

MSA 11주차

≡ 스터디원	소현
☼ Status	Done
🔗 URL	https://github.com/SPRING-STUDY-2023/sohyeon-spring-cloud-msa/pull/7
≡ 비고	MSA Section10
📅 제출 마감일	@November 22, 2023

Microservice 간 통신

Communication Types

- Synchronous HTTP communication : 동기적인 통신
- Asynchronous communication over AMQP : AMQP를 사용한 비동기적인 통신
- Rest Template

Rest Template 사용

User Service

- Bean 등록

```
@Configuration
public class RestTemplateConfig {
    @Bean
    public RestTemplate restTemplate() {
        return new RestTemplate();
    }
}
```

- Controller 수정

```
...

@Override
public UserDto getUserById(String userId) { // GET ../users/{userId}
    UserEntity userEntity = userRepository.findById(userId)
        .orElseThrow(() -> new UsernameNotFoundException("User Not Found"));

    UserDto userDto = new ModelMapper().map(userEntity, UserDto.class);

    // List<ResponseOrder> orders = new ArrayList<>();

    /* Using as rest template */
    List<ResponseOrder> orders = getOrdersByRestTemplate(userId);

    userDto.setOrders(orders);

    return userDto;
}

...
```

```

private List<ResponseOrder> getOrdersByRestTemplate(String userId) {
    String orderUrl = String.format(Objects.requireNonNull(env.getProperty("order_service
    ResponseEntity<List<ResponseOrder>> ordersResponse = restTemplate.exchange(
        orderUrl,
        HttpMethod.GET,
        null,
        new ParameterizedTypeReference<List<ResponseOrder>>() {
        }
    );
    return ordersResponse.getBody();
}

...

```

Native File Repo

```

...

order_service:
  url: http://localhost:8000/order-service/%s/orders

```

Test

The screenshot shows a REST client interface with the following details:

- Method:** POST
- URL:** localhost:8000/user-service/users
- Body Type:** JSON
- Request Body:**

```

{
  "email": "thgus345@naver.com",
  "name": "Sohyeon Kim",
  "pwd": "test1234"
}

```
- Response:**
 - Status: 201 Created
 - Time: 832 ms
 - Size: 367 B
 - Save as example
- Response Body (Pretty):**

```

{
  "email": "thgus345@naver.com",
  "name": "Sohyeon Kim",
  "userId": "45e90c8f-e8e5-4ac9-aa8b-53b9044f4bb9"
}

```

사용자 추가

POST

localhost:8000/order-service/45e90c8f-e8e5-4ac9-aa8b-53b9044f4bb9/orders

Send

ParamsAuthorizationHeadersBodyPre-request ScriptTestsSettings

noneform-datax-www-form-urlencodedrawbinaryGraphQLJSON

```
1 {
2   ... "productId": "CATALOG_0002",
3   ... "qty": 5,
4   ... "unitPrice": 1000
5 }
```

BodyCookiesHeaders (3)Test Results

Status: 201 CreatedTime: 43 msSize: 243 BSave as example

PrettyRawPreviewVisualizeJSON

```
1 {
2   "productId": "CATALOG_0002",
3   "qty": "5",
4   "unitPrice": 1000,
5   "totalPrice": 5000,
6   "orderId": "5d8f17ae-2379-4365-b023-25a724373756"
7 }
```

상품 주문

GET

localhost:8000/user-service/users/45e90c8f-e8e5-4ac9-aa8b-53b9044f4bb9

Send

ParamsAuthorizationHeaders (1)BodyPre-request ScriptTestsSettings

TypeBearer Tok...Token

eyJhbGciOiJIUzI1NiJ9.eyJzdWIiOiI0NWU5M...

BodyCookiesHeaders (8)Test Results

Status: 200 OKTime: 129 msSize: 538 BSave as example

PrettyRawPreviewVisualizeJSON

```
1 {
2   "email": "thgus345@naver.com",
3   "name": "Sohyeon Kim",
4   "userId": "45e90c8f-e8e5-4ac9-aa8b-53b9044f4bb9",
5   "orders": [
6     {
7       "productId": "CATALOG_0002",
8       "qty": 5,
9       "unitPrice": 1000,
10      "totalPrice": 5000,
11      "createdAt": "2023-11-20T07:18:51.818+00:00",
12      "orderId": "5d8f17ae-2379-4365-b023-25a724373756"
13     }
14   ]
15 }
```

사용자 조회 : 주문 정보 조회 성공

LoadBalanced

```
@Configuration
public class RestTemplateConfig {
    @Bean
    @LoadBalanced
    public RestTemplate restTemplate() {
        return new RestTemplate();
    }
}
```

...

order_service:

```
url: http://ORDER-SERVICE/order-service/%s/orders # http://{microservice-name}/{url}
```

...

FeignClient 사용

- Feign Client → HTTP Client
 - Rest call 을 추상화 한 Spring Cloud Netflix 라이브러리
- 사용방법
 - 호출하려는 HTTP Endpoint 에 대한 Interface 를 생성
 - `@FeignClient` 선언
- Load balanced 지원

User service

- dependencies 추가

...

```
<dependency>
  <groupId>org.springframework.cloud</groupId>
  <artifactId>spring-cloud-starter-openfeign</artifactId>
</dependency>
```

...

...

```
@EnableFeignClients
public class UserServiceApplication {
```

...

- Feign Client 생성

```
@FeignClient(name = "order-service")
public interface OrderServiceClient {

    @GetMapping("/order-service/{userId}/orders")
    List<ResponseOrder> getOrders(@PathVariable String userId);
}
```

Test

- 사용자 추가

POST localhost:8000/user-service/users

Params Authorization Headers **Body** Pre-request Script Tests Settings Cookies Beautify

none form-data x-www-form-urlencoded raw binary GraphQL JSON

```
1 {
2   ... "email": "thgus345@naver.com",
3   ... "name": "Sohyeon Kim",
4 }
5
```

Body Cookies (1) Headers (8) Test Results Status: 201 Created Time: 296 ms Size: 367 B Save as example

Pretty Raw Preview Visualize JSON

```
1 {
2   "email": "thgus345@naver.com",
3   "name": "Sohyeon Kim",
4   "userId": "0e52e9e1-2a0b-468f-a1f6-98b09e26cc4b"
5 }
```

- 상품 주문

POST localhost:8000/order-service/0e52e9e1-2a0b-468f-a1f6-98b09e26cc4b/orders

Params Authorization Headers **Body** Pre-request Script Tests Settings Cookies Beautify

none form-data x-www-form-urlencoded raw binary GraphQL JSON

```
1 {
2   ... "productId": "CATALOG_0003",
3   ... "qty": 5,
4   ... "unitPrice": 1000
5 }
```

Body Cookies (1) Headers (3) Test Results Status: 201 Created Time: 51 ms Size: 243 B Save as example

Pretty Raw Preview Visualize JSON

```
1 {
2   "productId": "CATALOG_0003",
3   "qty": "5",
4   "unitPrice": 1000,
5   "totalPrice": 5000,
6   "orderId": "4f98a417-c288-4f52-ad16-e2e23f31a3a8"
7 }
```

- 사용자 조회 (주문 목록 포함)

GET localhost:8000/user-service/users/0e52e9e1-2a0b-468f-a1f6-98b09e26cc4b

Params Authorization Headers **Body** Pre-request Script Tests Settings Cookies

Type Bearer Tok... Token eyJhbGciOiJIUzI1NiJ9.eyJzdWIiOiIwZTUyZTUyZT...

Body Cookies (1) Headers (8) Test Results Status: 200 OK Time: 183 ms Size: 538 B Save as example

Pretty Raw Preview Visualize JSON

```
1 {
2   "email": "thgus345@naver.com",
3   "name": "Sohyeon Kim",
4   "userId": "0e52e9e1-2a0b-468f-a1f6-98b09e26cc4b",
5   "orders": [
6     {
7       "productId": "CATALOG_0003",
8       "qty": 5,
9       "unitPrice": 1000,
10      "totalPrice": 5000,
11      "createdAt": "2023-11-21T06:11:51.218+00:00",
12      "orderId": "4f98a417-c288-4f52-ad16-e2e23f31a3a8"
13     }
14   ]
15 }
```

FeignClient 예외 처리

User service

- 설정 파일 수정

```
...

logging:
  level:
    com.example.userservice.client: DEBUG

...
```

- 빈 등록

```
@Configuration
public class LoggerConfig {

    @Bean
    public Logger.Level feignLoggerLevel() {
        return Logger.Level.FULL;
    }
}
```

- try - catch

```
...

@Override
public UserDto getUserByUserId(String userId) {
    ...

    /* Using a feign client */
    List<ResponseOrder> orders = getOrdersByFeignClient(userId);

    ...
}

private List<ResponseOrder> getOrdersByFeignClient(String userId) {
    List<ResponseOrder> orders = null;

    /* Feign exception handling */
    try {
        orders = orderServiceClient.getOrders(userId);
    } catch (FeignException ex) {
        log.error(ex.getMessage());
    }

    return orders;
}

...
```

ErrorDecoder를 이용한 예외 처리

User service

- 빈 등록

```
@Configuration
public class DecoderConfig {

    @Bean
    public FeignErrorDecoder getFeignErrorDecoder() {
        return new FeignErrorDecoder();
    }
}
```

- FeignErrorDecoder 추가

```
public class FeignErrorDecoder implements ErrorDecoder {

    @Override
    public Exception decode(String methodKey, Response response) {
        switch (response.status()) {
            case 400 -> {
            }
            case 404 -> {
                if (methodKey.contains("getOrders")) {
                    return new ResponseStatusException(
                        HttpStatus.valueOf(response.status()),
                        "User's orders is empty.");
                }
            }
            default -> {
                return new Exception(response.reason());
            }
        }
        return null;
    }
}
```

데이터 동기화 문제

Multiple Orders Service

- Orders Service 2개 기동
 - Users 의 요청 분산 처리
 - Orders 데이터도 분산 저장 → 데이터 동기화 문제
 - 하나의 Database 사용
 - Database 간의 동기화 (Messaging Queuing server 활용)
 - Kafka Connector + DB

데이터 동기화 문제 예시

- Orders service 2개 기동
- 상품 3개 주문 → 2개의 DB에 주문 데이터가 나눠 저장됨

Run

Run Selected

Auto complete

Clear

SQL statement:

SELECT * FROM ORDERS

SELECT * FROM ORDERS;

ID	CREATED_AT	ORDER_ID	PRODUCT_ID	QTY	TOTAL_PRICE	UNIT_PRICE	USER_ID
9	2023-11-21 16:14:31.516549	db71d5c8-5707-4b15-a6ff-5c6a4a09d096	CATALOG_0002	5	5000	1000	cf3071de-89f2-44f9-9e1d-12c834f2ad72

(1 row, 4 ms)

Edit

Run

Run Selected

Auto complete

Clear

SQL statement:

SELECT * FROM ORDERS

SELECT * FROM ORDERS;

ID	CREATED_AT	ORDER_ID	PRODUCT_ID	QTY	TOTAL_PRICE	UNIT_PRICE	USER_ID
1	2023-11-21 16:14:24.339846	1d7ea80f-239c-4d60-92e8-1fd96c951065	CATALOG_0003	5	5000	1000	cf3071de-89f2-44f9-9e1d-12c834f2ad72
2	2023-11-21 16:14:51.961141	312182c0-9549-4d09-8405-3969a40482a7	CATALOG_0001	5	5000	1000	cf3071de-89f2-44f9-9e1d-12c834f2ad72

(2 rows, 3 ms)

Edit

- 사용자 조회 (주문 내역 포함) → 사용자의 주문 데이터가 번갈아서 조회됨

GET

localhost:8000/user-service/users/cf3071de-89f2-44f9-9e1d-12c834f2ad72

Send

Params

Authorization

Headers (1)

Body

Pre-request Script

Tests

Settings

Cookies

Type

Bearer Tok...

Token

eyJhbGciOiJIUzI1NiJ9.eyJzdWIiOiJZJMwNz...

Body

Cookies (1)

Headers (8)

Test Results

Status: 200 OK

Time: 270 ms

Size: 703 B

Save as example

Pretty

Raw

Preview

Visualize

JSON

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GET

localhost:8000/user-service/users/cf3071de-89f2-44f9-9e1d-12c834f2ad72

Send

Params

Authorization

Headers (1)

Body

Pre-request Script

Tests

Settings

Cookies

Type

Bearer Tok...

Token

eyJhbGciOiJIUzI1NiJ9.eyJzdWIiOiJZJMwNz...

Body

Cookies (1)

Headers (8)

Test Results

Status: 200 OK

Time: 131 ms

Size: 538 B

Save as example

Pretty

Raw

Preview

Visualize

JSON

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```
{
  "email": "thgus345@naver.com",
  "name": "Sohyeon Kim",
  "userId": "cf3071de-89f2-44f9-9e1d-12c834f2ad72",
  "orders": [
    {
      "productId": "CATALOG_0002",
      "qty": 5,
      "unitPrice": 1000,
      "totalPrice": 5000,
      "createdAt": "2023-11-21T07:14:31.516+00:00",
      "orderId": "db71d5c8-5707-4bf5-a6ff-5c6a4a09d096"
    }
  ]
}
```

Pull Request

<https://github.com/SPRING-STUDY-2023/sohyeon-spring-cloud-msa/pull/7>