Spring Cloud Config

Spring Cloud Config

- Review Config Mgmt
- Config Server
- Config Client
- Spring Cloud Services

Config in a Spring Context

Configuration in a Spring context can *usually* be described as values that wire up Spring beans.

Spring has provided several approaches to setting config, including externalizing (via Command Line argumments, Env Variables, etc.)

Still, gaps exist:

- Changes to config require restarts
- No audit trail
- Config is de-centralized
- No support for sensitive information (no encryption capabilities)

Config in a 12 Factor Context

12 Factor application design states that configuration should be kept in OS environment variables.

In Pivotal Cloud Foundry, this is accomplished in the following ways:

- Using the **`cf set-env`** command
- Using a manifest with **`env:`** sections

This works well for applications with less demanding configuration needs.

Challenges When Using Env. Variables

Often times we want more capabilities because of the following:

- Managing many env variables can be a challenge
- Pivotal Cloud Foundry uses immutable containers.
  - Any configuration change requires restarting the app.
  - If you want zero downtime then blue/green deployments are necessary. This may be too much overhead.

More Demanding Config Use Cases

- Changing logging levels of a running application in order to debug a production issue
- Change the number of threads receiving messages from a message broker
- Report all configuration changes made to a production system to support regulatory audits
- Toggle features on/off in a running application
- Protect secrets (such as passwords) embedded in configuration

Externalized, Versioned, Distributed, Configuration

Q: How can these new use-cases be handled?

A: Externalize configuration to a service.

Configuration Mgmt approach should support:

- Versioning
- Auditability
- Encryption
- Refresh without restart

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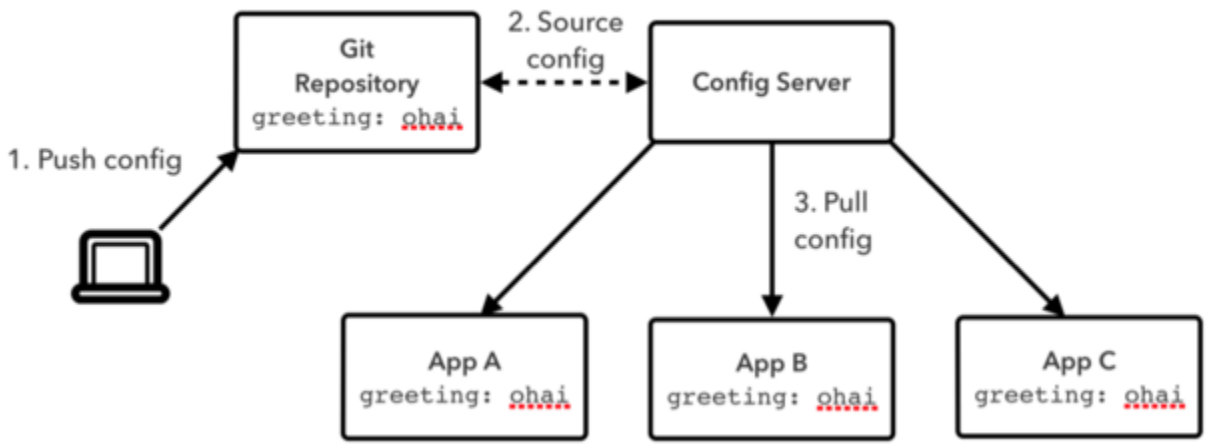
Configuration Flow



Spring Cloud Config Server

- The Server provides an HTTP, resource-based API for external configuration (name-value pairs, or equivalent YAML content).
- Bind to the Config Server and initialize Spring **`Environment`** with remote property sources
- Embeddable easily in a Spring Boot application using **`@EnableConfigServer`**
- Encrypt and decrypt property values (symmetric or asymmetric)

Include Dependency

pom.xml

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

Embedded Server

The server is easily embeddable in a Spring Boot application using the **`@EnableConfigServer`** annotation.

This app is a config server:

```
@SpringBootApplication
@EnableConfigServer
public class ConfigServer {
  public static void main(String[] args) {
    SpringApplication.run(ConfigServer.class, args);
  }
}
```

Server Config

- Application configuration data is stored in a backend
- Git, Subversion and File System backends are supported
- Git is the default backend. It's great for auditing changes and managing upgrades
- Setting the git backend is done via the **`spring.cloud.config.server.git.uri`** configuration property

Sample **`application.yml`**:

```
spring:
  cloud:
    config:
      server:
        git:
          uri: https://github.com/spring-cloud-samples/config-repo.git
```

Server Endpoints

Config server exposes config on the following endpoints:

```
/{application}/{profile}/[{label}]
/{application}-{profile}.yml
/{label}/{application}-{profile}.yml
/{application}-{profile}.properties
/{label}/{application}-{profile}.properties
```

- {application} maps to "spring.application.name" on the client side;
- {profile} maps to "spring.active.profiles" on the client (comma separated list); and
- {label} which is a server side feature labelling a "versioned" set of config files.

Configuration Files

What files do I put my configuration in?

Config files are stored in the git repository.

Example Input:

- **`spring.application.name`**=foo
- **`spring.active.profiles`**=dev

Union of all sources with overriding behavior.

Repo Files:

- **`application.yml`** - shared between all clients
- **`application-dev.yml`** - shared between all clients but profile specific (takes precedence over **`application.yml`**)
- **`foo.yml`** - app specific (takes precedence over **`application.yml`** files)
- **`foo-dev.yml`** - app and profile specific (takes precedence over **`foo.yml`**)

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Client Application

Typical Spring Configuration without Spring Cloud Config:

```
@SpringBootApplication
@RestController
public class ClientConfigApplication {

    public static void main(String[] args) {
        SpringApplication.run(ClientConfigApplication.class, args);
    }

    @Value("${greeting}") //<-- configuration injected from environment
    private String greeting;

    @RequestMapping("/greeting")
    String greeting() {
        return String.format("%s World", greeting);
    }

}
```

Include Dependency

pom.xml

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

Client Config

For Spring clients to use the configuration server, specify the **`spring.cloud.config.uri`** configuration property:

Sample **`bootstrap.yml`**

```
spring:
  cloud:
    config:
      uri: http://my-config-server.io/
```

`spring.cloud.config.uri` defaults to http://localhost:8888

Refreshable Application Components

What can be refreshed in a Spring Application?

- Loggers **`logging.level.*`**
- **`@ConfigurationProperties`** beans
- Beans with **`@RefreshScope`** annotation

@RefreshScope

Annotate bean with **@RefreshScope**:

```
@SpringBootApplication
@RestController
@RefreshScope // <-- Add RefreshScope annotation
public class ClientApplication {

    public static void main(String[] args) {
        SpringApplication.run(ClientApplication.class, args);
    }

    @Value("${greeting}")
    private String greeting;

    @RequestMapping("/greeting")
    String greeting() {
        return String.format("%s World", greeting);
    }

}
```

Refreshing Configuration

Two step process for applications getting new configuration:

1) Update Repository

2) Send a request to the application(s) to pick up new config values

Send a **`POST`** request to the refresh endpoint in the client app to fetch updated config values:

`http://127.0.0.1:8080/refresh`

Requires the **`Actuator`** dependency on the classpath (**`pom.xml`**).

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

Spring Cloud Bus

When running many applications, refreshing each one can be cumbersome.

Instead, leverage Spring Cloud Bus pub/sub notification with RabbitMQ.

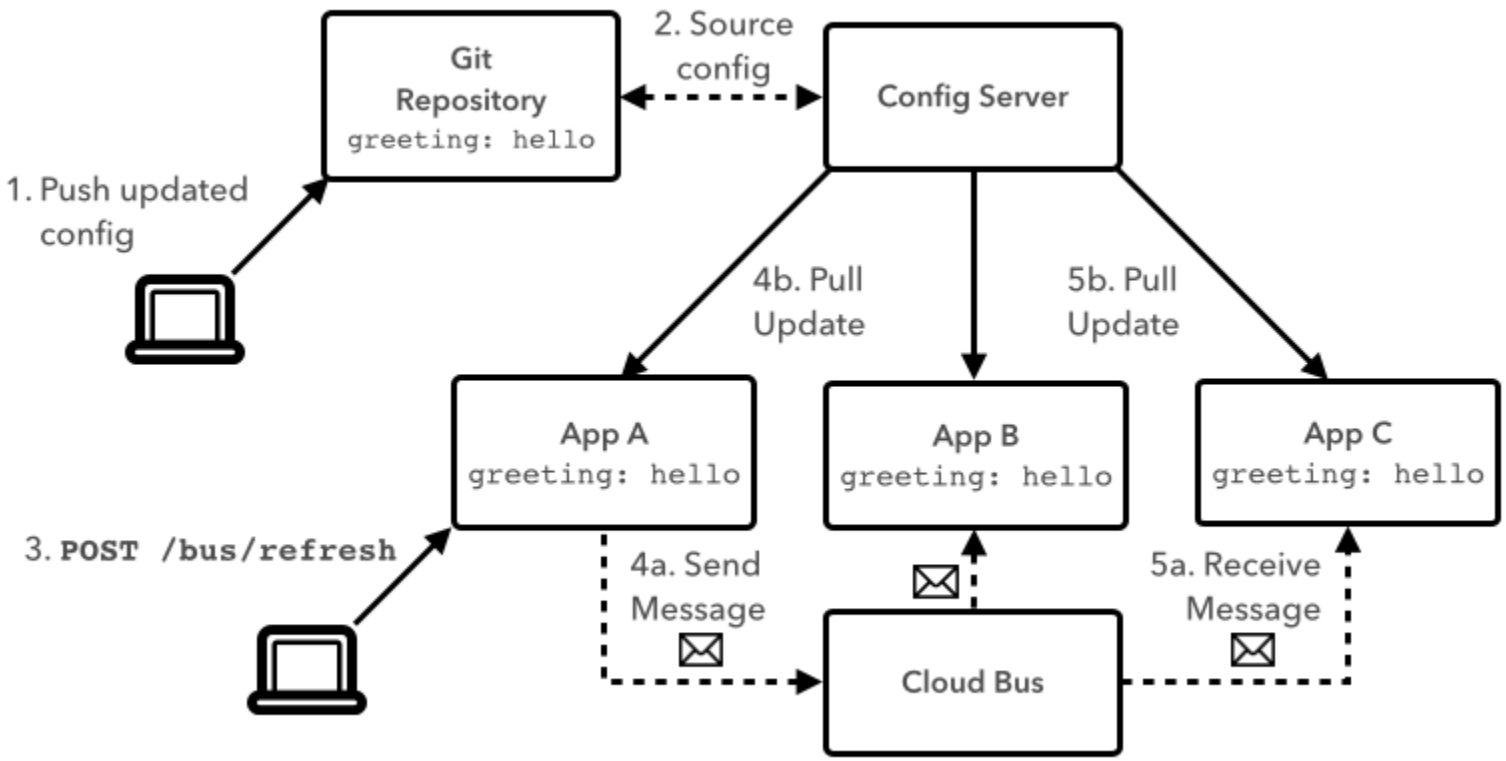
Send a POST request to the refresh endpoint to fetch updated config values:

`http://127.0.0.1:8080/bus/refresh`

Requires the **`Cloud Bus AMQP`** dependency on the classpath (**`pom.xml`**).

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

Cloud Bus Diagram



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Spring Cloud Services

- Brings Spring Cloud to Pivotal Cloud Foundry
- Includes: Config Server, Service Registry & Circuit Breaker Dashboard services

Spring Cloud Services: Config Server

1) Include dependency:

pom.xml

```
<dependency>
  <groupId>io.pivotal.spring.cloud</groupId>
  <artifactId>spring-cloud-services-starter-config-client</artifactId>
</dependency>
```

2) Create a Config Server service instance

3) Configure the service instance with a Git Repository

4) Bind the service to the app

Spring Cloud Services: Config Server

Cloud Bus in Pivotal Cloud Foundry

1) Include dependency:

pom.xml

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

2) Create a RabbitMQ service instance

3) Bind the service to the app