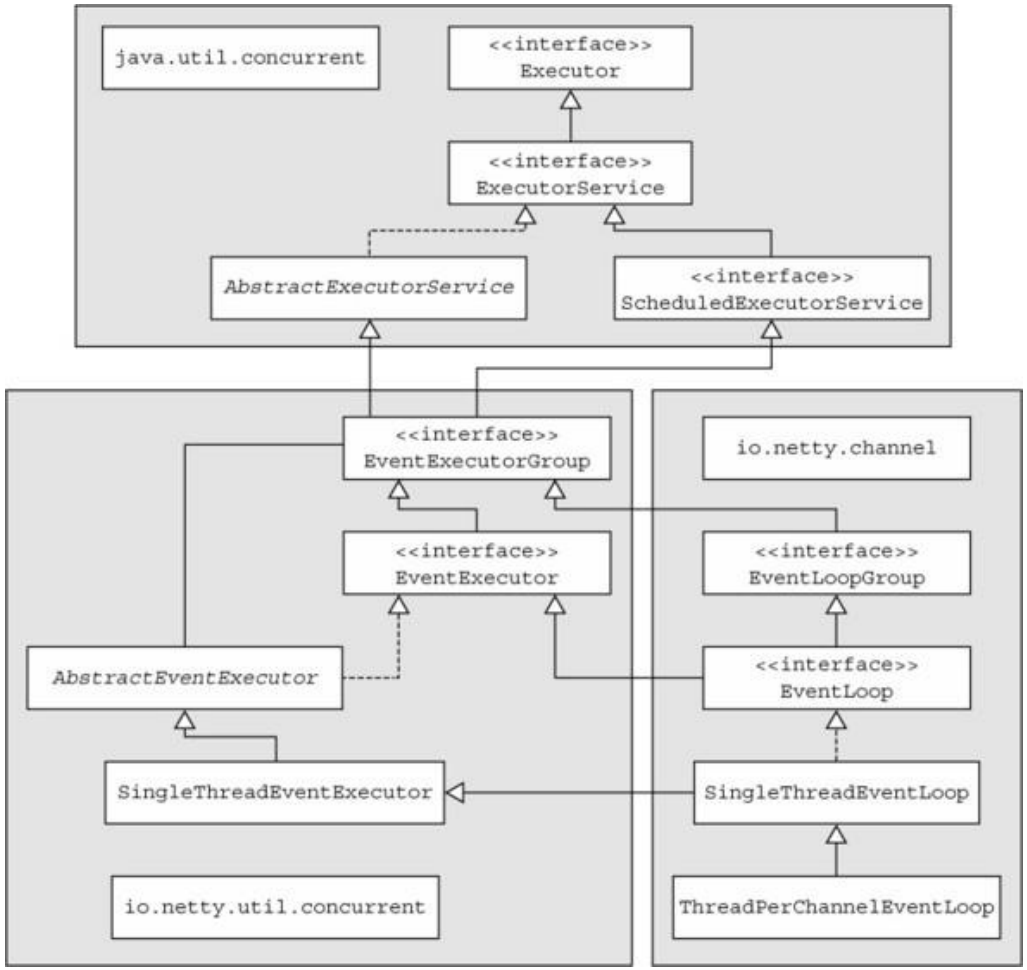
EventLoop



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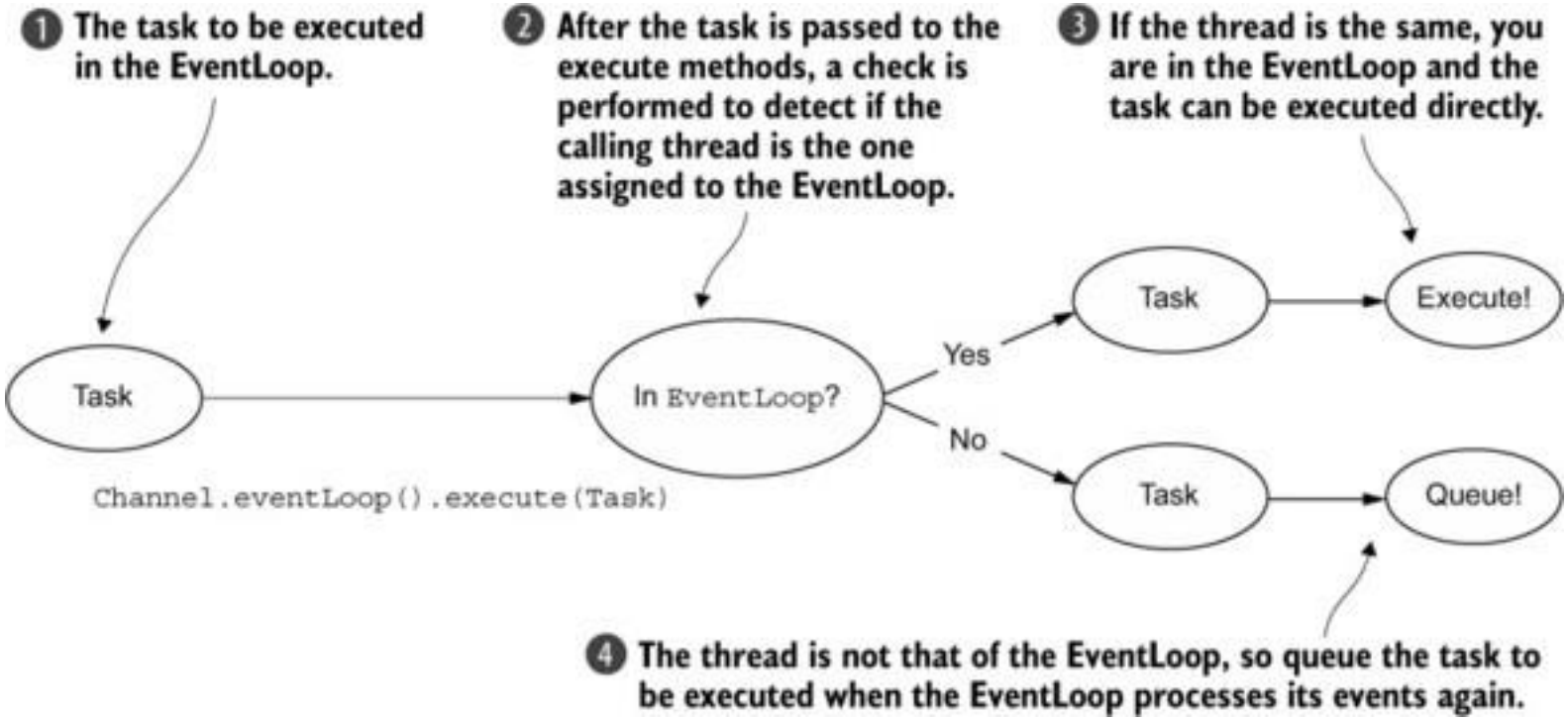
EventLoop



EventLoop

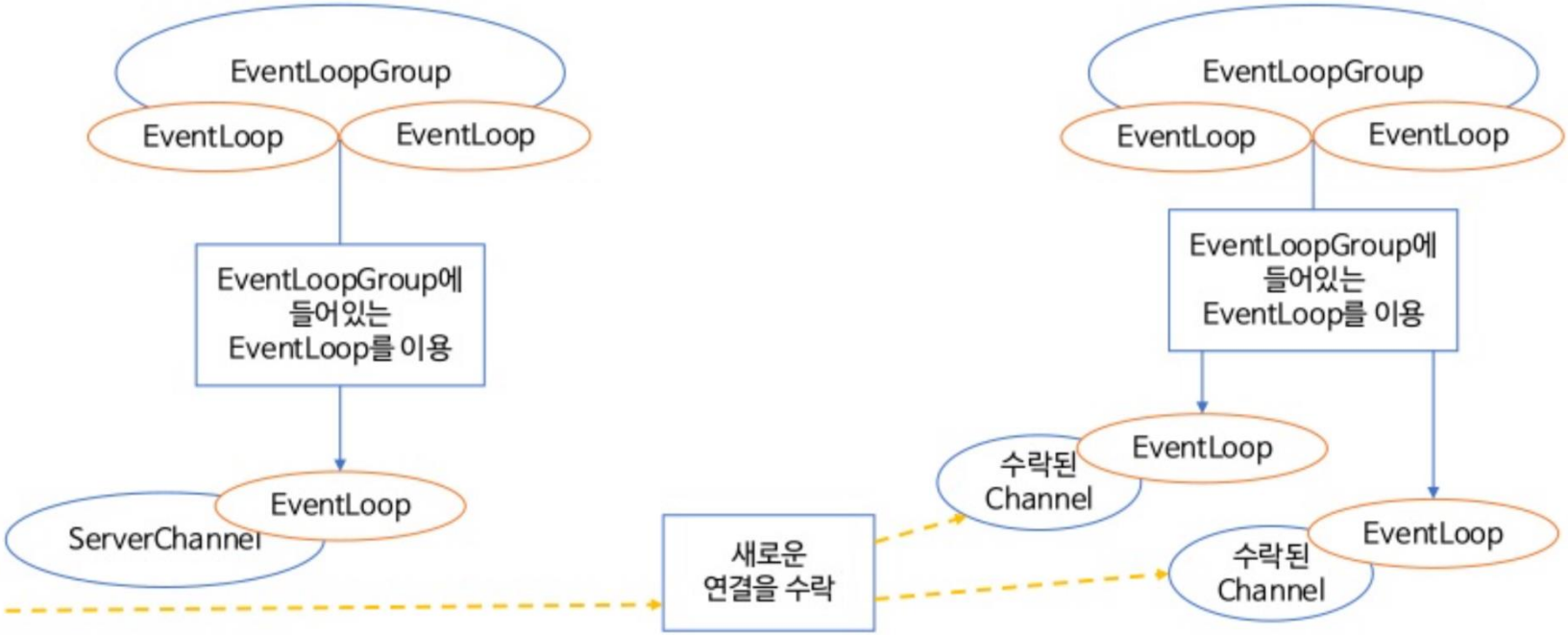
Channel, Thread, EventLoop, EventLoopGroup 간의 관계

- 하나의 EventLoopGroup은 하나 이상의 EventLoop를 포함
- EventLoopGroup은 Channel에 EventLoop를 할당
- 하나의 EventLoop는 수명주기 동안 하나의 Thread로 바인딩
- 하나의 Channel은 수명주기 동안 하나의 EventLoop에 등록
- 하나의 EventLoop를 하나 이상의 Channel로 할당 가능
- EventLoop가 생성 및 할당 되는 방법은 전송의 구현에 따라 다름 (Blocking 또는 Non-Blocking)

EventLoop

ServerBootstrap은 각기 다른 Channel의 두 집합을 필요로 함

1. 로컬 포트로 바인딩된 서버 자체의 수신 소켓을 나타내는 ServerChannel
2. 서버가 수락한 연결마다 하나씩 들어오는 클라이언트 연결을 처리하기 위해 생성된 모든 Channel



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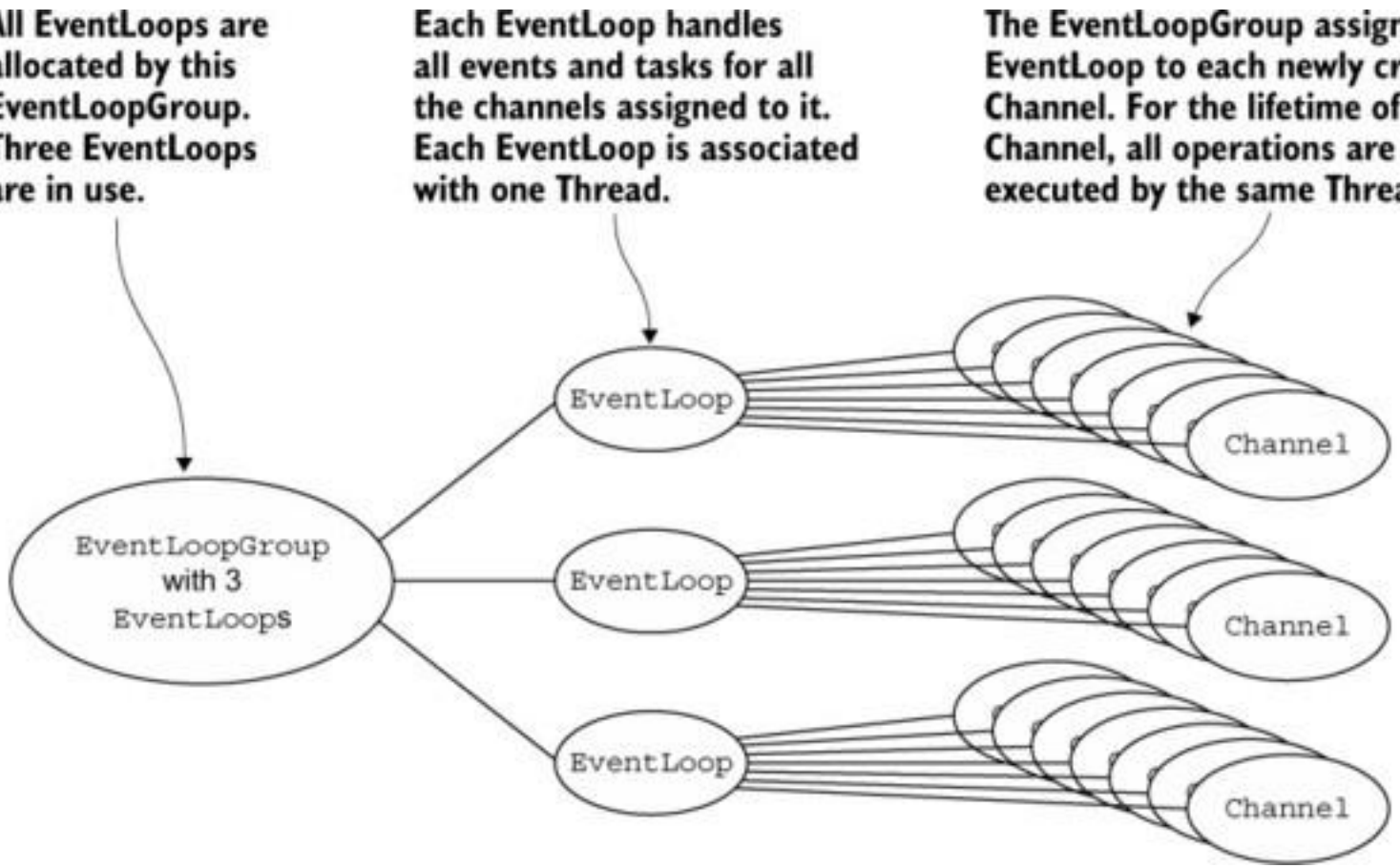
EventLoop



Non-Blocking

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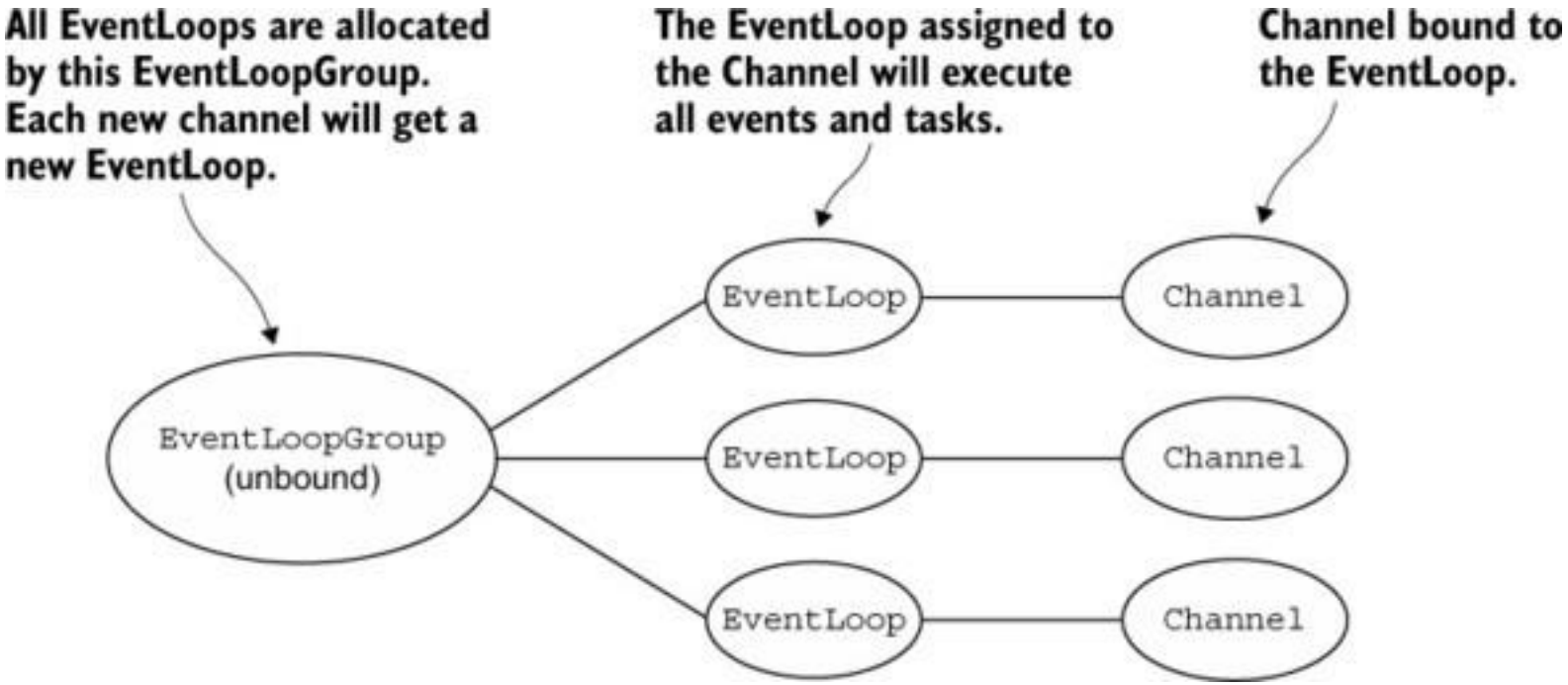
EventLoop



Blocking

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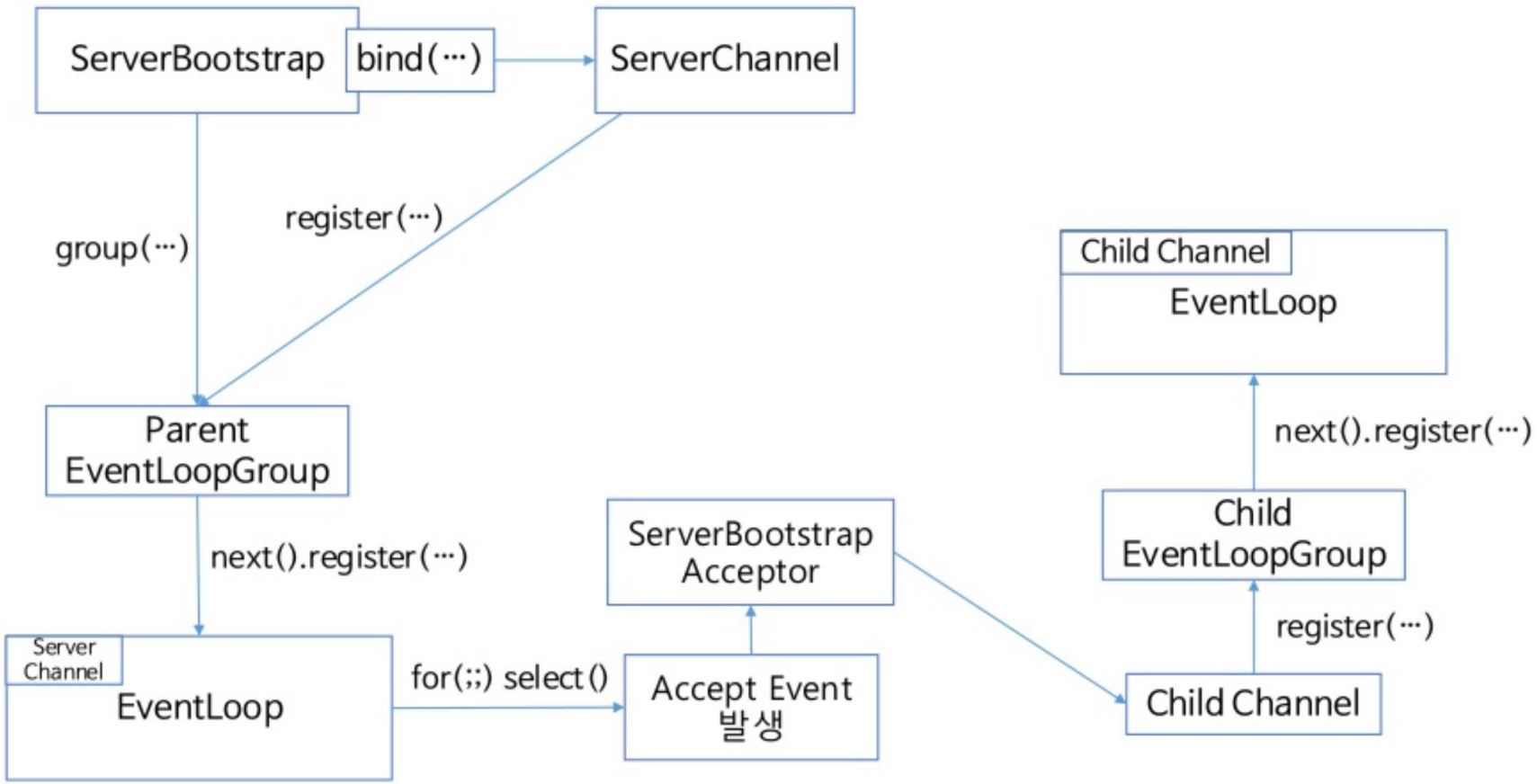
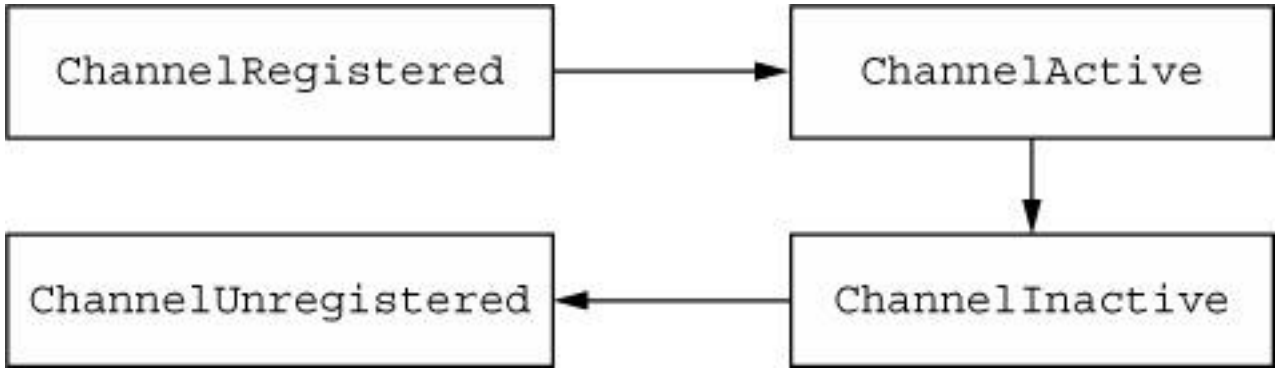
EventLoop



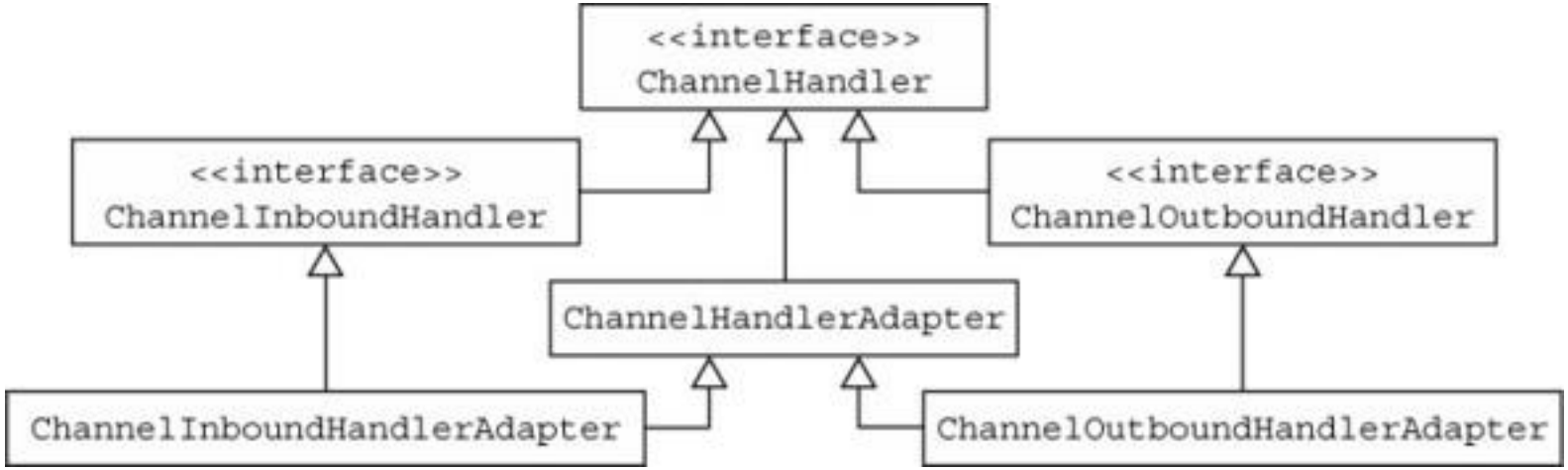
ChannelHandler
ChannelPipeline

ChannelHandler, ChannelPipeline



상태	기술
ChannelUnregistered	채널이 생성되었지만 EventLoop에 등록되지 않았습니다.
ChannelRegistered	채널이 EventLoop에 등록됩니다.
ChannelActive	채널이 활성 상태입니다 (원격 피어에 연결됨). 이제 데이터를 받고 보낼 수 있습니다.
ChannelInactive	채널이 원격 피어에 연결되어 있지 않습니다.

ChannelHandler, ChannelPipeline



유형	기술
handlerAdded	ChannelHandler가 ChannelPipeline에 추가 될 때 호출됩니다.
handlerRemoved	ChannelPipeline에서 ChannelHandler가 제거 될 때 호출됩니다.
exceptionCaught	처리 중 ChannelPipeline에서 오류가 발생하면 호출됩니다.

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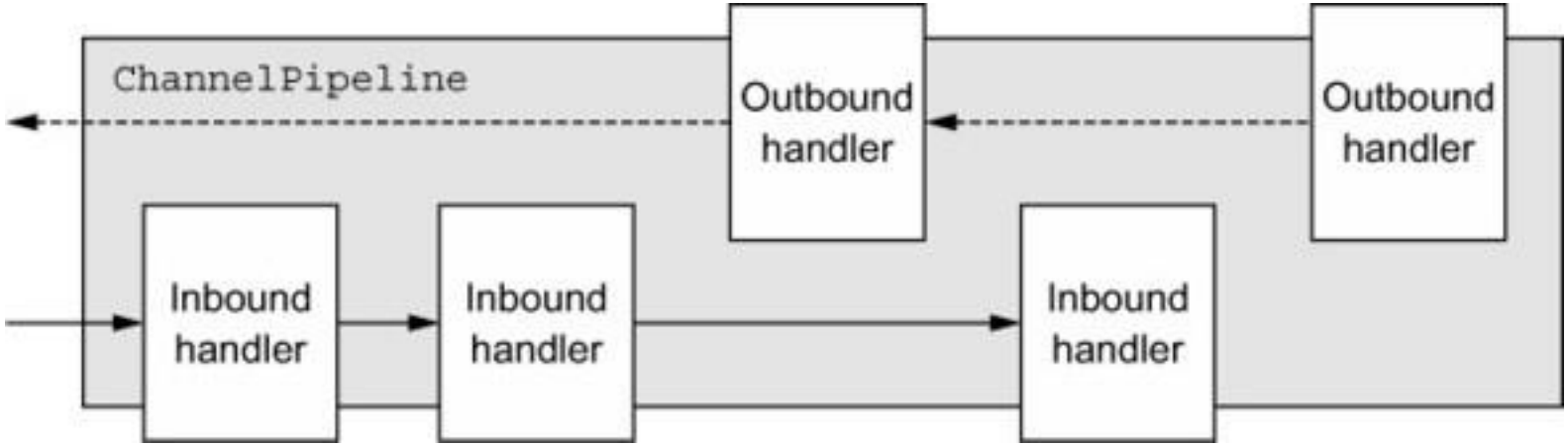
ChannelHandler, ChannelPipeline



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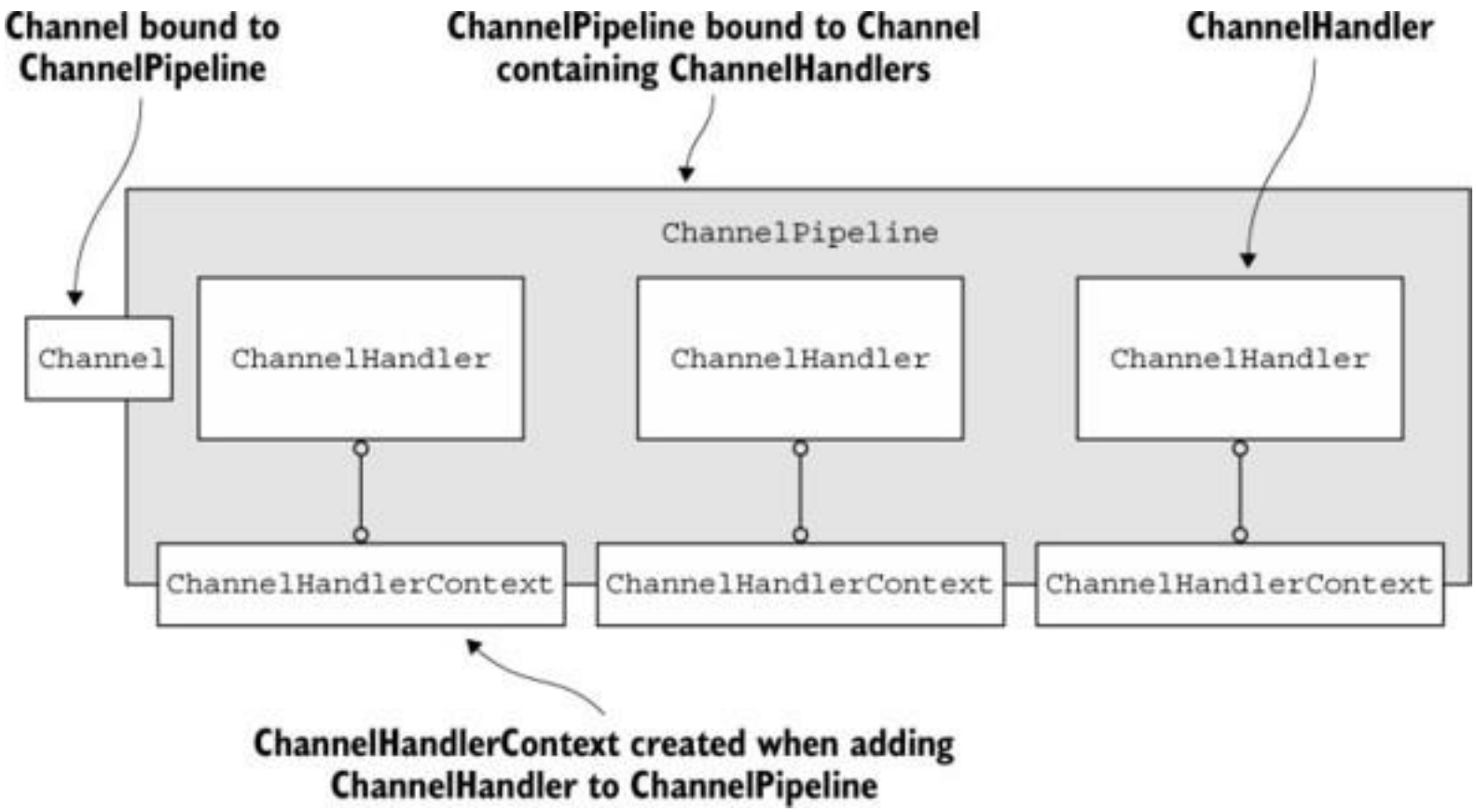
ChannelHandler, ChannelPipeline



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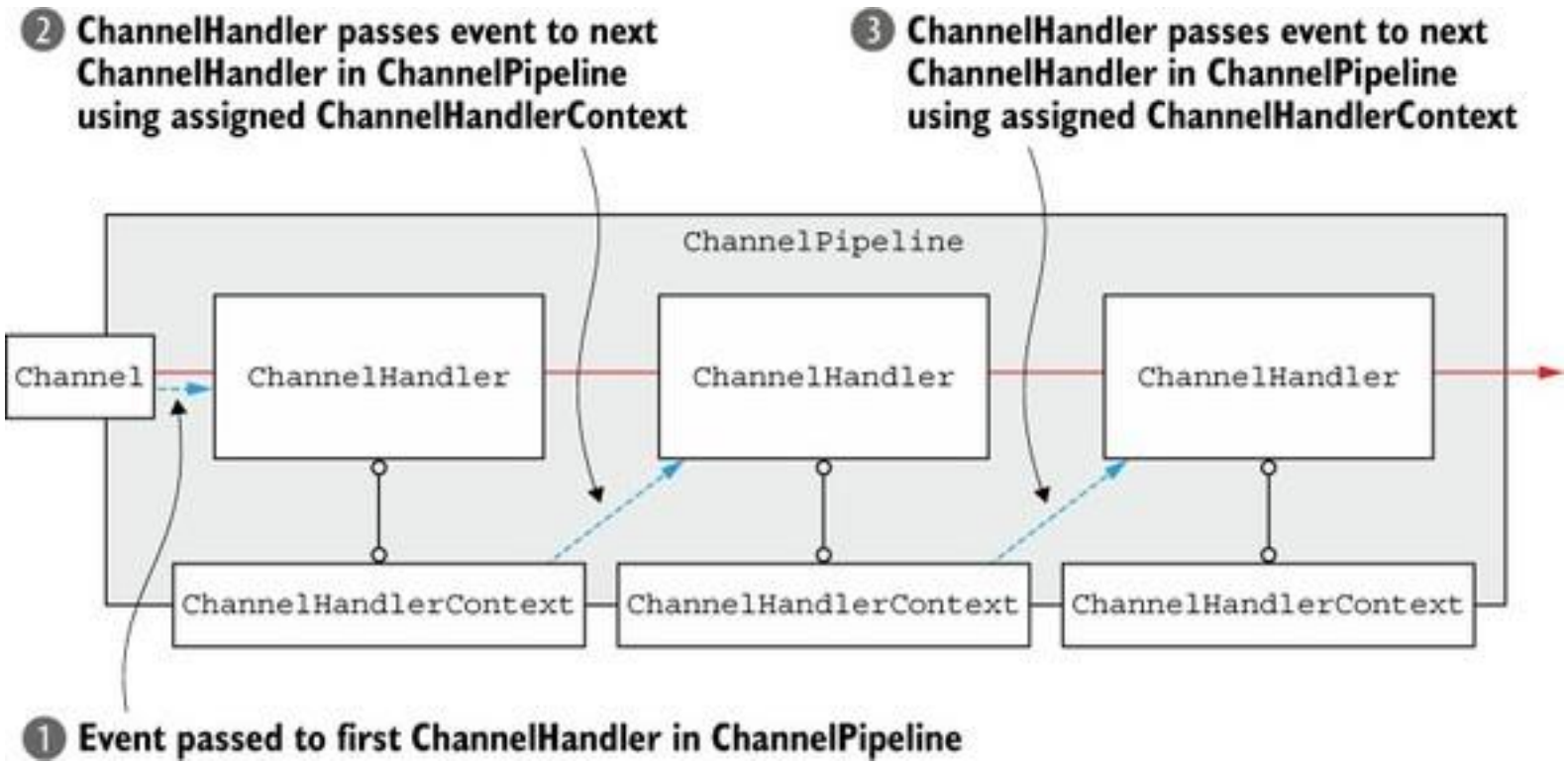
ChannelHandler, ChannelPipeline



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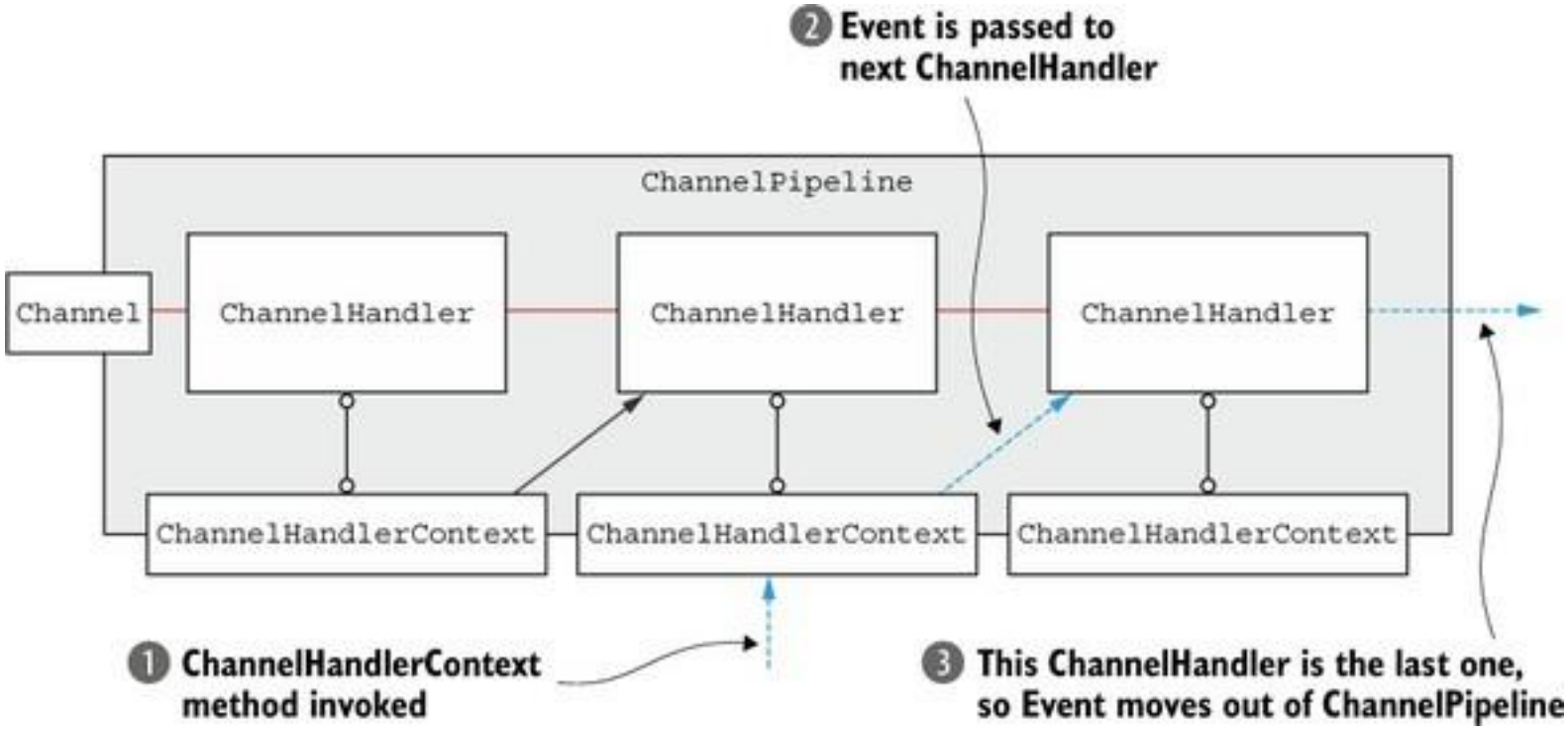
ChannelHandler, ChannelPipeline



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ChannelHandler, ChannelPipeline