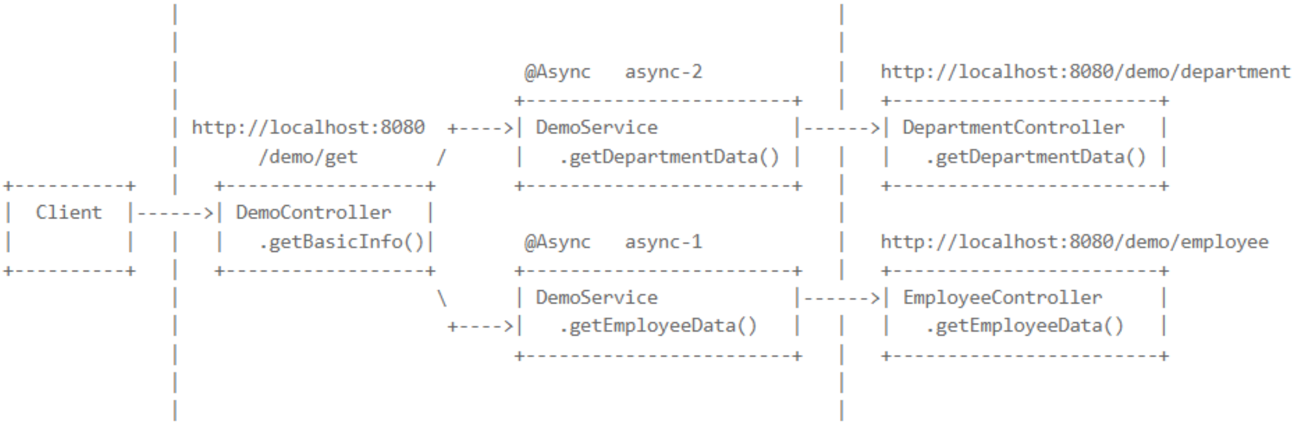
使用 Async

在程式執行過程中，若遇到某些方法的執行是和實際業務無關OR耗時等待，比如記錄日誌、發電子郵件/簡訊，建議交由其他執行續處理

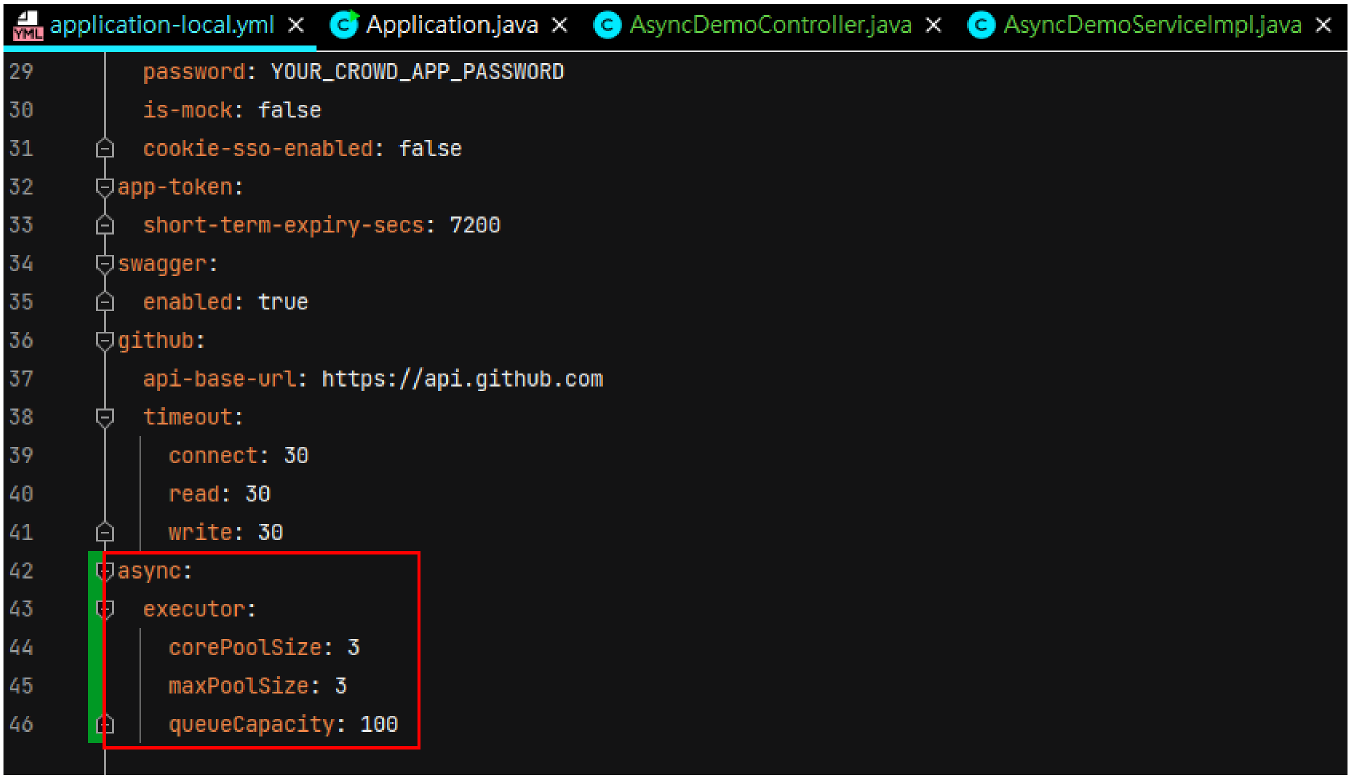
> *測試情境：啟動應用程式後，以Postman或瀏覽器對 http://localhost:8080/demo/get 發出GET請求。*
>
> *應用程式收到請求並執行後會在console印出下面結果。可以觀察到外部API分別由兩條不同的執行緒async-1及async-2非同步執行。*
>
> ```
> async-1:get employee data start
> async-2:get department data start
> async-2:get department data end
> async-1:get employee data end
> ```
>
> *如果把@Async拿掉，則在console印出下面結果，可以看到外部API都是由同一條執行緒http-nio-8080-exec-2依順序同步執行。*
>
> ```
> http-nio-8080-exec-2:get employee data start
> http-nio-8080-exec-2:get employee data end
> http-nio-8080-exec-2:get department data start
> http-nio-8080-exec-2:get department data end
> ```



```
               |                                                           |
               |                                                           |
               |                               @Async   async-2            |    http://localhost:8080/demo/department
               |                              +-------------------------+  |    +-------------------------+
               | http://localhost:8080  +---->| DemoService             |------>| DepartmentController    |
               |       /demo/get       /      |   .getDepartmentData()  |  |    |   .getDepartmentData()  |
+----------+   |   +------------------+       +-------------------------+  |    +-------------------------+
|  Client  |------>| DemoController   |                                    |
|          |   |   |   .getBasicInfo()|        @Async   async-1            |    http://localhost:8080/demo/employee
+----------+   |   +------------------+       +-------------------------+  |    +-------------------------+
               |                       \      | DemoService             |------>| EmployeeController      |
               |                        +---->|   .getEmployeeData()    |  |    |   .getEmployeeData()    |
               |                              +-------------------------+  |    +-------------------------+
               |                                                           |
               |                                                           |
```

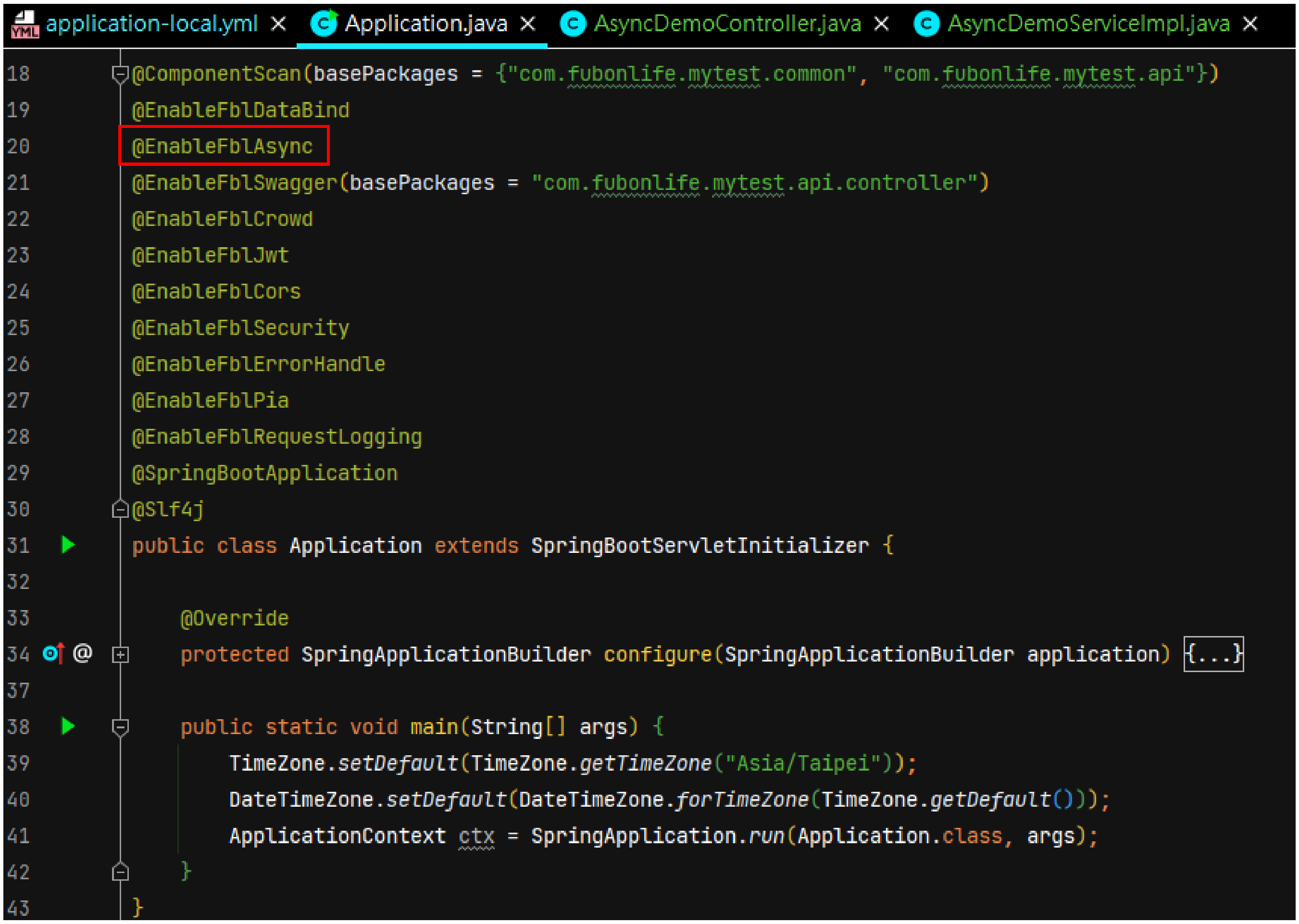
開發步驟

> *步驟一：多執行緒配置*



```yaml
  password: YOUR_CROWD_APP_PASSWORD
  is-mock: false
  cookie-sso-enabled: false
app-token:
  short-term-expiry-secs: 7200
swagger:
  enabled: true
github:
  api-base-url: https://api.github.com
  timeout:
    connect: 30
    read: 30
    write: 30
async:
  executor:
    corePoolSize: 3
    maxPoolSize: 3
    queueCapacity: 100
```

> *步驟二：在子專案的啟動類上增添一標記 @EnableFblAsync*



```
@ComponentScan(basePackages = {"com.fubonlife.mytest.common", "com.fubonlife.mytest.api"})
@EnableFblDataBind
@EnableFblAsync
@EnableFblSwagger(basePackages = "com.fubonlife.mytest.api.controller")
@EnableFblCrowd
@EnableFblJwt
@EnableFblCors
@EnableFblSecurity
@EnableFblErrorHandle
@EnableFblPia
@EnableFblRequestLogging
@SpringBootApplication
@Slf4j
public class Application extends SpringBootServletInitializer {

    @Override
    protected SpringApplicationBuilder configure(SpringApplicationBuilder application) {...}

    public static void main(String[] args) {
        TimeZone.setDefault(TimeZone.getTimeZone("Asia/Taipei"));
        DateTimeZone.setDefault(DateTimeZone.forTimeZone(TimeZone.getDefault()));
        ApplicationContext ctx = SpringApplication.run(Application.class, args);
    }
}
```

> *步驟三：開發後端API及相關Service*

- AsyncDemoController

AsyncDemoController

```
package com.fubonlife.mytest.api.controller;

import com.fubonlife.mytest.common.model.asyncdemo.BasicInfoDto;
import com.fubonlife.mytest.common.model.asyncdemo.DepartmentDataDto;
import com.fubonlife.mytest.common.model.asyncdemo.DepartmentInfo;
import com.fubonlife.mytest.common.model.asyncdemo.EmployeeDataDto;
import com.fubonlife.mytest.common.model.asyncdemo.EmployeeInfo;
import com.fubonlife.mytest.common.service.AsyncDemoService;
import io.swagger.annotations.Api;
import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.web.bind.annotation.GetMapping;
import org.springframework.web.bind.annotation.RequestMapping;
import org.springframework.web.bind.annotation.RestController;

import java.util.List;
import java.util.concurrent.CompletableFuture;
import java.util.concurrent.ExecutionException;
import java.util.stream.Collectors;

@RestController
@RequestMapping(value = "/api/async-demo")
@Api(tags = {"AsyncDemo"}, description = "")
public class AsyncDemoController {

    @Autowired
    private AsyncDemoService asyncDemoService;

    @GetMapping(value = "/list")
    public BasicInfoDto listBasicInfo() throws InterruptedException, ExecutionException {

        CompletableFuture<EmployeeDataDto> employeeDataDtoCompletableFuture = asyncDemoService.
getEmployeeData();

        CompletableFuture<DepartmentDataDto> departmentDataDtoCompletableFuture = asyncDemoService.
getDepartmentData();

        //
        CompletableFuture.allOf(
            employeeDataDtoCompletableFuture,
            departmentDataDtoCompletableFuture
        ).join();

        List<EmployeeInfo> employeeInfoList = employeeDataDtoCompletableFuture.get().getEmployeeInfoList();
        List<DepartmentInfo> departmentInfoList = departmentDataDtoCompletableFuture.get().
getDepartmentInfoList();

        return new BasicInfoDto(
            employeeInfoList.stream().map(EmployeeInfo::getName).collect(Collectors.toList()),
            departmentInfoList.stream().map(DepartmentInfo::getName).collect(Collectors.toList())
        );

    }
}
```

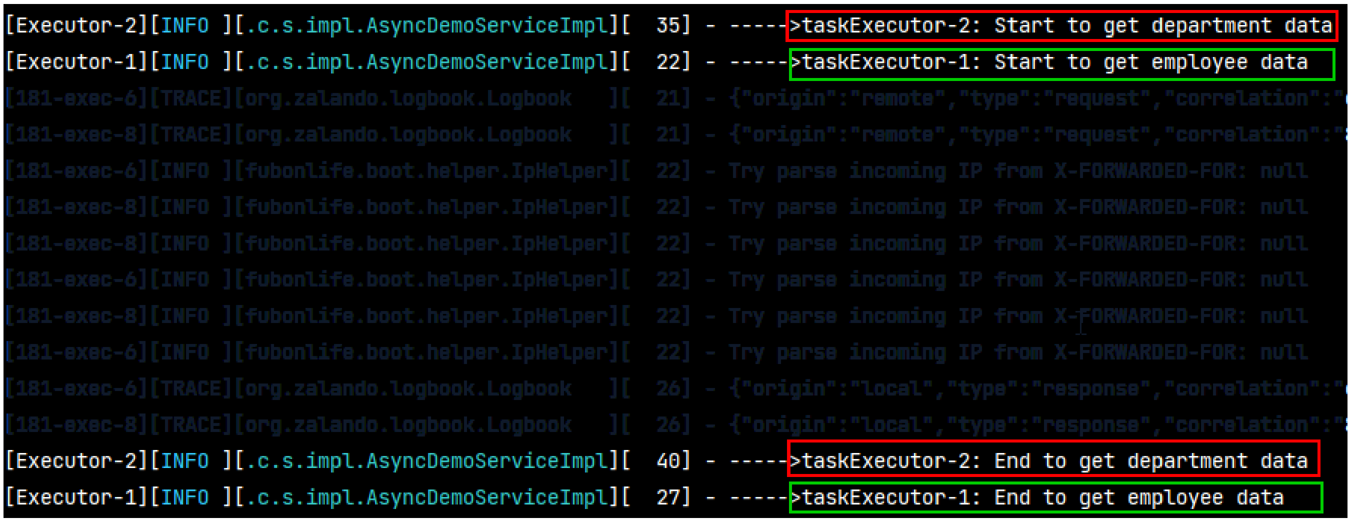
- AsyncDemoService

AsyncDemoService 實作類

```java
package com.fubonlife.mytest.common.service.impl;

import com.fubonlife.mytest.common.model.asyncdemo.DepartmentDataDto;
import com.fubonlife.mytest.common.model.asyncdemo.EmployeeDataDto;
import com.fubonlife.mytest.common.service.AsyncDemoService;
import lombok.extern.slf4j.Slf4j;
import org.springframework.scheduling.annotation.Async;
import org.springframework.stereotype.Service;
import org.springframework.web.client.RestTemplate;

import java.util.concurrent.CompletableFuture;

@Service
@Slf4j
public class AsyncDemoServiceImpl implements AsyncDemoService {

    private final RestTemplate restTemplate = new RestTemplate();

    @Async
    public CompletableFuture<EmployeeDataDto> getEmployeeData() throws InterruptedException {

        log.info("----->{}: Start to get employee data", Thread.currentThread().getName());

        EmployeeDataDto employeeDataDto = restTemplate.getForObject("http://localhost:8181/api/async-employee/list", EmployeeDataDto.class);

        Thread.sleep(2000);
        log.info("----->{}: End to get employee data", Thread.currentThread().getName());

        return CompletableFuture.completedFuture(employeeDataDto);
    }

    @Async
    public CompletableFuture<DepartmentDataDto> getDepartmentData() throws InterruptedException {

        log.info("----->{}: Start to get department data ", Thread.currentThread().getName());

        DepartmentDataDto departmentInfoDto = restTemplate.getForObject("http://localhost:8181/api/async-department/list", DepartmentDataDto.class);

        Thread.sleep(1000);
        log.info("----->{}: End to get department data", Thread.currentThread().getName());

        return CompletableFuture.completedFuture(departmentInfoDto);
    }
}
```

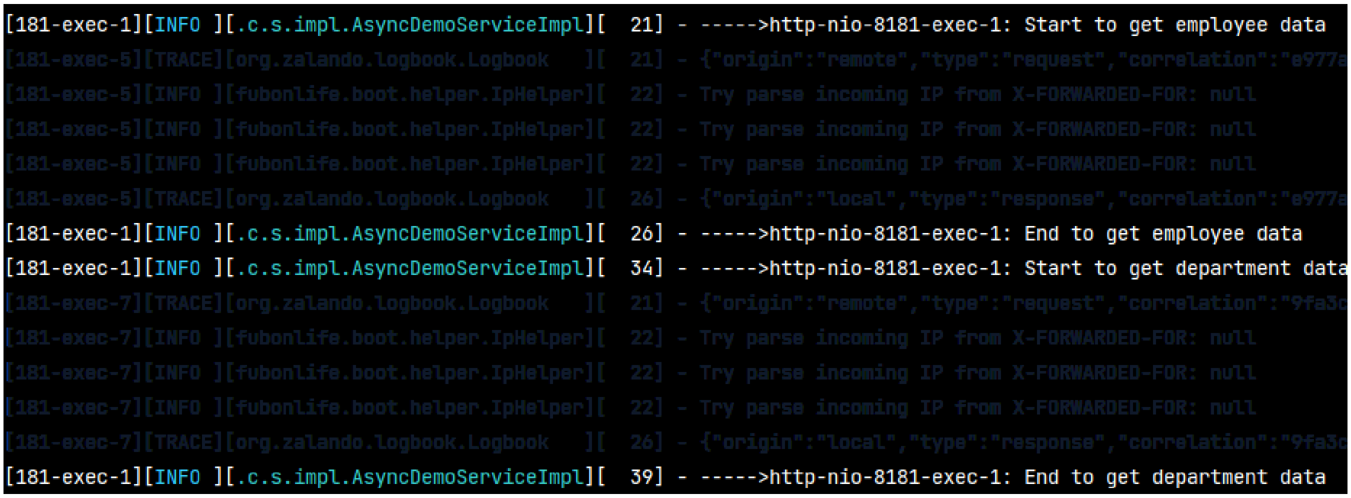
> *步驟四：以Postman或瀏覽器對後端API發出**GET**請求*

- 非同步執行成功



```
[Executor-2][INFO ][.c.s.impl.AsyncDemoServiceImpl][  35] - ----->taskExecutor-2: Start to get department data
[Executor-1][INFO ][.c.s.impl.AsyncDemoServiceImpl][  22] - ----->taskExecutor-1: Start to get employee data
[181-exec-6][TRACE][org.zalando.logbook.Logbook    ][  21] - {"origin":"remote","type":"request","correlation":"
[181-exec-8][TRACE][org.zalando.logbook.Logbook    ][  21] - {"origin":"remote","type":"request","correlation":"
[181-exec-6][INFO ][fubonlife.boot.helper.IpHelper][  22] - Try parse incoming IP from X-FORWARDED-FOR: null
[181-exec-8][INFO ][fubonlife.boot.helper.IpHelper][  22] - Try parse incoming IP from X-FORWARDED-FOR: null
[181-exec-8][INFO ][fubonlife.boot.helper.IpHelper][  22] - Try parse incoming IP from X-FORWARDED-FOR: null
[181-exec-6][INFO ][fubonlife.boot.helper.IpHelper][  22] - Try parse incoming IP from X-FORWARDED-FOR: null
[181-exec-8][INFO ][fubonlife.boot.helper.IpHelper][  22] - Try parse incoming IP from X-FORWARDED-FOR: null
[181-exec-6][INFO ][fubonlife.boot.helper.IpHelper][  22] - Try parse incoming IP from X-FORWARDED-FOR: null
[181-exec-6][TRACE][org.zalando.logbook.Logbook    ][  26] - {"origin":"local","type":"response","correlation":"
[181-exec-8][TRACE][org.zalando.logbook.Logbook    ][  26] - {"origin":"local","type":"response","correlation":"
[Executor-2][INFO ][.c.s.impl.AsyncDemoServiceImpl][  40] - ----->taskExecutor-2: End to get department data
[Executor-1][INFO ][.c.s.impl.AsyncDemoServiceImpl][  27] - ----->taskExecutor-1: End to get employee data
```

- 沒有非同步的執行結果



```
[181-exec-1][INFO ][.c.s.impl.AsyncDemoServiceImpl][  21] - ----->http-nio-8181-exec-1: Start to get employee data
[181-exec-5][TRACE][org.zalando.logbook.Logbook    ][  21] - {"origin":"remote","type":"request","correlation":"e977a
[181-exec-5][INFO ][fubonlife.boot.helper.IpHelper][  22] - Try parse incoming IP from X-FORWARDED-FOR: null
[181-exec-5][INFO ][fubonlife.boot.helper.IpHelper][  22] - Try parse incoming IP from X-FORWARDED-FOR: null
[181-exec-5][INFO ][fubonlife.boot.helper.IpHelper][  22] - Try parse incoming IP from X-FORWARDED-FOR: null
[181-exec-5][TRACE][org.zalando.logbook.Logbook    ][  26] - {"origin":"local","type":"response","correlation":"e977a
[181-exec-1][INFO ][.c.s.impl.AsyncDemoServiceImpl][  26] - ----->http-nio-8181-exec-1: End to get employee data
[181-exec-1][INFO ][.c.s.impl.AsyncDemoServiceImpl][  34] - ----->http-nio-8181-exec-1: Start to get department data
[181-exec-7][TRACE][org.zalando.logbook.Logbook    ][  21] - {"origin":"remote","type":"request","correlation":"9fa3c
[181-exec-7][INFO ][fubonlife.boot.helper.IpHelper][  22] - Try parse incoming IP from X-FORWARDED-FOR: null
[181-exec-7][INFO ][fubonlife.boot.helper.IpHelper][  22] - Try parse incoming IP from X-FORWARDED-FOR: null
[181-exec-7][INFO ][fubonlife.boot.helper.IpHelper][  22] - Try parse incoming IP from X-FORWARDED-FOR: null
[181-exec-7][TRACE][org.zalando.logbook.Logbook    ][  26] - {"origin":"local","type":"response","correlation":"9fa3c
[181-exec-1][INFO ][.c.s.impl.AsyncDemoServiceImpl][  39] - ----->http-nio-8181-exec-1: End to get department data
```