Spring Cloud Config

Centralized, versioned configuration management for distributed applications

Objectives

- At the end of this module, you will be able to
  - Explain what Spring Cloud Config is
  - Build and Run and Spring Cloud Config Server
  - Establish a Repository
  - Build, Run, and Configure a Client

Module Outline

- Configuration Management
  - Challenges
  - Desired Solution
- Spring Cloud Config
  - Server Side
  - Client Side
- Repository Organization

What is Application Configuration?

- Applications are more than just code
  - Connections to resources, other applications

- Usually use external configuration to adjust software behavior
  - Where resources are located
  - How to connect to the DB
  - Etc.

Configuration Options

- Package configuration files with application
  - Requires rebuild, restart
- Configuration files in common file system
  - Unavailable in cloud
- Use environment variables
  - Done differently on different platforms
  - Large # of individual variables to manage / duplicate
- Use a cloud-vendor specific solution
  - Coupling application to specific environment

Other Challenges

- Microservices → large # of dependent services
- Dynamic updates
  - Changes to services or environment variables require restage or restart
- Version control

Manual Work, Brittle

Deployment Activities

Traceablity

Desired Solution for Configuration

- Platform/Cloud-Independent solution
  - Language-independent too
- Centralized
  - Or a few discrete sources of our choosing
- Dynamic
  - Ability to update settings while an application is running
- Controllable
  - Same SCM choices we use with software
- Passive
  - Services (Applications) should do most of the work themselves by self-registering

Solution:

- Spring Cloud Config
  - Provides centralized, externalized, secured, easy-to-reach source of application configuration
- Spring Cloud Bus
  - Provides simple way to notify clients to config changes
- Spring Cloud Netflix Eureka
  - Service Discovery – Allows applications to register themselves as clients

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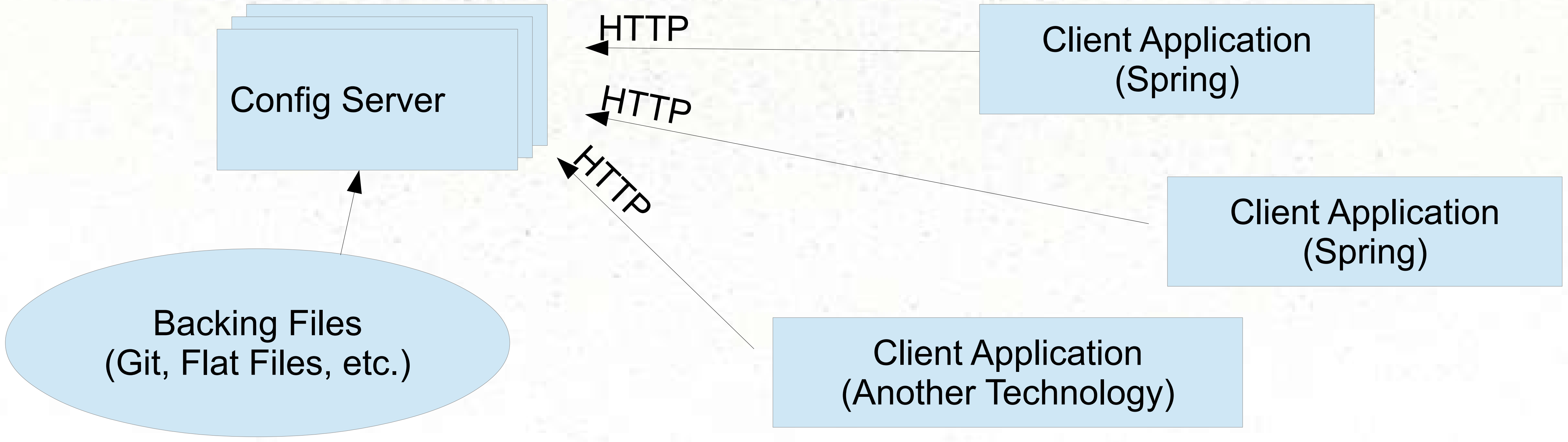
Spring Cloud Config

- Designates a centralized server to serve-up configuration information
  - Configuration itself can be backed by source control
- Clients connect over HTTP and retrieve their configuration settings
  - In addition to their own, internal sources of configuration


Config Server
HTTP
HTTP
HTTP
Client Application (Spring)
Client Application (Spring)
Client Application (Another Technology)
Backing Files (Git, Flat Files, etc.)

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Spring Cloud Config Server

- Source available at GitHub: https://github.com/spring-cloud-samples/configserver
- Or, it is reasonably easy to build your own

Spring Cloud Config Server – Building, part 1

- Include minimal dependencies in your POM (or Gradle)
  - Spring **Cloud** Starter Parent
  - Spring Cloud Config Server

```
<parent>
  <groupId>org.springframework.cloud</groupId>
  <artifactId>spring-cloud-starter-parent</artifactId>
  <version>Angel.SR4</version>
</parent>

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

Spring Cloud Config Server – Building, part 2

- application.yml – indicates location of configuration repository

```
---
spring:
  cloud:
    config:
      server:
        git:
          uri: https://github.com/kennyk65/Microservices-With-Spring-Student-Files
          searchPaths: ConfigData
```

  – ...or application.properties

Spring Cloud Config Server – Building, part 3

- Add @EnableConfigServer

```
@SpringBootApplication
@EnableConfigServer
public class Application {

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

}
```

- That's It!

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The Client Side – Building part 1

- Use the Spring **Cloud** Starter parent as a Parent POM:

```
<parent>
    <groupId>org.springframework.cloud</groupId>
    <artifactId>spring-cloud-starter-parent</artifactId>
    <version>Angel.SR4</version>
</parent>
```

- ...OR use a Dependency management section:

```
<dependencyManagement>
    <dependencies>
        <dependency>
            <groupId>org.springframework.cloud</groupId>
            <artifactId>spring-cloud-starter-parent</artifactId>
            <version>Angel.SR4</version>
            <type>pom</type>
            <scope>import</scope>
        </dependency>
    </dependencies>
</dependencyManagement>
```

The Client Side – Building Part 2

- Include the Spring **Cloud** Starter for config:

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

- Configure application name and server location in bootstrap.properties / yml
    - So it is examined early in the startup process

```
# bootstrap.properties:
spring.application.name: lucky-word
spring.cloud.config.uri: http://localhost:8001
```

- That's It!
    - Client connects at startup for additional configuration settings.

The Client Side

- How Properties work in Spring Applications
  - Spring apps have an `Environment` object
  - `Environment` object contains multiple `PropertySources`
    - Typically populated from environment variables, system properties, JNDI, developer-specified property files, etc.
  - Spring Cloud Config Client library simply adds another `PropertySource`
    - By connecting to server over HTTP
    - http://<server>:<port>/<spring.application.name>/<profile>
  - Result: Properties described by server become part of client application's environment

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EnvironmentRepository - Choices

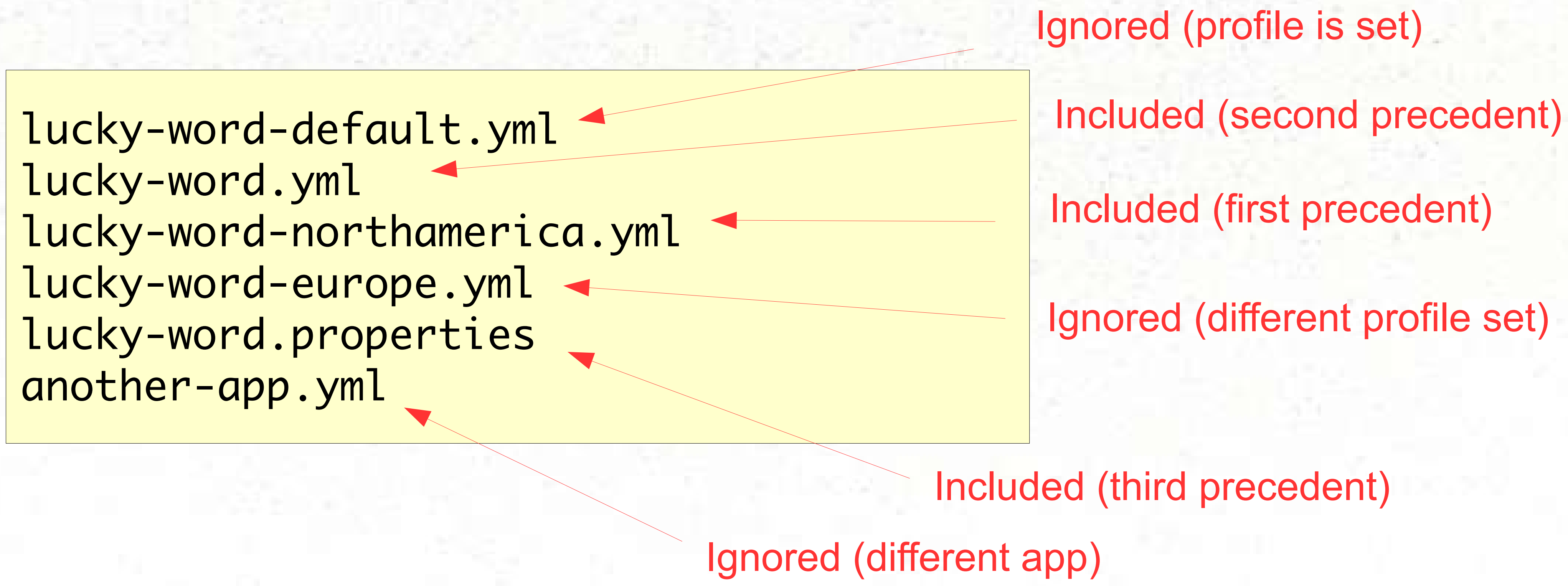
- Spring Cloud Config Server uses an `EnvironmentRepository`
  - Two implementations available: Git and Native (local files)
- Implement `EnvironmentRepository` to use other sources.

Environment Repository - Organization

- Configuration file naming convention:
  - <spring.application.name>-<profile>.yml
    - Or .properties (yml takes precedence)
  - spring.application.name – set by client application's bootstrap.yml (or .properties)
  - profile – Client's spring.profiles.active
    - (set various ways)
- Obtain settings from server:
  - http://<server>:<port>/<spring.application.name>/<profile>
  - Spring Cloud clients do this automatically on startup

Environment Repository – Organization Example

- Assume client application named “lucky-word” and profile set to “northamerica”
  - Spring client (automatically) requests
    - /lucky-word/northamerica



```
lucky-word-default.yml
lucky-word.yml
lucky-word-northamerica.yml
lucky-word-europe.yml
lucky-word.properties
another-app.yml
```

Ignored (profile is set)
Included (second precedent)
Included (first precedent)
Ignored (different profile set)
Included (third precedent)
Ignored (different app)

.yml vs .properties

- Settings can be stored in either YAML or standard Java properties files
  - Both have advantages
  - Config server will favor .yml over .properties

```
# .properties file
spring.config.name=aaa
spring.config.location=bbb
spring.profiles.active=ccc
spring.profiles.include=ddd
some.other.property=fff
```

```
# .yml file
---
spring:
  config:
    name: aaa
    location: bbb
  profiles:
    active: ccc
    include: ddd
some.other.property: fff
```

Profiles

- YAML Format can hold multiple profiles in a single file

```
# lucky-word-east.properties
lucky-word: Clover
```

```
# lucky-word-west.properties
lucky-word: Rabbit's Foot
```

```
# luckyword.yml
---
spring:
  profiles: east
lucky-word: Clover

---
spring:
  profiles: west
lucky-word: Rabbit's Foot
```

What about non-Java / non-Spring Clients?

- Spring Cloud Server exposes properties over simple HTTP interface
  - http://<server>:<port>/<spring.application.name>/<profile>
- Reasonably easy to call server from any application
  - Just not as automated as Spring.

What if the Config Server is Down?

- Spring Cloud Config Server should typically run on several instances
  - So downtime should be a non-issue
- Client application can control policy of how to handle missing config server
  - spring.cloud.config.failFast=true
  - Default is false
- Config Server settings override local settings
  - Strategy: provide local fallback settings.

Summary

- Spring Cloud Config offers centralized, versioned configuration for distributed applications
- Spring Cloud Config Server – Easy to Build
  - Backed by repository (Git or native) with .yml or .properties
- Spring Cloud Config Client –
  - Accesses Server, adds another PropertySource

Exercise

Setup your own Spring Cloud
Config Server, Client, and Repository

Instructions: Student Files, Lab 3