SpringCloud

SpringBoot和SpringCloud关系：

- SpringBoot专注于快速方便的开发单个个体微服务
- SpringCloud是关注全局的微服务协调整理治理框架，它将SpringBoot开发的一个个单体微服务整合并管理起来，为各个微服务之间提供：配置管理，服务发现，断路由，路由，微代理，事件总线，全局锁，决策竞选，分布式会话等集成服务
- SpringBoot可以单独使用开发项目，但是SpringCloud不能单独使用，离不开SpringBoot，属于依赖关系

> 新建Maven项目，创建父项目依赖

```xml
    <dependencyManagement>
        <dependencies>
            <!--SpringCloud依赖-->
            <!-- https://mvnrepository.com/artifact/org.springframework.cloud/spring-cloud-deper
            <dependency>
                <groupId>org.springframework.cloud</groupId>
                <artifactId>spring-cloud-dependencies</artifactId>
                <version>Greenwich.SR1</version>
                <type>pom</type>
                <scope>import</scope>
            </dependency>
            <!--SpringBoot-->
            <!-- https://mvnrepository.com/artifact/org.springframework.boot/spring-boot -->
            <dependency>
                <groupId>org.springframework.boot</groupId>
                <artifactId>spring-boot-dependencies</artifactId>
                <version>2.1.4.RELEASE</version>
                <type>pom</type>
                <scope>import</scope>
            </dependency>
            <!--mysql-->
            <dependency>
                <groupId>mysql</groupId>
                <artifactId>mysql-connector-java</artifactId>
                <version>5.1.47</version>
            </dependency>
            <!--数据源-->
            <!-- https://mvnrepository.com/artifact/com.alibaba/druid -->
            <dependency>
                <groupId>com.alibaba</groupId>
                <artifactId>druid</artifactId>
                <version>1.1.0</version>
            </dependency>
            <!--SpringBoot mybatis启动器-->
            <!-- https://mvnrepository.com/artifact/org.mybatis.spring.boot/mybatis-spring-boot-
            <dependency>
                <groupId>org.mybatis.spring.boot</groupId>
                <artifactId>mybatis-spring-boot-starter</artifactId>
                <version>1.3.2</version>
            </dependency>
            <!--junit-->
            <!-- https://mvnrepository.com/artifact/junit/junit -->
            <dependency>
                <groupId>junit</groupId>
                <artifactId>junit</artifactId>
                <version>${junit.version}</version>
            </dependency>
            <!--lombok-->
            <!-- https://mvnrepository.com/artifact/org.projectlombok/lombok -->
            <dependency>
                <groupId>org.projectlombok</groupId>
                <artifactId>lombok</artifactId>
                <version>${lombok.version}</version>
            </dependency>
            <!--log4j-->
            <!-- https://mvnrepository.com/artifact/log4j/log4j -->
            <dependency>
                <groupId>log4j</groupId>
                <artifactId>log4j</artifactId>
                <version>${log4j.version}</version>
            </dependency>
            <!-- https://mvnrepository.com/artifact/ch.qos.logback/logback-core -->
            <dependency>
                <groupId>ch.qos.logback</groupId>
                <artifactId>logback-core</artifactId>
                <version>1.2.3</version>
            </dependency>
        </dependencies>
    </dependencyManagement>
```

> 创建实体类module

```
@NoArgsConstructor
@Data
@Accessors(chain = true) //链式写法
/**
 * 链式写法
 * Dept dept = new Dept();
 * dept.setdeptno().setdeptName
 */
public class Dept {
    private Long deptno;
    private String deptName;
    //一个服务对应一个数据库
    private String deptSource;

    public Dept(String deptName){
        this.deptName = deptName;
    }
}
```

Eureka

CAP理论：

- C（一致性）
- A（可用性）

- P（容错性）

Zookeeper保证的是CP;Eureka保证的是AP
Eureka可以很好的应对因网络故障导致部分节点失去联系的情况，而不会像zookeeper那样使整个注册服务瘫痪
调用微服务访问的方法：

- 微服务名字[Robbon]
- 接口和注解[feign]

> 创建eureka

- 导入eureka依赖

```
    <!-- https://mvnrepository.com/artifact/org.springframework.cloud/spring-cloud-starter-r
    <dependency>
        <groupId>org.springframework.cloud</groupId>
        <artifactId>spring-cloud-starter-netflix-eureka-server</artifactId>
    </dependency>
```

- euerka配置

```
server:
  port: 7001

# Eureka配置
eureka:
  instance:
    hostname: eureka7001.com #Eureka服务端实例的名称
  client:
    register-with-eureka: false #表示是否向eureka注册中心注册自己
    fetch-registry: false #如果为false,则表示自己为注册中心
    service-url:  #监控页面
      #单机:http://${eureka.instance.hostname}:${server.port}/eureka/
      #集群:
      defaultZone: http://eureka7002.com:7002/eureka/,http://eureka7003.com:7003/eureka/
```

- 主启动类添加注解

```
@EnableEurekaServer //服务端的启动类，可以接收别人注册进来
```

> 创建提供者

- 依赖

```xml
<dependencies>
    <!--要拿到实体类，需要配置api module-->
    <dependency>
        <groupId>com.xhh</groupId>
        <artifactId>springcloud-api</artifactId>
        <version>1.0-SNAPSHOT</version>
    </dependency>
    <dependency>
        <groupId>junit</groupId>
        <artifactId>junit</artifactId>
    </dependency>
    <dependency>
        <groupId>mysql</groupId>
        <artifactId>mysql-connector-java</artifactId>
    </dependency>
    <dependency>
        <groupId>com.alibaba</groupId>
        <artifactId>druid</artifactId>
    </dependency>
    <dependency>
        <groupId>ch.qos.logback</groupId>
        <artifactId>logback-core</artifactId>
    </dependency>
    <dependency>
        <groupId>org.mybatis.spring.boot</groupId>
        <artifactId>mybatis-spring-boot-starter</artifactId>
    </dependency>
    <dependency>
        <groupId>org.springframework.boot</groupId>
        <artifactId>spring-boot-test</artifactId>
    </dependency>
    <dependency>
        <groupId>org.springframework.boot</groupId>
        <artifactId>spring-boot-starter-web</artifactId>
    </dependency>
    <!--jetty:应用服务器-->
    <dependency>
        <groupId>org.springframework.boot</groupId>
        <artifactId>spring-boot-starter-jetty</artifactId>
    </dependency>
    <!--热部署-->
    <dependency>
        <groupId>org.springframework.boot</groupId>
        <artifactId>spring-boot-devtools</artifactId>
    </dependency>
    <dependency>
        <groupId>org.springframework.cloud</groupId>
        <artifactId>spring-cloud-starter-netflix-eureka-server</artifactId>
    </dependency>
    <!--完善监控信息-->
    <dependency>
```

```
            <groupId>org.springframework.boot</groupId>
            <artifactId>spring-boot-starter-actuator</artifactId>
        </dependency>
    </dependencies>
```

- dao层

```
@Mapper
@Repository
public interface DeptDao {
    boolean addDept(Dept dept);
    Dept queryBIyd(Long id);
    List<Dept> queryAll();
}
```

- service层
- controller层

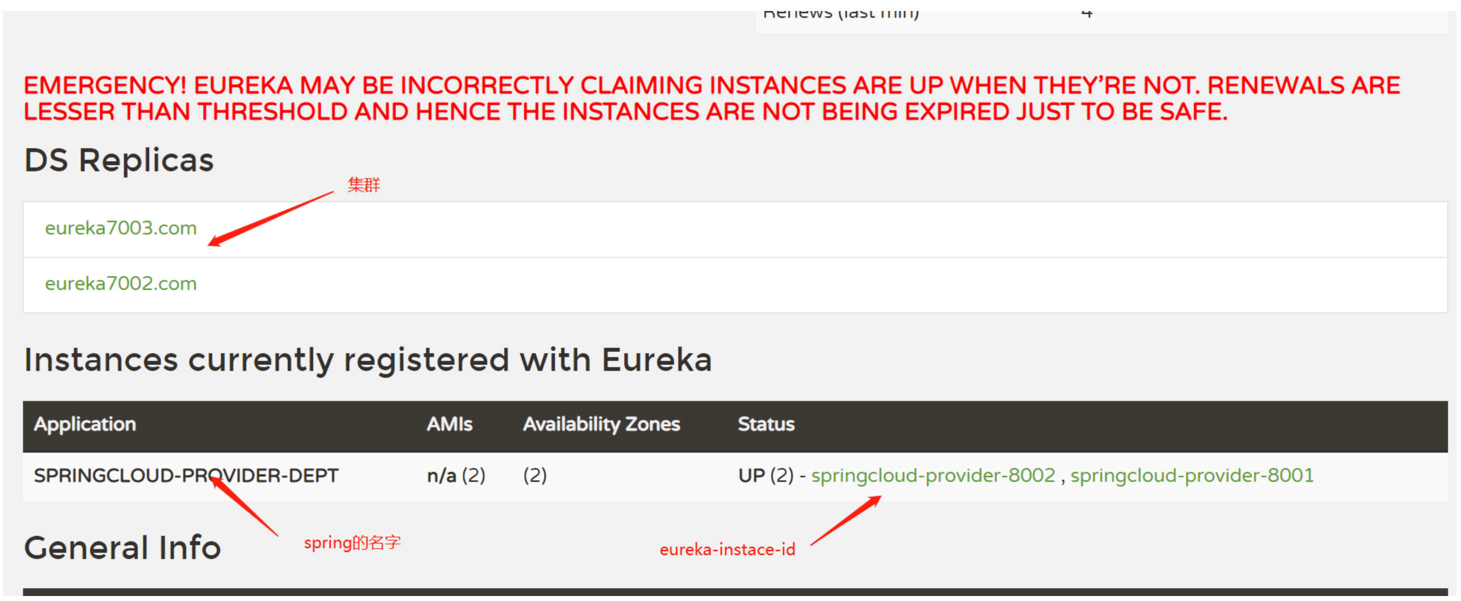
```
@RestController
public class DeptController {
    @Autowired
    private DeptService deptService;

    @PostMapping("/dept/add")
    public boolean addDept(Dept dept){
        return deptService.addDept(dept);
    }

    @GetMapping("/dept/{id}")
    public Dept queryBIyd(@PathVariable Long id){
        return deptService.queryBIyd(id);
    }

    @RequestMapping("/dept/queryAll")
    public List<Dept> queryAll() {
        return deptService.queryAll();
    }
}
```

- DeptMapper.xml
- applicaiton.yml

```yaml
server:
  port: 8001

#mybatis
mybatis:
  type-aliases-package: com.xhh.springcloud.pojo
  mapper-locations: classpath:mybatis/mapper/*.xml

#spring
spring:
  application:
    name: springcloud-provider-dept
  datasource:
    type: com.alibaba.druid.pool.DruidDataSource
    driver-class-name: com.mysql.jdbc.Driver
    url: jdbc:mysql://localhost:3306/db_01?useUnicode=true&characterEncoding=utf-8
    username: root
    password: xhh1999.02.10

#注册到Eureka中
eureka:
  client:
    service-url:
      defaultZone: http://eureka7001.com:7001/eureka/,http://eureka7002.com:7002/eureka/,http://
  instance:
    instance-id: springcloud-provider-8001
#info配置
info:
  app.name: xhh
  company.name : www.baidu.com
```

- 主配置类添加注解

```java
@EnableEurekaClient //向eureka注册扫描
```


Renews (last min) 4

EMERGENCY! EUREKA MAY BE INCORRECTLY CLAIMING INSTANCES ARE UP WHEN THEY'RE NOT. RENEWALS ARE LESSER THAN THRESHOLD AND HENCE THE INSTANCES ARE NOT BEING EXPIRED JUST TO BE SAFE.

DS Replicas

集群

eureka7003.com

eureka7002.com

Instances currently registered with Eureka

Application	AMIs	Availability Zones	Status
SPRINGCLOUD-PROVIDER-DEPT	n/a (2)	(2)	UP (2) - springcloud-provider-8002 , springcloud-provider-8001

General Info

spring的名字

eureka-instace-id

Ribbon负载均衡

SpringCloudRibbon是基于NetFixRibbon实现的一套客户端负载均衡的工具
不用导入依赖，`spring-cloud-starter-netflix-hystrix` 包含ribbon相关依赖

> 创建多个提供者,多个数据库，与提供者对应

> 创建消费者

- 创建config类

```java
@Configuration
public class ConfigBean {

    //配置负载均衡
    @Bean
    @LoadBalanced   //Ribbon
    public RestTemplate restTemplate(){
        return new RestTemplate();
    }
}
```

- controller层

```
@Controller
@ResponseBody
public class DeptConsumerController {

    //通过访问http得到数据
    @Autowired
    private RestTemplate restTemplate;//提供多种便捷访问远程http服务的方法，简单的restful模板

//    private static final String REST_URL_PREFIX = "http://localhost:8001";
    //Ribbon通过
private static final String REST_URL_PREFIX = "http://SPRINGCLOUD-PROVIDER-DEPT";
    @RequestMapping("/dept/consumer/add")
    public boolean addDept(Dept dept){
        return restTemplate.postForObject(REST_URL_PREFIX+"/dept/add",dept,boolean.class);
    }

    @RequestMapping("/dept/consumer/{id}")
    public Dept queryBIyd(@PathVariable("id") Long id){
        return restTemplate.getForObject(REST_URL_PREFIX+"/get/"+id,Dept.class);
    }

    @RequestMapping("/dept/consumer/queryAll")
    public List<Dept> queryAll() {
        return restTemplate.getForObject(REST_URL_PREFIX+"/dept/queryAll",List.class);
    }
}
```

- application.yml

```yaml
server:
  port: 8083



#eureka配置
eureka:
  client:
    register-with-eureka: false #不向eureka注册自己
    service-url:
      defaultZone: http://eureka7001.com:7001/eureka/,http://eureka7002.com:7002/eureka/,http://
```

Fegin负载均衡

在Feigin的实现下，我们只需要创建一个接口并使用注解的方式来配置它（类似于dao接口的@Mapper注解，现在是一个微服务接口上标注一个Feign注解即可）

- 导入依赖

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

- 在实体类module中添加service层,service映射链接和提供者controller映射链接相同

```
@FeignClient(value = "SPRINGCLOUD-PROVIDER-DEPT")
public interface DeptClientService {

    @RequestMapping("/dept/add")
    boolean addDept(Dept dept);

    @RequestMapping("/dept/{id}")
    Dept queryBIyd(@PathVariable("id") Long id);

    @RequestMapping("/dept/queryAll")
    List<Dept> queryAll();
}
```

- 消费者controller层

```
@Controller
@ResponseBody
public class DeptConsumerController {

    @Autowired(required = false)
    private DeptClientService deptClientService;

    @RequestMapping("/dept/consumer/add")
    public boolean addDept(Dept dept){
        return this.deptClientService.addDept(dept);
    }

    @RequestMapping("/dept/consumer/{id}")
    public Dept queryBIyd(@PathVariable("id") Long id){
        return this.deptClientService.queryBIyd(id);
    }

    @RequestMapping("/dept/consumer/queryAll")
    public List<Dept> queryAll() {
        return this.deptClientService.queryAll();
    }
}
```

- 主配置添加注解

```
@EnableFeignClients(basePackages = {"com.xhh.springcloud"})
```

Hystrix

- Hystrix是一个用于处理分布式系统的延迟和容错的开源库，在分布式系统里，许多依赖不可避免的会调用失败，比如超时，异常等，Hystrix能够保证在一个依赖出问题的情况下，不会导致整体服务失败，避免级联故障，以提高分布式系统的弹性。
- “短路由”本身是一种开关设置，当某个服务单元发生故障之后，通过断路器的故障监控（类似熔断保险丝），**向调用方法返回一个服务预期的，可处理的备选响应（fallback），而不是长时间的等待或者抛出调用方法无法处理的异常，这样就保证了服务调用方的线程不会被长时间不必要的占用**，从而避免了故障在分布式系统中的蔓延，乃至雪崩

服务熔断

导入依赖

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

- 熔断机制是对应雪崩效应的一种微服务链路保护机制
- 创建springcloud-provider-dept-hystrix-8001module
- 修改controller类

```
@RestController
public class DeptController {
    @Autowired
    private DeptService deptService;

    @GetMapping("/dept/{id}")
    @HystrixCommand(fallbackMethod = "hystrixQueryBIyd")
    public Dept queryBIyd(@PathVariable Long id){
        Dept dept = deptService.queryBIyd(id);

        if(dept == null){
            throw new RuntimeException("id==>"+id+"不存在该id");
        }
        return dept;

    }

    //备选方法
    public Dept hystrixQueryBIyd(@PathVariable("id") Long id) {
        return new Dept().setDeptno(id)
                .setDeptName("id->"+id+"没有对应的信息,null")
                .setDeptSource("no this database in MySql");
    }


}
```

- 主启动类添加注解

```
//添加对熔断的支持
//@EnableCircuitBreaker
@EnableHystrix
```

服务降级

- 在springcloud-api中service层添加 `FallbackFactory` 实现类DeptClientServiceFallbckFactory,重写create方法

```java
@Component
public class DeptClientServiceFallbackFactory implements FallbackFactory {
    public DeptClientService create(Throwable throwable) {
        return new DeptClientService() {
            public boolean addDept(Dept dept) {
                return false;
            }

            public Dept queryBIyd(Long id) {
                return new Dept()
                        .setDeptno(id)
                        .setDeptName("id==>"+id+"没有对应的信息，客户端提供了降级的信息，整个服务现在
                        .setDeptSource("没有数据");
            }

            public List<Dept> queryAll() {
                return null;
            }
        };
    }
}
```

- 在DeptClientService接口中添加注解

```java
@FeignClient(value = "SPRINGCLOUD-PROVIDER-DEPT",fallbackFactory = DeptClientServiceFallbackFact
```

- 在客户端applicaiton.yml添加配置

```yaml
#开启降级feign,hystrix
feign:
  hystrix:
    enabled: true
```

区别

> 服务熔断

服务端；某个服务超时或者异常，引起熔断

> 服务降级

客户端；从整体网站请求负载考虑，当某个服务熔断或者关闭之后，服务将不再调用，此时在客户端我们可以准备一个FallbackFactory，返回一个默认的值，整体的服务水平下降

Dashboard流监控

- 创建 `springcloud-consumer-hystrix-dashboard`
- 导入dashboard依赖

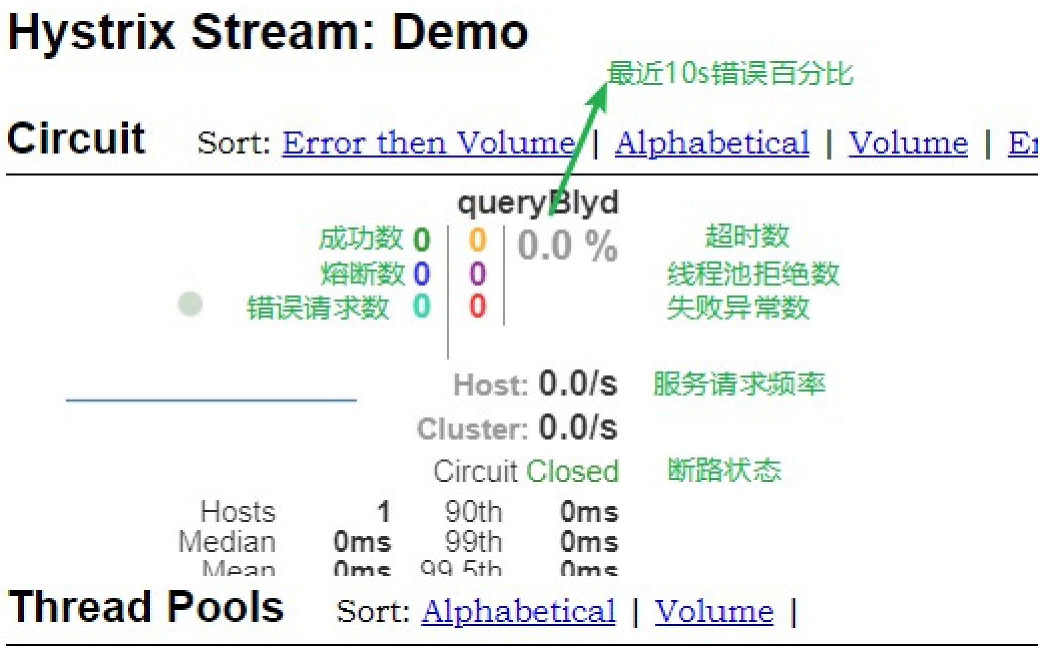
```xml
    <dependency>
        <groupId>org.springframework.cloud</groupId>
        <artifactId>spring-cloud-starter-netflix-hystrix-dashboard</artifactId>
    </dependency>
```

- application.yml配置端口号
- 编写主配置类，添加dashboard注解

```java
@SpringBootApplication
//开启dashboard
@EnableHystrixDashboard
public class DeptConsumerDashboard_9001 {
    public static void main(String[] args) {
        SpringApplication.run(DeptConsumerDashboard_9001.class,args);
    }
}
```

- 在 `sringcloud-provider-dept-hystrix-8001` 配置类中添加servlet

```java
    //增加一个servlet
    @Bean
    public ServletRegistrationBean hystrixMetricsStreamServlet(){
        ServletRegistrationBean registrationBean = new ServletRegistrationBean(new HystrixMetric
        registrationBean.addUrlMappings("/actuator/hystrix.stream");
        return  registrationBean;
    }
```



Zuul路由网关

Zuul包含了对请求的路由和过滤两个主要的功能：其中路由功能负责将外部请求转发到具体的微服务上，是实现外部访问同一入口的基础，而过滤器功能则负责对请求的处理过程进行干预，是实现请求校验，服务聚合等功能的基础。Zuul和Eureka进行整合，将Zuul自身注册成为Eureka服务治理下的应用，同时从Eureka中获得其他微服务的消息，即以后的访问微服务都是通过Zuul跳转后获得

- 创建 `springcloud-zuul-9527` 项目

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

- 创建主启动类，添加zuul注解

```
@EnableZuulProxy
```

- 配置applicaion.yml

```yaml
server:
  port: 9527

spring:
  application:
    name: springcloud-zuul

eureka:
  client:
    service-url:
      defaultZone: http://eureka7001.com:7001/eureka/,http://eureka7002.com:7002/eureka/,http://
  instance:
    instance-id: zuul9527.com

info:
  app.name: springcloudzuul
  company.name: xhh

zuul:
  routes:
    mydept.serviceId: springcloud-provider-dept
    mydept.path: /mydept/**
  ignored-services: "*"   #springcloud-provider-dept 隐藏，不能使用该路径访问 *隐藏全部
  prefix: /xhh
```

SpringCloud config分布式配置

微服务意味着要将单体应用中的业务拆分成一个个子服务，每个服务的粒度相对较小，因此系统中会出现大量的服务，由于每个服务需要配置文件，所以一套集中，动态的配置管理设施是必不可少的

> 服务端

- 新建Module `springcloud-config-server-3344`

    ```xml
    <dependency>
        <groupId>org.springframework.cloud</groupId>
        <artifactId>spring-cloud-config-server</artifactId>
    </dependency>
    ```

- application.yml文件中添加git相关配置

```yaml
server:
  port: 3344
spring:
  application:
    name: springcloud-config-server
    #连接远程仓库
  cloud:
    config:
      server:
        git:
          uri: https://gitee.com/cnuto/springcloud-config.git
          username: 13767152962
          password: xhh1999.02.10
```

- 主启动类添加注解

```java
@EnableConfigServer
```

> 客户端

- 新建module，导入依赖

```xml
        <dependency>
            <groupId>org.springframework.cloud</groupId>
            <artifactId>spring-cloud-config-client</artifactId>
        </dependency>
```

- 创建bootstrap.yml和application.yml文件
    - bootstrap.yml

```yaml
#系统级别的配置
spring:
  cloud:
    config:
      uri: http://localhost:3344
      name: config-client #需要在git上读取的资源文件名
      profile: dev
      label: master
```

- application.yml

```yaml
#用户级别的配置
spring:
  application:
    name: springcloud-config-client-3355
```

- 编写controller测试

```java
@RestController
public class ConfigClientController {
    @Value("${spring.application.name}")
    private String applicationName;

    @Value("${eureka.client.service-url.defaultZone}")
    private String eurekaServer;

    @Value("${server.port}")
    private String ports;

    @RequestMapping("/config")
    public String getConfig(){
        return "application"+applicationName+
                "eurekaServer"+eurekaServer+
                "ports"+ports;
    }
}
```

gitee上传文件application.yml和config-client.yml文件

```yaml
spring:
  profiles:
    active: dev

---

server:
  port: 8201
#spring
spring:
  profiles: dev
  application:
    name: springcloud-provider-dept

#注册到Eureka中
eureka:
  client:
    service-url:
      defaultZone: http://eureka7001.com:7001/eureka/,http://eureka7002.com:7002/eureka/,http://


---

server:
  port: 8202
#spring
spring:
  profiles: test
  application:
    name: springcloud-provider-dept

#注册到Eureka中
eureka:
  client:
    service-url:
      defaultZone: http://eureka7001.com:7001/eureka/,http://eureka7002.com:7002/eureka/,http://
```