Spring Boot File upload with Multipart File

In this lab, I will show you how to upload and download files with a Spring Boot Rest APIs to/from a static folder. We also use Spring Web `MultipartFile` interface to handle HTTP multi-part requests.

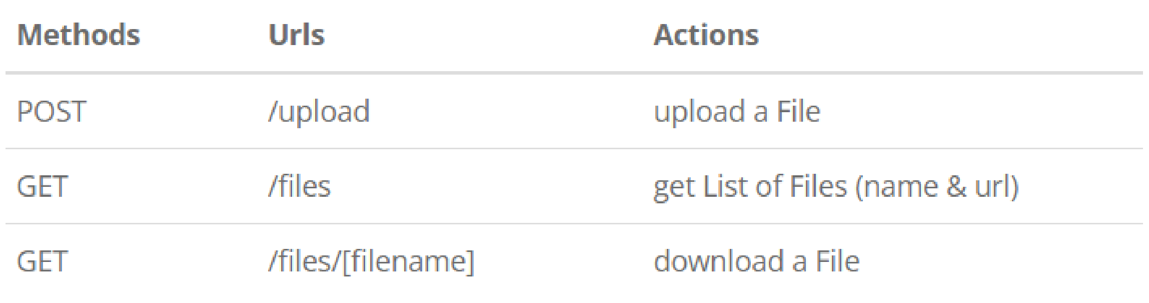
Contents

[Spring Boot Rest APIs for uploading Files]

Our Spring Boot Application will provide APIs for:

- uploading File to a static folder in the Server
- downloading File from server with the link
- getting list of Files' information (file name & url)

These are APIs to be exported:



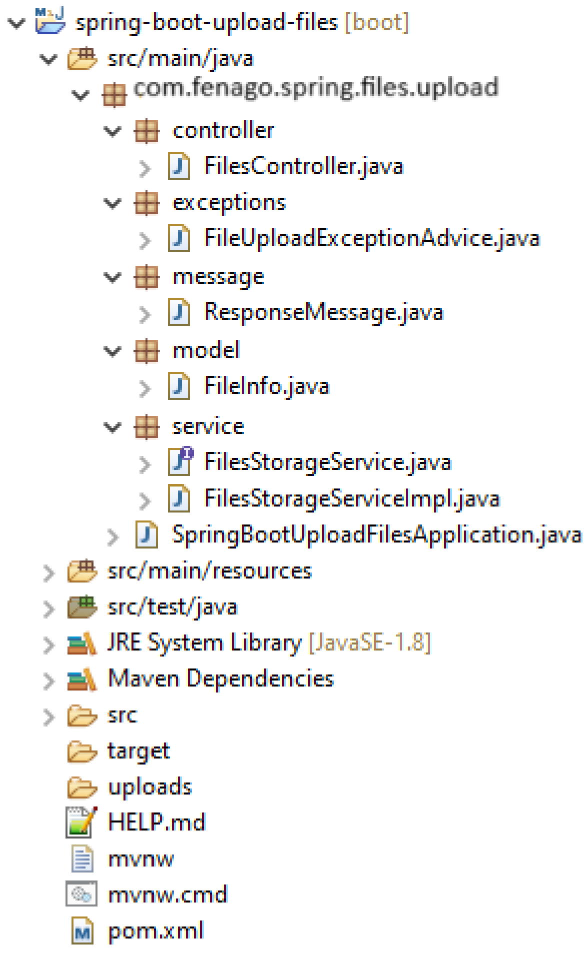
Methods	Urls	Actions
POST	/upload	upload a File
GET	/files	get List of Files (name & url)
GET	/files/[filename]	download a File

There is also the static folder that stores all uploaded files.

[Technology]

- Java 17
- Spring Boot 3 / 2 (with Spring Web MVC)
- Maven

[Project Structure]



```
spring-boot-upload-files [boot]
  src/main/java
    com.fenago.spring.files.upload
      controller
        FilesController.java
      exceptions
        FileUploadExceptionAdvice.java
      message
        ResponseMessage.java
      model
        FileInfo.java
      service
        FilesStorageService.java
        FilesStorageServiceImpl.java
      SpringBootUploadFilesApplication.java
  src/main/resources
  src/test/java
  JRE System Library [JavaSE-1.8]
  Maven Dependencies
  src
  target
  uploads
  HELP.md
  mvnw
  mvnw.cmd
  pom.xml
```

Let me explain it briefly.

-- `FileInfo` contains information of the uploaded file.
-- `FilesStorageService` helps us to initialize storage, save new file, load file, get list of Files' info, delete all files.
-- `FilesController` uses `FilesStorageService` to export Rest APIs: POST a file, GET all files' information, download a File.
-- `FileUploadExceptionAdvice` handles exception when the controller processes file upload.
-- *application.properties* contains configuration for Servlet Multipart.
-- *uploads* is the static folder for storing files.
-- *pom.xml* for Spring Boot dependency.

Setup Spring Boot project

Starter project is available at following path for this lab:

```
cd /workspace/angular-advanced-springboot/labs/lab2/spring-boot-starter-upload-
multipart-files

mvn install
```

[Create Service for File Storage]

First we need an interface that will be autowired in the Controller.
In *service* folder, create `FilesStorageService` interface like following code:

service/FilesStorageService.java

```
package com.fenago.spring.files.upload.service;

import java.nio.file.Path;
import java.util.stream.Stream;

import org.springframework.core.io.Resource;
import org.springframework.web.multipart.MultipartFile;

public interface FilesStorageService {
  public void init();

  public void save(MultipartFile file);

  public Resource load(String filename);

  public boolean delete(String filename);

  public void deleteAll();

  public Stream<Path> loadAll();
}
```

Now we create implementation of the interface.

service/FilesStorageServiceImpl.java

```
package com.fenago.spring.files.upload.service;

import java.io.IOException;
import java.net.MalformedURLException;
import java.nio.file.FileAlreadyExistsException;
import java.nio.file.Files;
import java.nio.file.Path;
import java.nio.file.Paths;
import java.util.stream.Stream;

import org.springframework.core.io.Resource;
import org.springframework.core.io.UrlResource;
import org.springframework.stereotype.Service;
import org.springframework.util.FileSystemUtils;
import org.springframework.web.multipart.MultipartFile;

@Service
public class FilesStorageServiceImpl implements FilesStorageService {

  private final Path root = Paths.get("uploads");

  @Override
  public void init() {
    try {
      Files.createDirectories(root);
    } catch (IOException e) {
      throw new RuntimeException("Could not initialize folder for upload!");
    }
  }

  @Override
  public void save(MultipartFile file) {
    try {
      Files.copy(file.getInputStream(),
this.root.resolve(file.getOriginalFilename()));
    } catch (Exception e) {
      if (e instanceof FileAlreadyExistsException) {
        throw new RuntimeException("A file of that name already exists.");
      }

      throw new RuntimeException(e.getMessage());
    }
  }

  @Override
  public Resource load(String filename) {
    try {
      Path file = root.resolve(filename);
      Resource resource = new UrlResource(file.toUri());

      if (resource.exists() || resource.isReadable()) {
        return resource;
      } else {
        throw new RuntimeException("Could not read the file!");
      }
    } catch (MalformedURLException e) {
      throw new RuntimeException("Error: " + e.getMessage());
    }
  }

  @Override
  public boolean delete(String filename) {
    try {
      Path file = root.resolve(filename);
      return Files.deleteIfExists(file);
    } catch (IOException e) {
      throw new RuntimeException("Error: " + e.getMessage());
    }
  }

  @Override
  public void deleteAll() {
    FileSystemUtils.deleteRecursively(root.toFile());
  }
  @Override
  public Stream<Path> loadAll() {
    try {
      return Files.walk(this.root, 1).filter(path ->
!path.equals(this.root)).map(this.root::relativize);
    } catch (IOException e) {
      throw new RuntimeException("Could not load the files!");
    }
  }

}
```

[Define Data Models]

Let's create `FileInfo` model which has fields: `name` & `url`.

model/FileInfo.java

```
package com.fenago.spring.files.upload.model;

public class FileInfo {
  private String name;
  private String url;

  public FileInfo(String name, String url) {
    this.name = name;
    this.url = url;
  }

  public String getName() {
    return this.name;
  }

  public void setName(String name) {
    this.name = name;
  }

  public String getUrl() {
    return this.url;
  }

  public void setUrl(String url) {
    this.url = url;
  }
}
```

[Define Response Message]

The `ResponseMessage` is for message to client that we're gonna use in Rest Controller and Exception Handler.

message/ResponseMessage.java

```
package com.fenago.spring.files.upload.message;

public class ResponseMessage {
  private String message;

  public ResponseMessage(String message) {
    this.message = message;
  }

  public String getMessage() {
    return message;
  }

  public void setMessage(String message) {
    this.message = message;
  }

}
```

[Create Controller for upload & download Files]

In **controller** package, we create `FilesController`.

controller/FilesController.java

```
package com.fenago.spring.files.upload.controller;

import java.util.List;
import java.util.stream.Collectors;

import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.core.io.Resource;
import org.springframework.http.HttpHeaders;
import org.springframework.http.HttpStatus;
import org.springframework.http.ResponseEntity;
import org.springframework.stereotype.Controller;
import org.springframework.web.bind.annotation.CrossOrigin;
import org.springframework.web.bind.annotation.DeleteMapping;
import org.springframework.web.bind.annotation.GetMapping;
import org.springframework.web.bind.annotation.PathVariable;
import org.springframework.web.bind.annotation.PostMapping;
import org.springframework.web.bind.annotation.RequestParam;
import org.springframework.web.multipart.MultipartFile;
import org.springframework.web.servlet.mvc.method.annotation.MvcUriComponentsBuilder;

import com.fenago.spring.files.upload.message.ResponseMessage;
import com.fenago.spring.files.upload.model.FileInfo;
import com.fenago.spring.files.upload.service.FilesStorageService;

@Controller
@CrossOrigin(origins = "*")
public class FilesController {
  @Autowired
  FilesStorageService storageService;

  @PostMapping("/upload")
  public ResponseEntity<ResponseMessage> uploadFile(@RequestParam("file")
MultipartFile file) {
    String message = "";
    try {
      storageService.save(file);

      message = "Uploaded the file successfully: " + file.getOriginalFilename();
      return ResponseEntity.status(HttpStatus.OK).body(new ResponseMessage(message));
    } catch (Exception e) {
      message = "Could not upload the file: " + file.getOriginalFilename() + ". Error:
" + e.getMessage();
      return ResponseEntity.status(HttpStatus.EXPECTATION_FAILED).body(new
ResponseMessage(message));
    }
  }

  @GetMapping("/files")
  public ResponseEntity<List<FileInfo>> getListFiles() {
    List<FileInfo> fileInfos = storageService.loadAll().map(path -> {
      String filename = path.getFileName().toString();
      String url = MvcUriComponentsBuilder
          .fromMethodName(FilesController.class, "getFile",
path.getFileName().toString()).build().toString();

      return new FileInfo(filename, url);
    }).collect(Collectors.toList());

    return ResponseEntity.status(HttpStatus.OK).body(fileInfos);
  }

  @GetMapping("/files/{filename:.+}")
  public ResponseEntity<Resource> getFile(@PathVariable String filename) {
    Resource file = storageService.load(filename);
    return ResponseEntity.ok()
        .header(HttpHeaders.CONTENT_DISPOSITION, "attachment; filename=\"" +
file.getFilename() + "\"").body(file);
  }

  @DeleteMapping("/files/{filename:.+}")
  public ResponseEntity<ResponseMessage> deleteFile(@PathVariable String filename) {
    String message = "";

    try {
      boolean existed = storageService.delete(filename);

      if (existed) {
        message = "Delete the file successfully: " + filename;
        return ResponseEntity.status(HttpStatus.OK).body(new
ResponseMessage(message));
      }

      message = "The file does not exist!";
      return ResponseEntity.status(HttpStatus.NOT_FOUND).body(new
ResponseMessage(message));
    } catch (Exception e) {
      message = "Could not delete the file: " + filename + ". Error: " +
e.getMessage();
      return ResponseEntity.status(HttpStatus.INTERNAL_SERVER_ERROR).body(new
ResponseMessage(message));
    }
  }
}
```

-- `@CrossOrigin` is for configuring allowed origins.
-- `@Controller` annotation is used to define a controller.
-- `@GetMapping` and `@PostMapping` annotation is for mapping HTTP GET & POST requests onto specific handler methods:

- POST /upload: `uploadFile()`
- GET /files: `getListFiles()`
- GET /files/[filename]: `getFile()`

-- We use `@Autowired` to inject implementation of `FilesStorageService` bean to local variable.

[Configure Multipart File for Servlet]

Let's define the maximum file size that can be uploaded in *application.properties* as following:

```
spring.servlet.multipart.max-file-size=500KB
spring.servlet.multipart.max-request-size=500KB
```

-- `spring.servlet.multipart.max-file-size`: max file size for each request.
-- `spring.servlet.multipart.max-request-size`: max request size for a multipart/form-data.

[Handle File Upload Exception]

This is where we handle the case in that a request exceeds Max Upload Size. The system will throw `MaxUploadSizeExceededException` and we're gonna use `@ControllerAdvice` with `@ExceptionHandler` annotation for handling the exceptions.

exception/FileUploadExceptionAdvice.java

```
package com.fenago.spring.files.upload.exception;

import org.springframework.web.multipart.MaxUploadSizeExceededException;
import
org.springframework.web.servlet.mvc.method.annotation.ResponseEntityExceptionHandler;

import com.fenago.spring.files.upload.message.ResponseMessage;
import org.springframework.http.HttpStatus;
import org.springframework.http.ResponseEntity;
import org.springframework.web.bind.annotation.ControllerAdvice;
import org.springframework.web.bind.annotation.ExceptionHandler;

@ControllerAdvice
public class FileUploadExceptionAdvice extends ResponseEntityExceptionHandler {

  @ExceptionHandler(MaxUploadSizeExceededException.class)
  public ResponseEntity<ResponseMessage>
handleMaxSizeException(MaxUploadSizeExceededException exc) {
    return ResponseEntity.status(HttpStatus.EXPECTATION_FAILED).body(new
ResponseMessage("File too large!"));
  }
}
```

[Initialize Storage]

We need to run `init()` method of `FilesStorageService` (and also `deleteAll()` if necessary). So open *SpringBootUploadFilesApplication.java* and implement `CommandLineRunner` for `run()` method like this:

```
package com.fenago.spring.files.upload;

// import javax.annotation.Resource; // for Spring Boot 2
import jakarta.annotation.Resource;

import org.springframework.boot.CommandLineRunner;
import org.springframework.boot.SpringApplication;
import org.springframework.boot.autoconfigure.SpringBootApplication;

import com.fenago.spring.files.upload.service.FilesStorageService;

@SpringBootApplication
public class SpringBootUploadFilesApplication implements CommandLineRunner {
  @Resource
  FilesStorageService storageService;

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

  @Override
  public void run(String... arg) throws Exception {
//    storageService.deleteAll();
    storageService.init();
  }
}
```

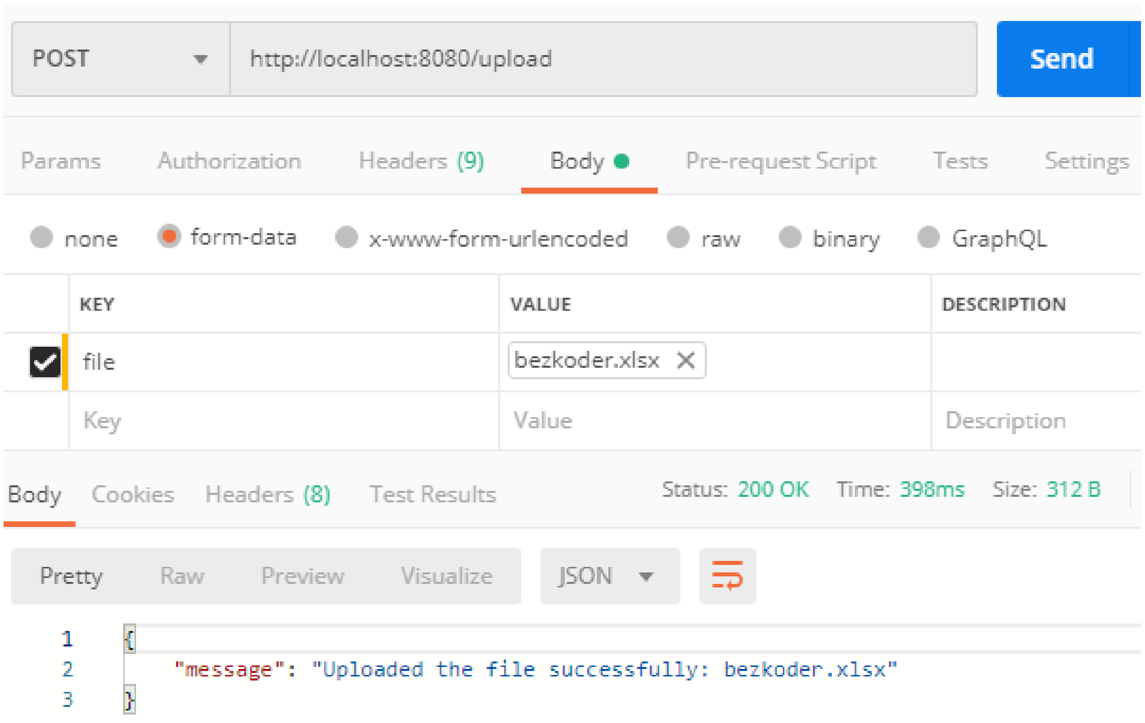
Run & Test

Run Spring Boot application with command: `mvn spring-boot:run`.
Refresh the project directory and you will see *uploads* folder inside it.

Let's use **Postman** to make some requests. You will need to use Gitpod URL port 8080 to access the spring boot server:

`https://8080-YOUR_GITPOD_URL.gitpod.io`

-- Upload some files:



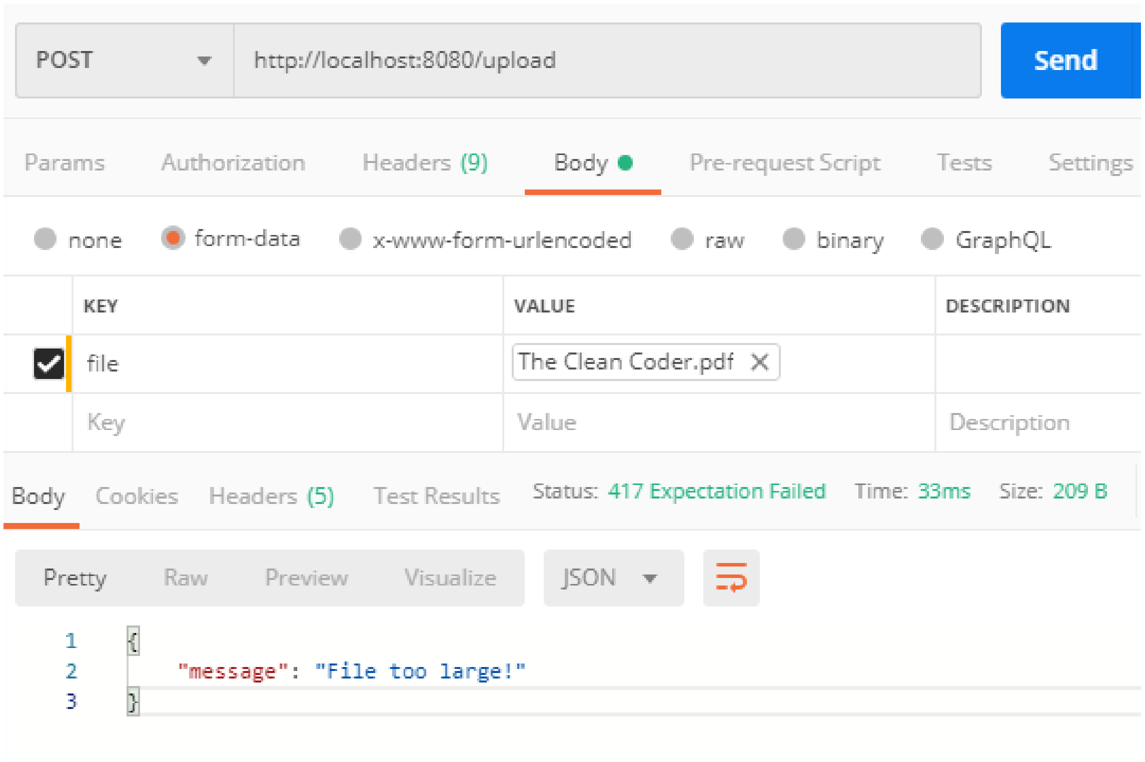
http://localhost:8080/upload

	KEY	VALUE	DESCRIPTION
✓	file	bezkoder.xlsx	
	Key	Value	Description

Status: 200 OK Time: 398ms Size: 312 B

```
{
    "message": "Uploaded the file successfully: bezkoder.xlsx"
}
```

-- Upload a file with size larger than max file size (500KB):


POST http://localhost:8080/upload

Body: form-data

KEY	VALUE	DESCRIPTION
file	The Clean Coder.pdf	

Status: 417 Expectation Failed Time: 33ms Size: 209 B

```
{
    "message": "File too large!"
}
```

-- Check **uploads** folder inside the sprign boot directory to see files.

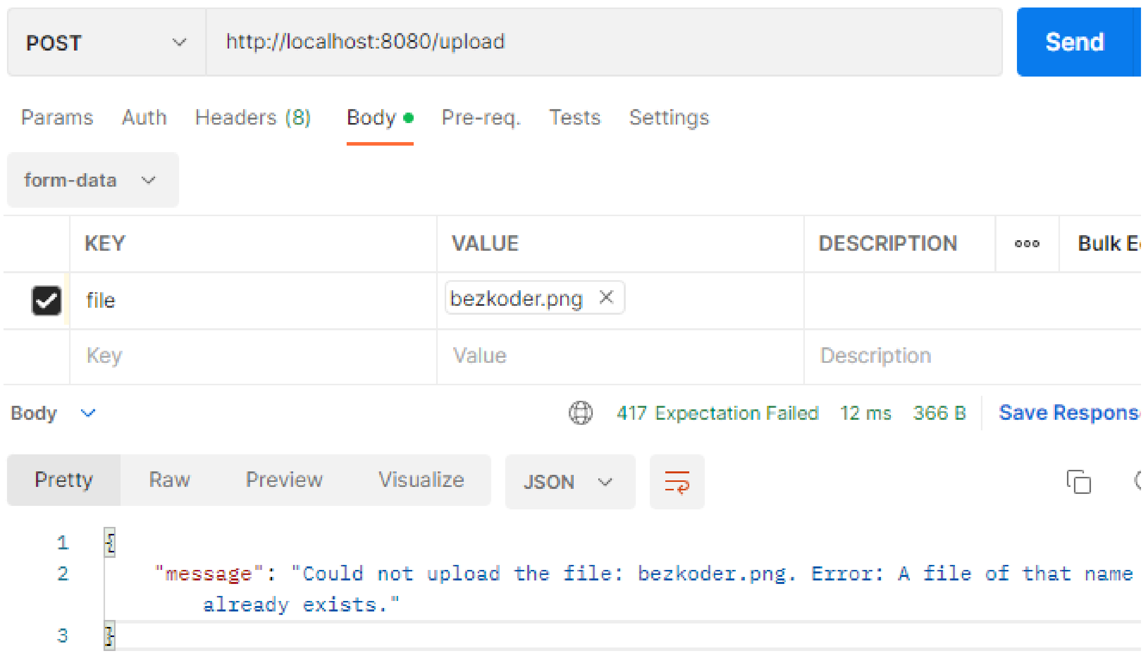
-- Retrieve list of Files' information:

For example: `https://8080-YOUR_GITPOD_URL.gitpod.io/files`

-- Now you can download any file from one of the paths above.

For example: `https://8080-YOUR_GITPOD_URL.gitpod.io/files/YOUR_FILE_NAME`

-- If you upload a file that the file name already exists:



POST http://localhost:8080/upload

KEY	VALUE	DESCRIPTION
file	bezkoder.png	
Key	Value	Description

417 Expectation Failed 12 ms 366 B

```
{
    "message": "Could not upload the file: bezkoder.png. Error: A file of that name
        already exists."
}
```

Lab Solution

Complete lab solution for this lab is also available in the lab environment. Run Spring Boot Server as shown below:

```
cd /workspace/angular-advanced-springboot/labs/lab2/spring-boot-upload-multipart-files

mvn spring-boot:run
```

Conclusion

In this lab, we've learned how to create Spring Boot File Upload Rest Api Application to upload multipart files and get files information with static folder via Restful API.

In the next lab, we will develop Angular frontend to upload files on spring boot server.