Research & Development Team

Microservices with Spring Boot

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Software

INSTALLATION

การติดตั้ง

JDK 8

การติดตั้ง JDK 8

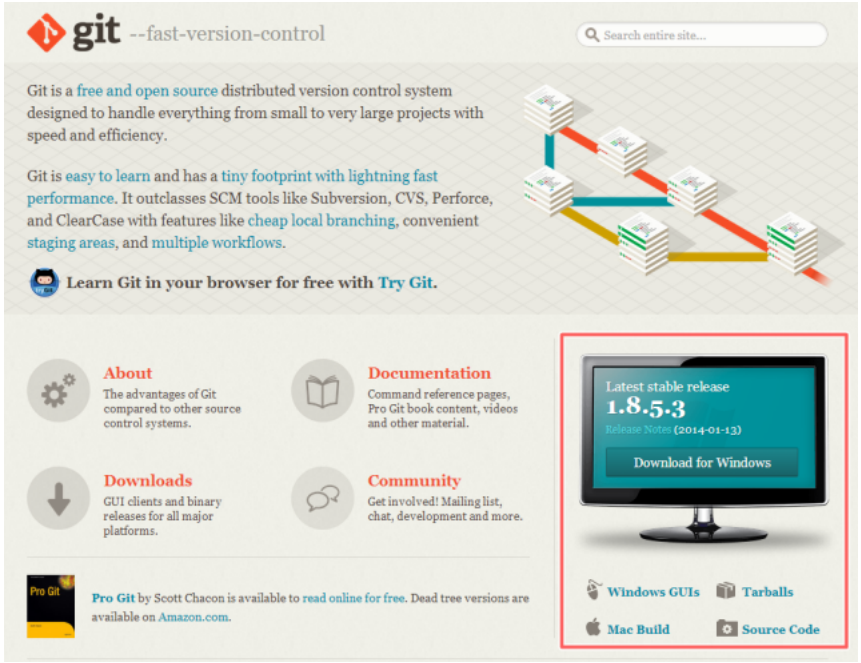
- download JDK 8 จาก link ดังนี้
  - http://www.oracle.com/technetwork/java/javase/downloads/jdk8-downloads-2133151.html
- ติดตั้งตามขั้นตอนไปจนสิ้นสุดการติดตั้ง
  - ทดสอบการติดตั้งโดยการ Check java version
  - java –version

การติดตั้ง

GIT FOR WINDOWS

การติดตั้ง GIT สำหรับ Windows

- เข้า website https://git-scm.com/downloads
- เลือก Download Git เพื่อติดตั้งบน Windows

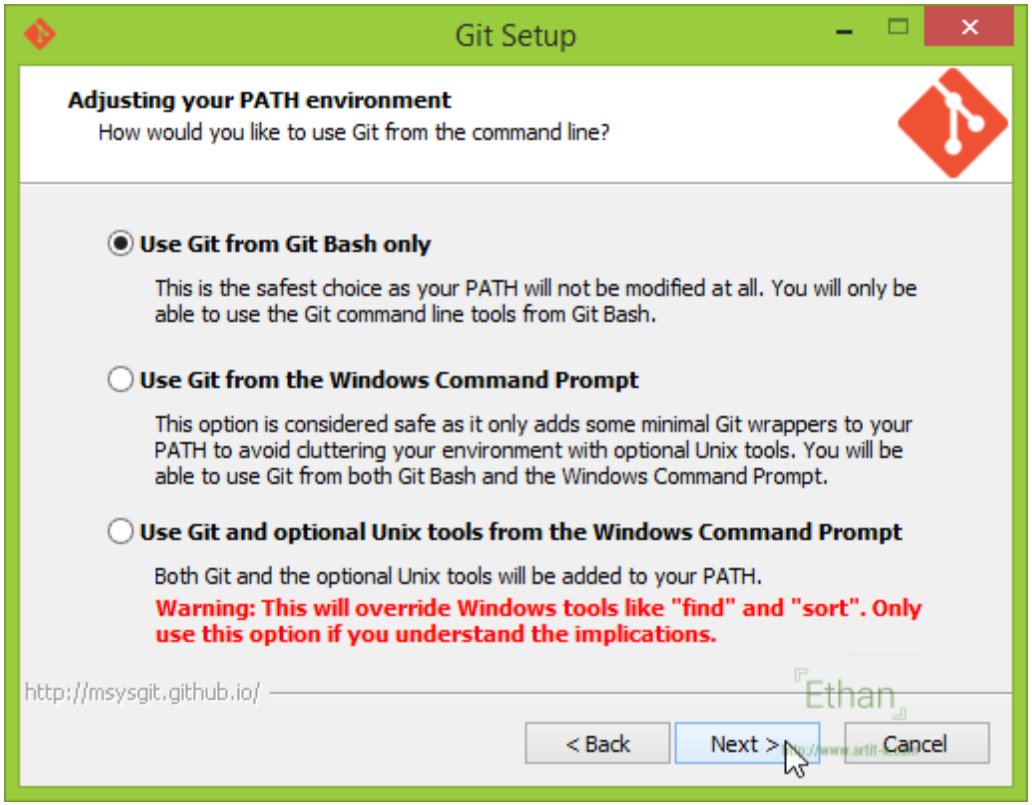


การติดตั้ง GIT สำหรับ Windows #2

- ติดตั้งโดยใช้สิทธิ Administrator ในการติดตั้ง

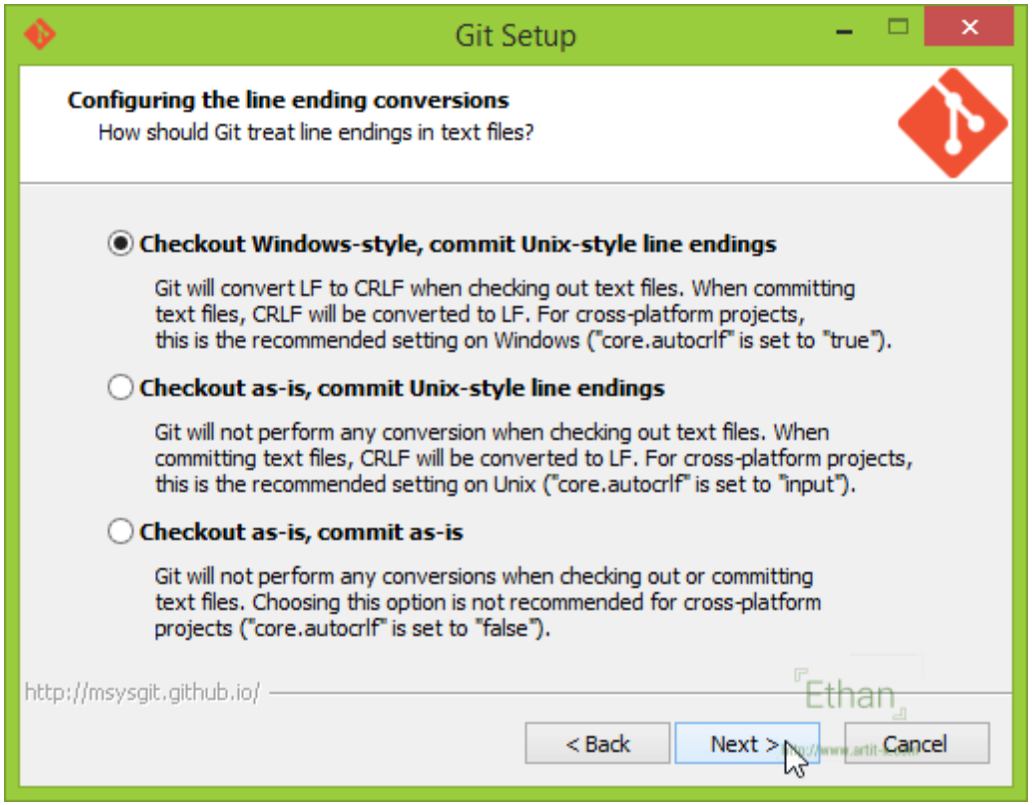
การติดตั้ง GIT สำหรับ Windows #3

- เลือกติดตั้งแบบ **Use Git from the Windows Command Prompt**



การติดตั้ง GIT สำหรับ Windows #4

- เลือกเป็น **Checkout Windows-style, commit Unix-style line endings**

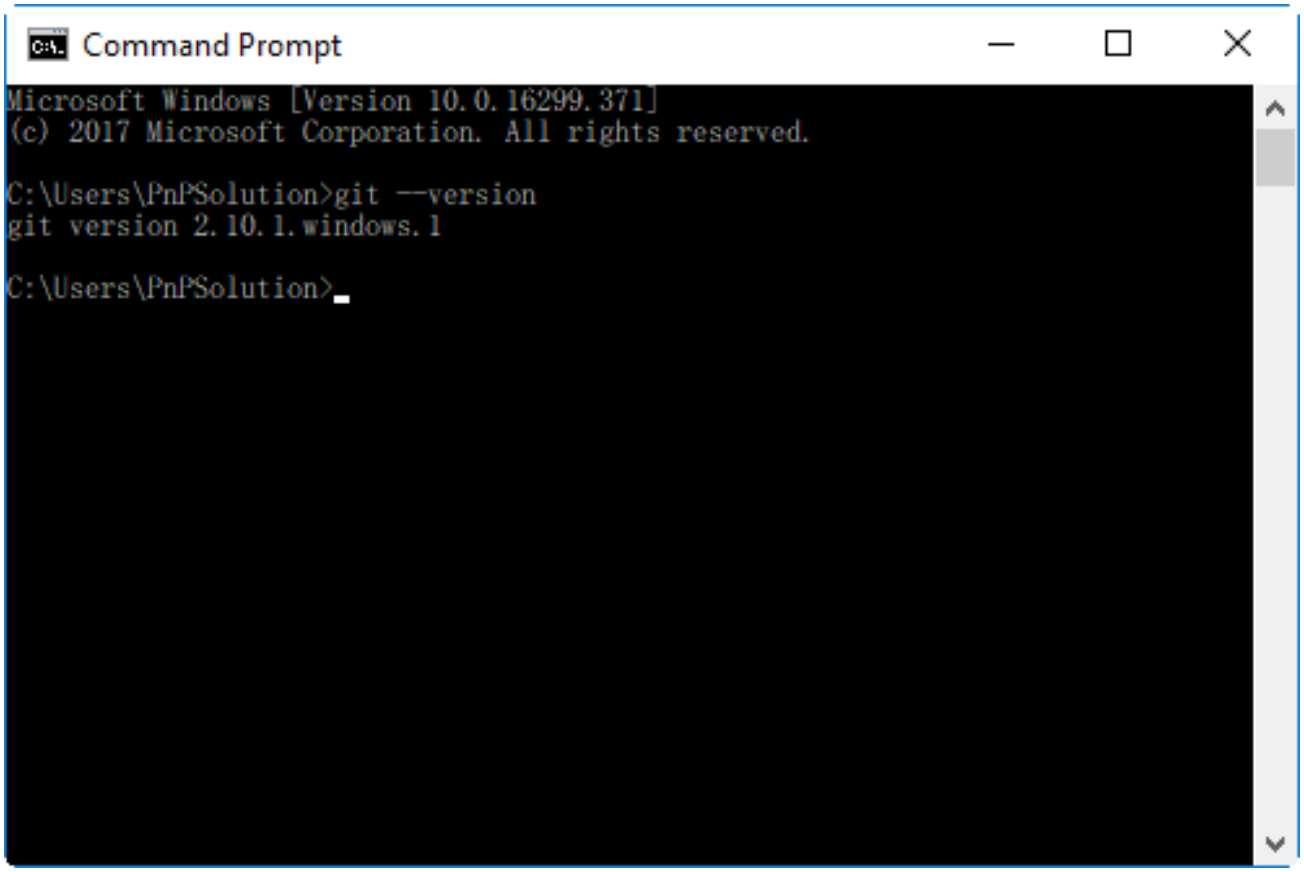


การติดตั้ง GIT สำหรับ Windows #5

- กดปุ่ม next ไปจนถึงหน้าสุดท้าย

ทดสอบหลังการติดตั้ง Git

- เปิดโปรแกรม cmd แล้วพิมพ์คำสั่ง git --version

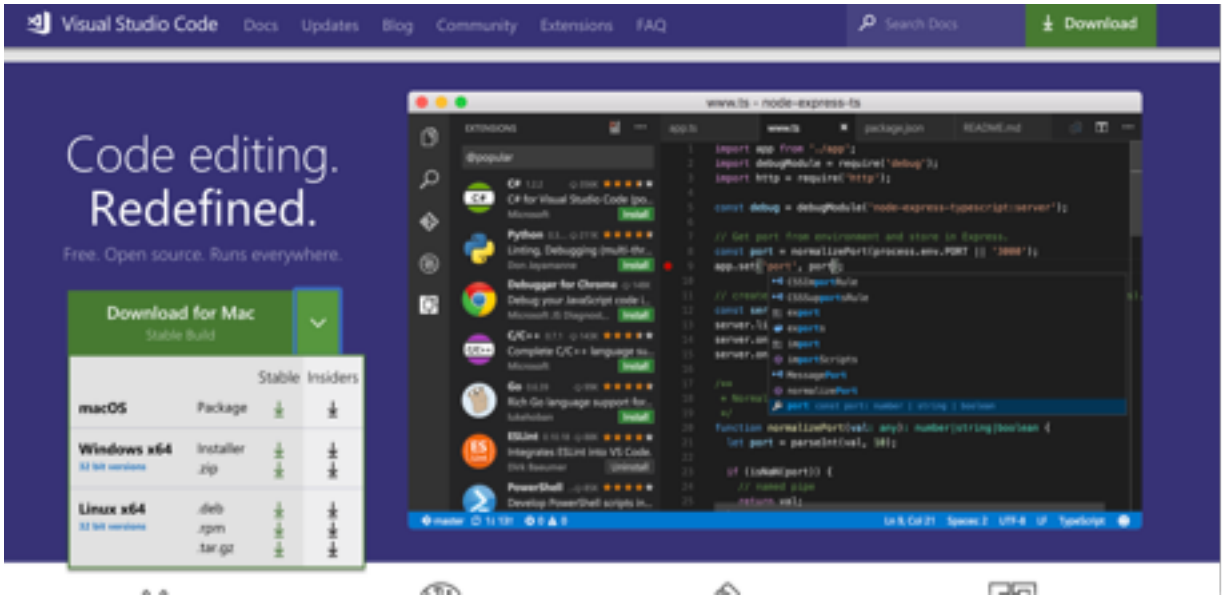


การติดตั้ง

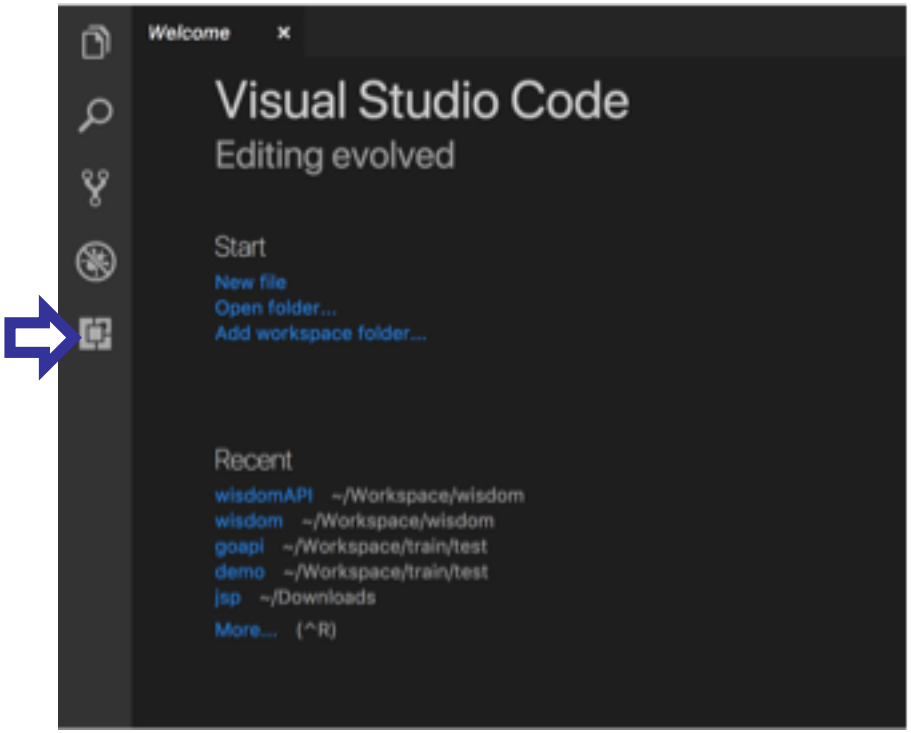
VISUAL STUDIO CODE

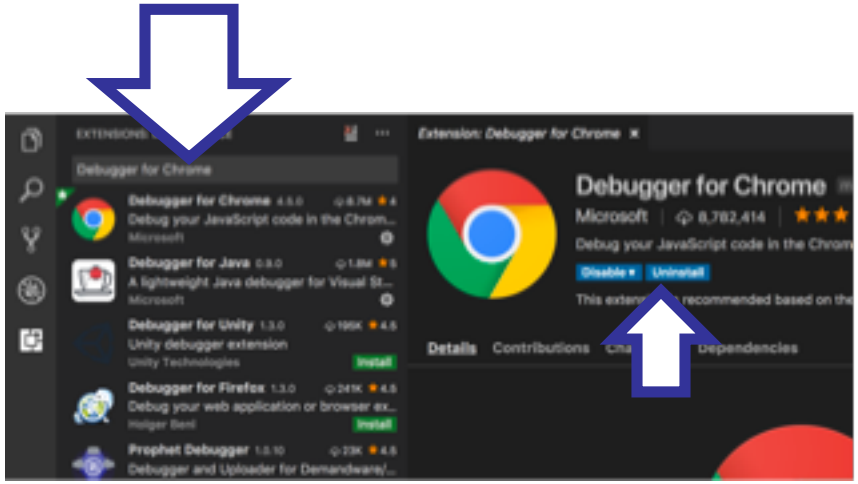
การติดตั้ง VSC

- เข้าไปที่ website https://code.visualstudio.com/
- เลือก download สำหรับ windows (stable)



Install Extensions





Install Visual Studio Code Extensions

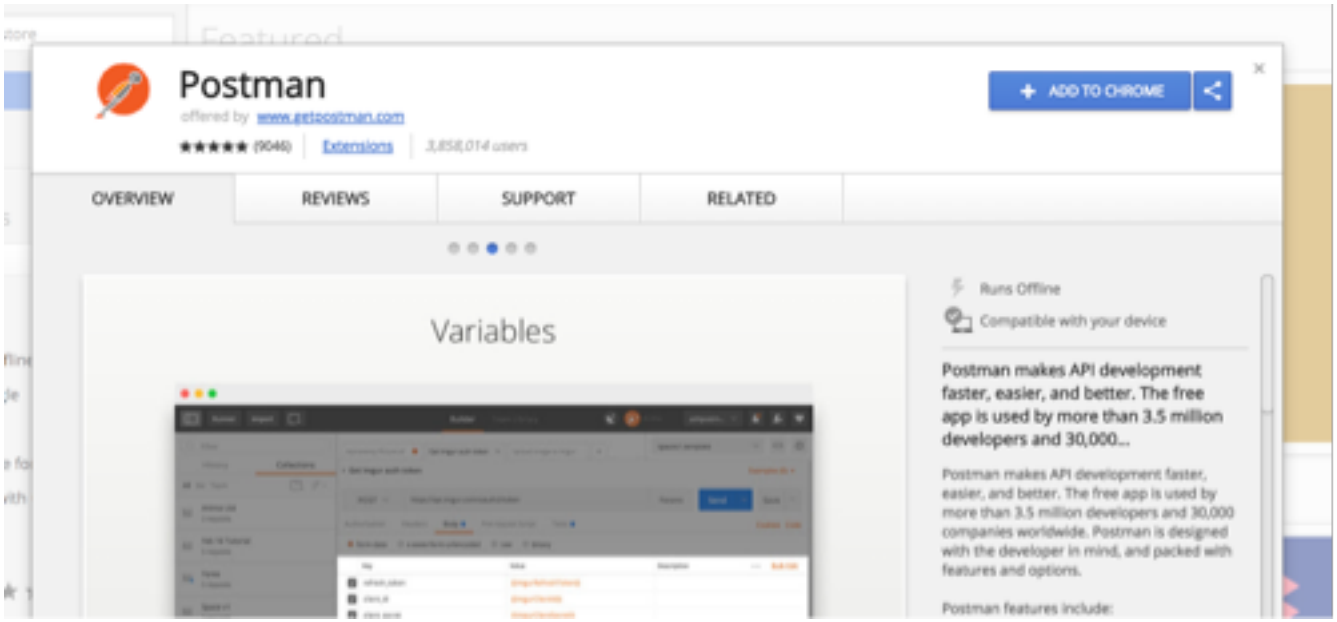
- Java Extension Pack [vscjava.vscode-java-pack]
- Spring Boot Tools [Pivotal.vscode-spring-boot]
- Spring Initializr Java Support [vscjava.vscode-spring-initializr]
- Bracket Pair Colorizer [coenraads.bracket-pair-colorizer]

การติดตั้ง

POSTMAN

การติดตั้ง postman

- เข้า url https://chrome.google.com/webstore/detail/postman/fhbjgbiflinjbdggehcddcbncdddomop?hl=en

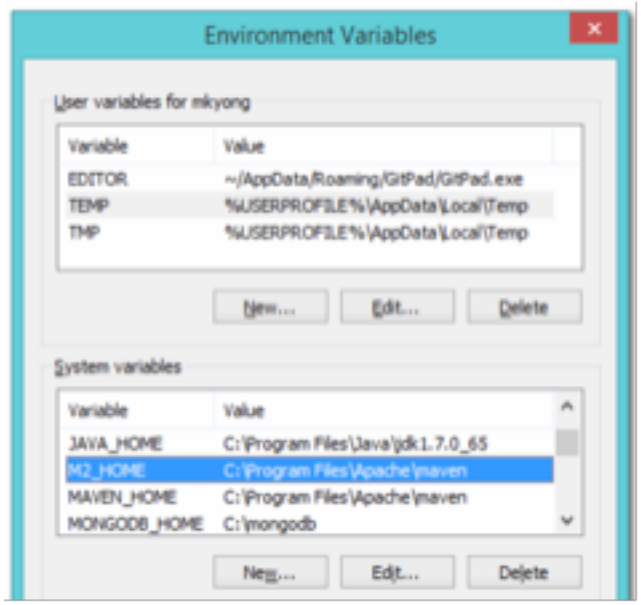


การติดตั้ง

MAVEN

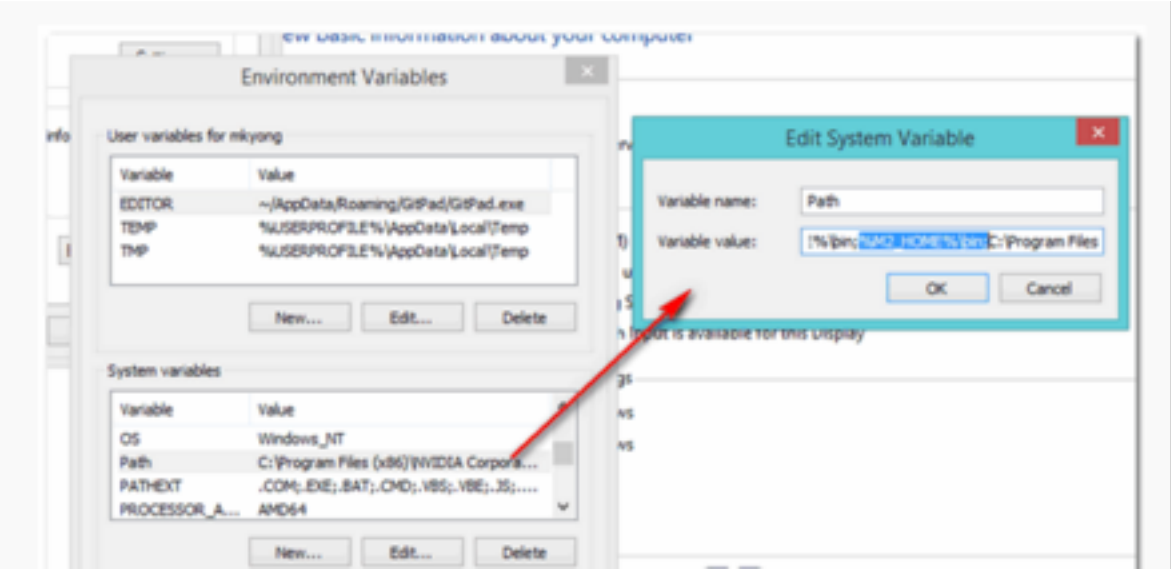
การติดตั้ง maven

- download maven ตาม url ดังนี้
  - https://maven.apache.org/download.cgi
  - example : apache-maven-3.2.2-bin.zip
- หลังจาก download แตก zip file ให้ที่เครื่อง เช่น c:/maven
- เพิ่ม M2_HOME, MAVEN_HOME เข้าไปใน environment ดังภาพ



การติดตั้ง maven

- เพิ่ม PATH เข้าไปใน environment ดังภาพ



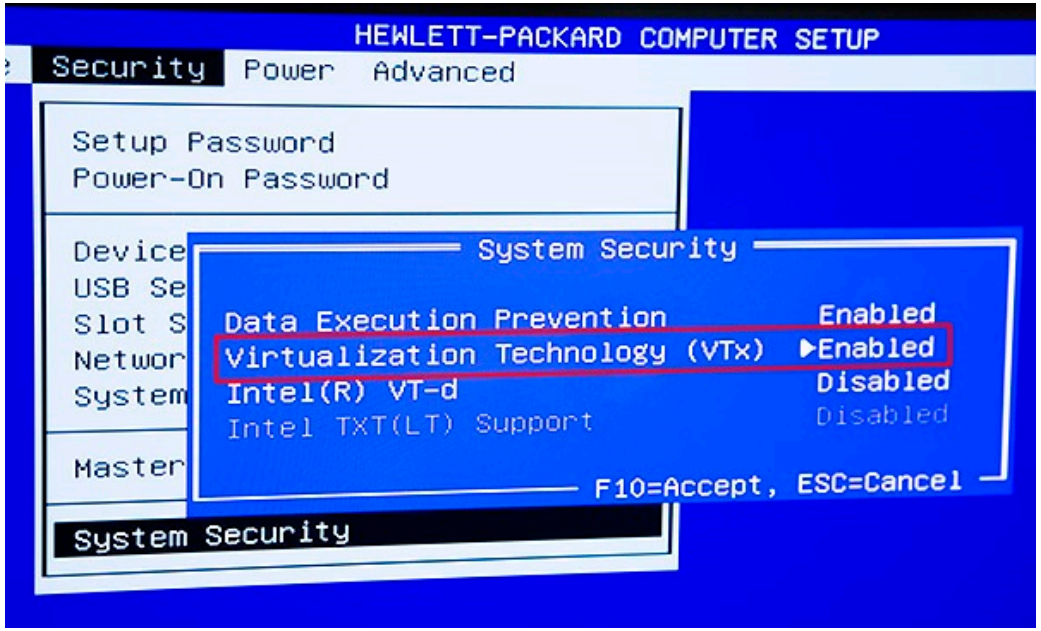
- หลังจากติดตั้งเสร็จแล้วให้ทำการทดสอบการติดตั้งโดยใช้คำสั่งดังนี้
  - mvn -version

การติดตั้ง

DOCKER FOR WINDOWS

การติดตั้ง Docker สำหรับ Windows

- ความต้องการขั้นพื้นฐานสำหรับการติดตั้ง Docker for windows
  - Windows ต้องเป็น version 64bit เท่านั้น
  - Windows 7 or higher
  - Cpu ต้องมีความสามารถ Hyper-v สามารถเปิดได้ที่ BIOS

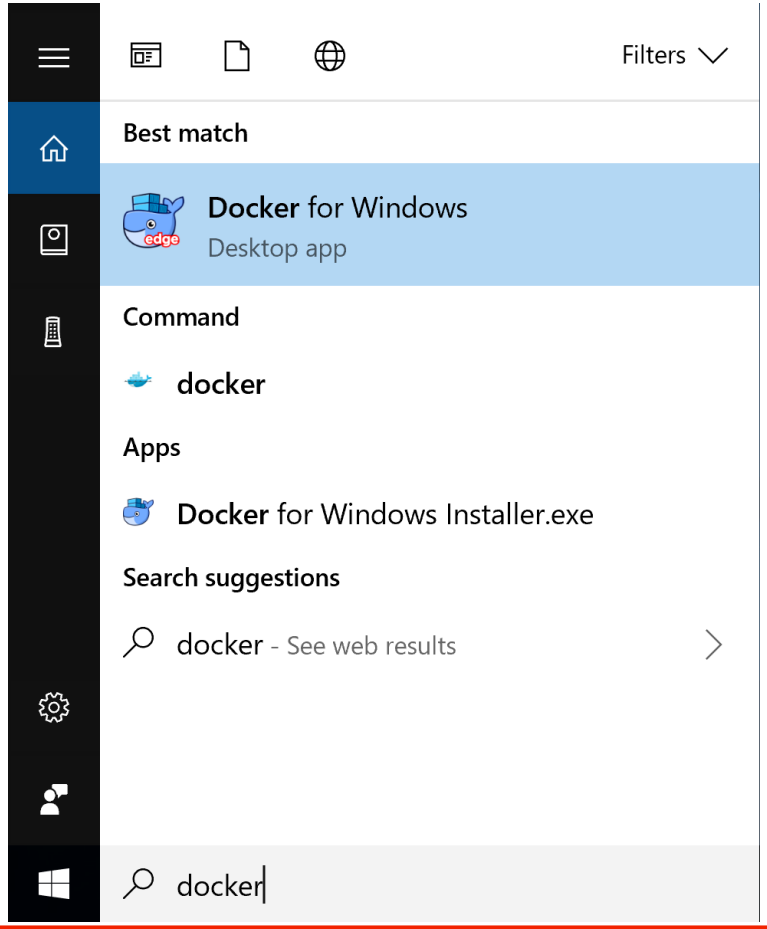


การติดตั้ง Docker สำหรับ Windows #2

- เข้า link https://download.docker.com/win/stable/Docker%20for%20Windows%20Installer.exe
- กด next ไปเรื่อยๆ จนสิ้นสุดการติดตั้ง

การติดตั้ง Docker สำหรับ Windows #3

- หลังจากติดตั้งเสร็จแล้วให้ทำการเปิด docker ดังนี้



การติดตั้ง Docker สำหรับ Windows #4

- จะมี docker run อยู่ที่ taskbar ดังภาพ

- ทดสอบการติดตั้งโดยการเปิด cmd แล้วพิมพคำสั่งดังนี้
- docker ps

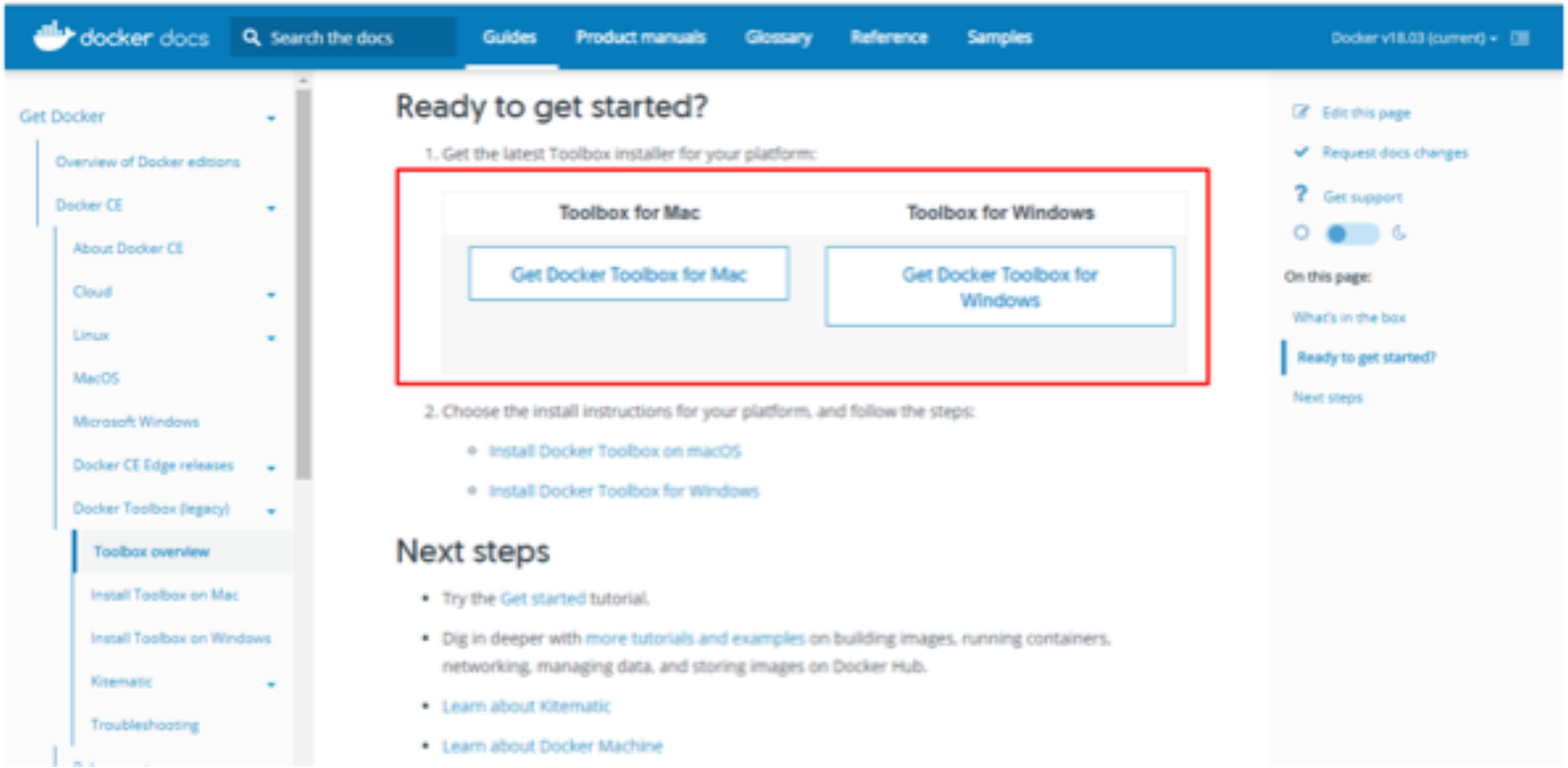
```
Sommais-MacBook-Pro:~ sommaik$ docker ps
CONTAINER ID        IMAGE               COMMAND             CREATED             STATUS              PORTS               NAMES
```

การติดตั้ง

DOCKER TOOLBOX

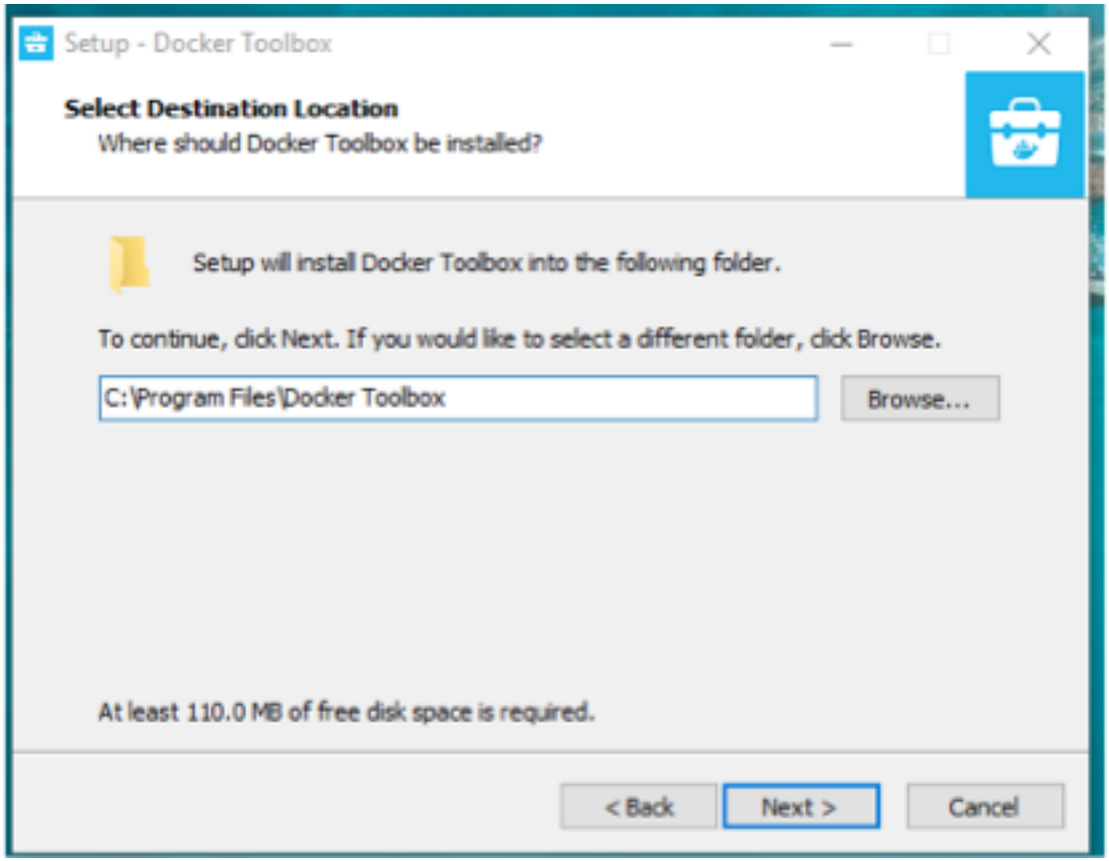
การติดตั้ง Docker Toolbox

- https://docs.docker.com/toolbox/overview/#ready-to-get-started



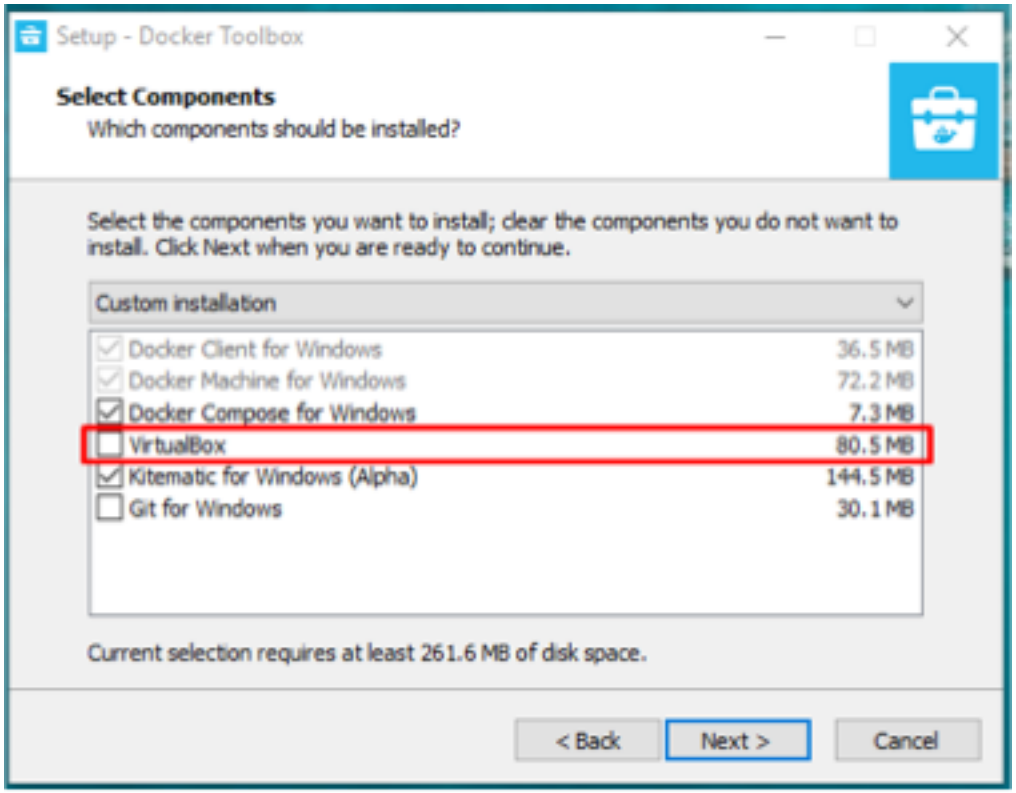
การติดตั้ง Docker Toolbox

การติดตั้ง Docker Toolbox

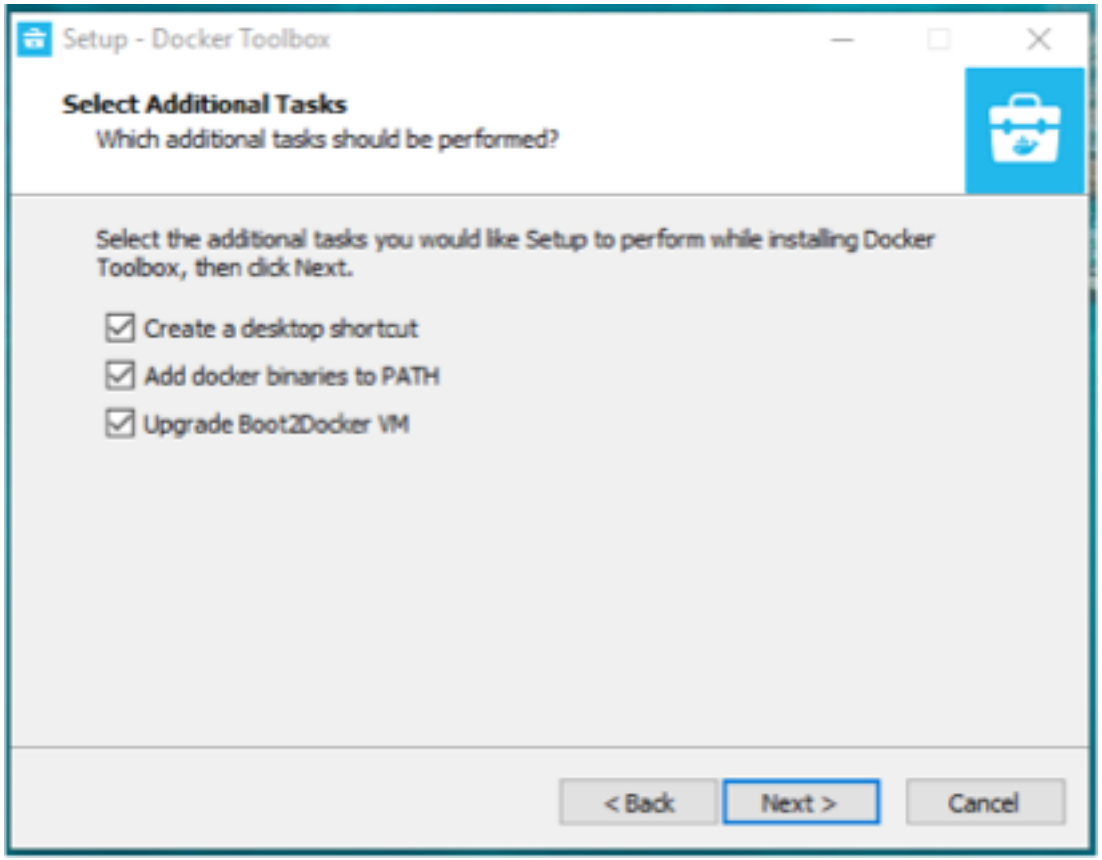


การติดตั้ง Docker Toolbox

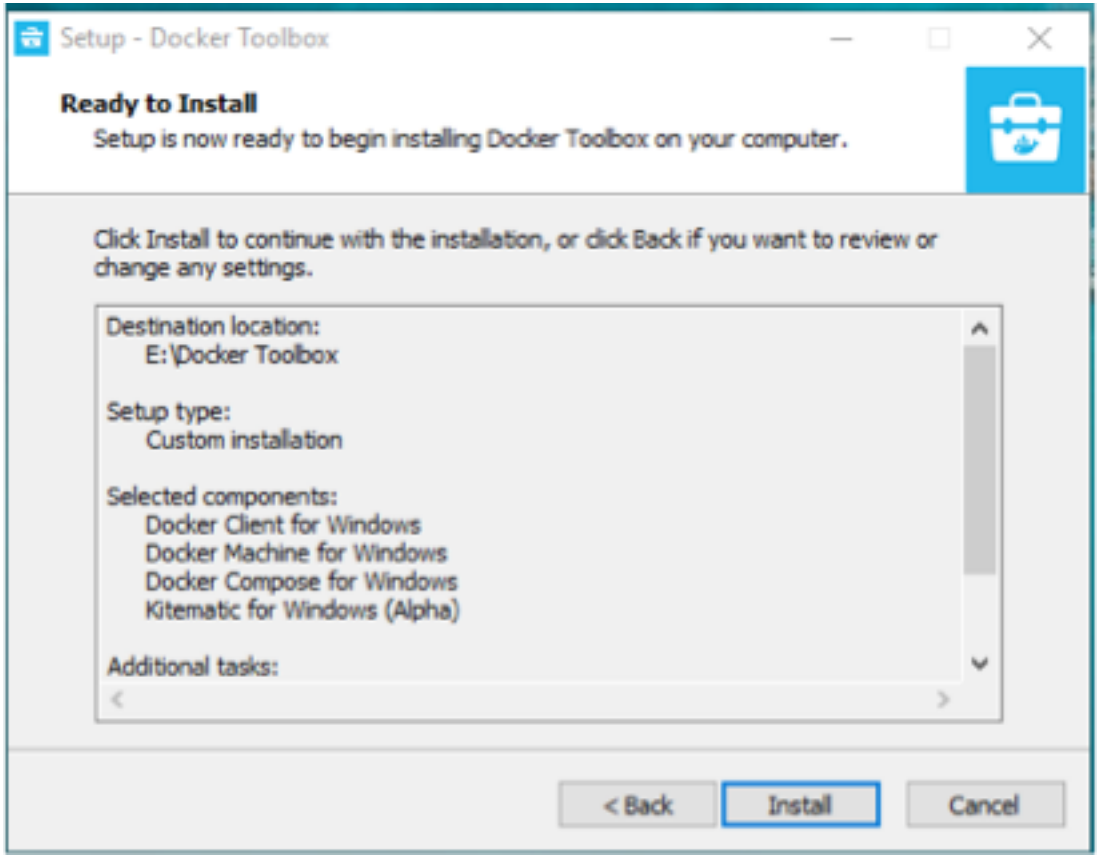
- เอาเครื่องหมายถูกหน้า VirtualBox ออก



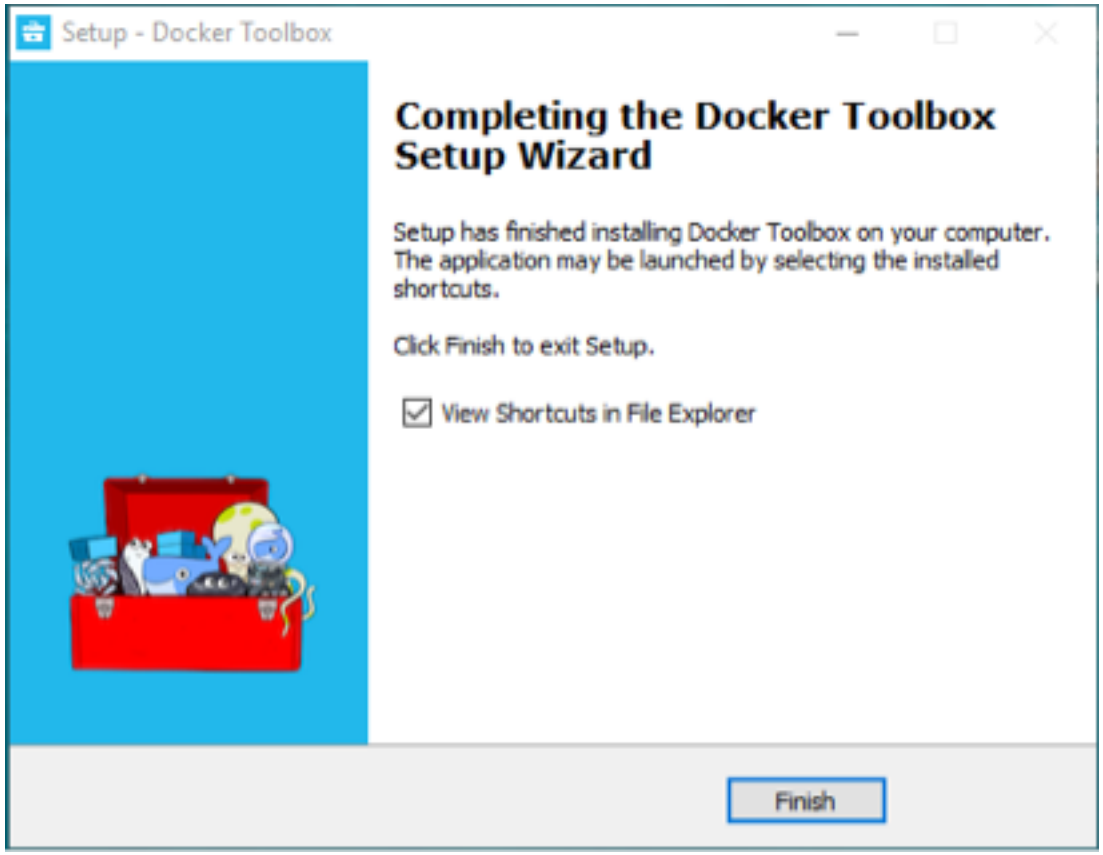
การติดตั้ง Docker Toolbox



การติดตั้ง Docker Toolbox



การติดตั้ง Docker Toolbox



Software project management with

MAVEN

Getting started with Maven

- According to the docs, Maven is a “software project management and comprehension tool. Based on the concept of a project object model (POM), Maven can manage a project’s build, reporting and documentation from a central piece of information.” However, most normal people refer to it as a build tool. Its job is to build the project, convert the source code into a binary artifact, package the resources into it, and if needed automatically download and use necessary dependencies.
- The complexity of using Maven comes from the fact that it tries to do multiple things at the same time. First of all it needs to describe the project, its structure, submodules, the necessary build steps and so on. Then it needs a mechanism to provide the information about what other libraries are required for the project to build. Then it has to actually assemble the project, run the tests and perhaps even push it out to your artifact repository.

Create project

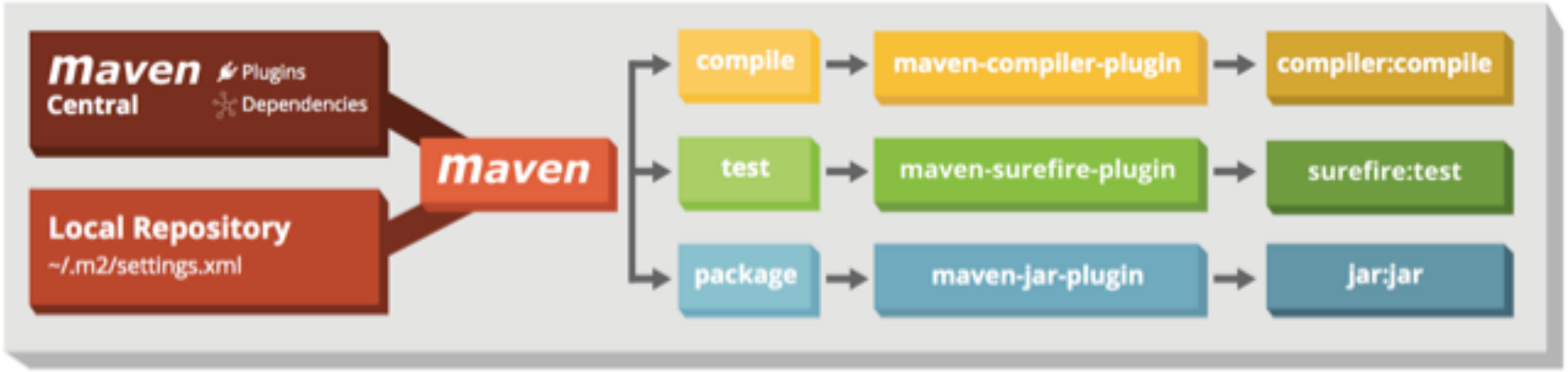
Create Java Project

- mvn archetype:generate -DgroupId=org.yourcompany.project -DartifactId=application

Create web project

- mvn archetype:generate -DgroupId=org.yourcompany.project -DartifactId=application -DarchetypeArtifactId=maven-archetype-webapp

Maven architecture



Maven command

- clean — delete target directory
- validate — validate, if the project is correct
- compile — compile source code, classes stored in target/classes
- test — run tests
- package — take the compiled code and package it in its distributable format, e.g. JAR, WAR
- verify — run any checks to verify the package is valid and meets quality criteria
- install — install the package into the local repository
- deploy — copies the final package to the remote repository
-

pom.xml

```
<?xml version="1.0" encoding="UTF-8"?>
<project xmlns="http://maven.apache.org/POM/4.0.0"
        xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
        xsi:schemaLocation="http://maven.apache.org/POM/4.0.0 http://maven.apache.org/xsd/maven-4.0.0.xsd">
    <modelVersion>4.0.0</modelVersion>
    <groupId>com.pnp</groupId>
    <artifactId>maven-spring-boot</artifactId>
    <version>1.0-SNAPSHOT</version>
    <properties>
        <project.build.sourceEncoding>UTF-8</project.build.sourceEncoding>
        <java.version>1.7</java.version>
    </properties>
    <parent>
        <groupId>org.springframework.boot</groupId>
        <artifactId>spring-boot-starter-parent</artifactId>
        <version>1.5.8.RELEASE</version>
    </parent>
    <dependencies>
        <dependency>
            <groupId>org.springframework.boot</groupId>
            <artifactId>spring-boot-starter-web</artifactId>
        </dependency>
    </dependencies>
    <build>
        <plugins>
            <plugin>
                <groupId>org.springframework.boot</groupId>
                <artifactId>spring-boot-maven-plugin</artifactId>
            </plugin>
        </plugins>
    </build>
</project>
```

Introduction

SPRING BOOT

Introduction

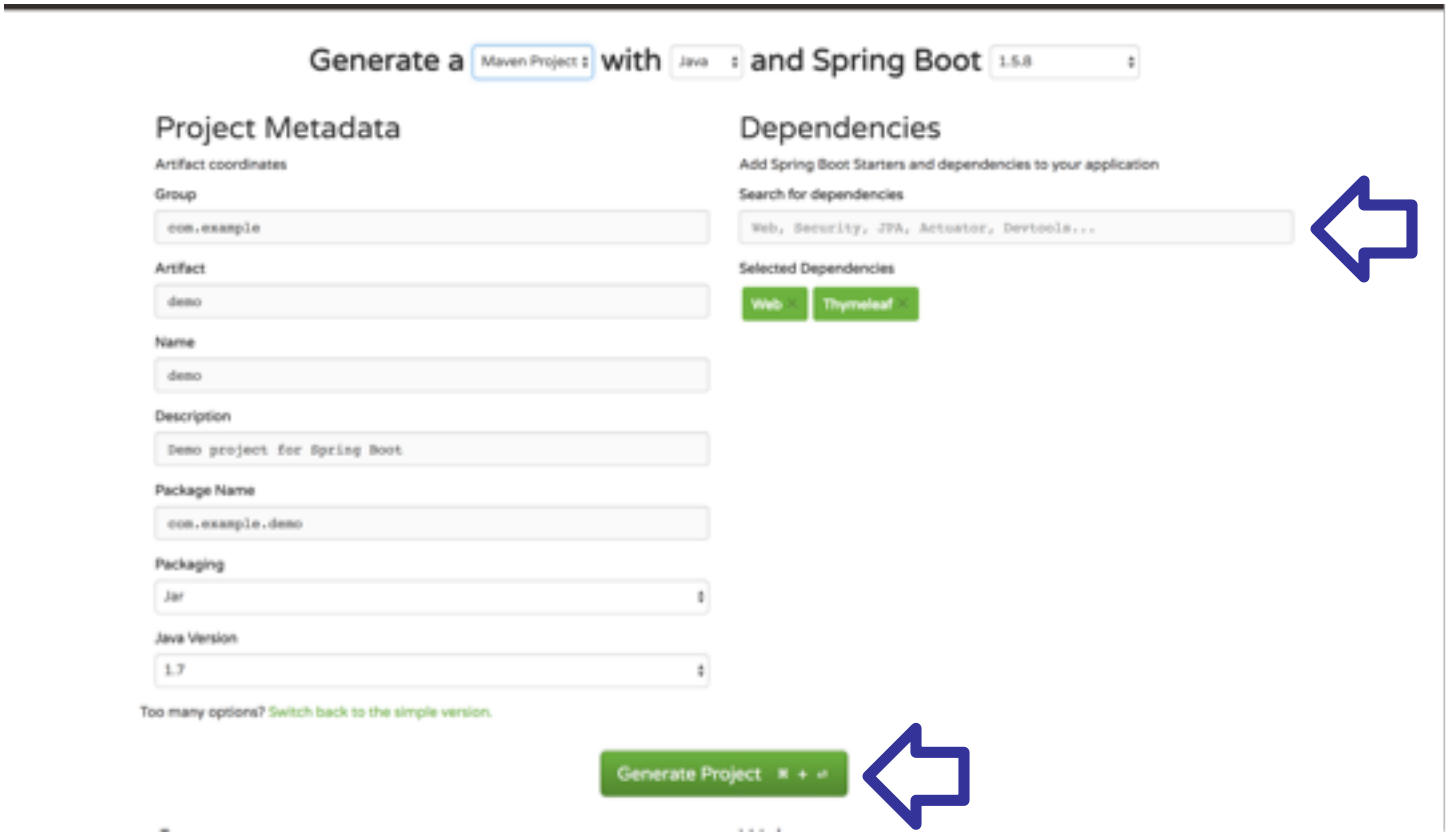
- Spring Boot makes it easy to create stand-alone, production-grade Spring based Applications that you can "just run".
- We take an opinionated view of the Spring platform and third-party libraries so you can get started with minimum fuss. Most Spring Boot applications need very little Spring configuration.

Features

- Create stand-alone Spring applications
- Embed Tomcat, Jetty or Undertow directly (no need to deploy WAR files)
- Provide opinionated 'starter' dependencies to simplify your build configuration
- Automatically configure Spring and 3rd party libraries whenever possible
- Provide production-ready features such as metrics, health checks and externalized configuration
- Absolutely no code generation and no requirement for XML configuration

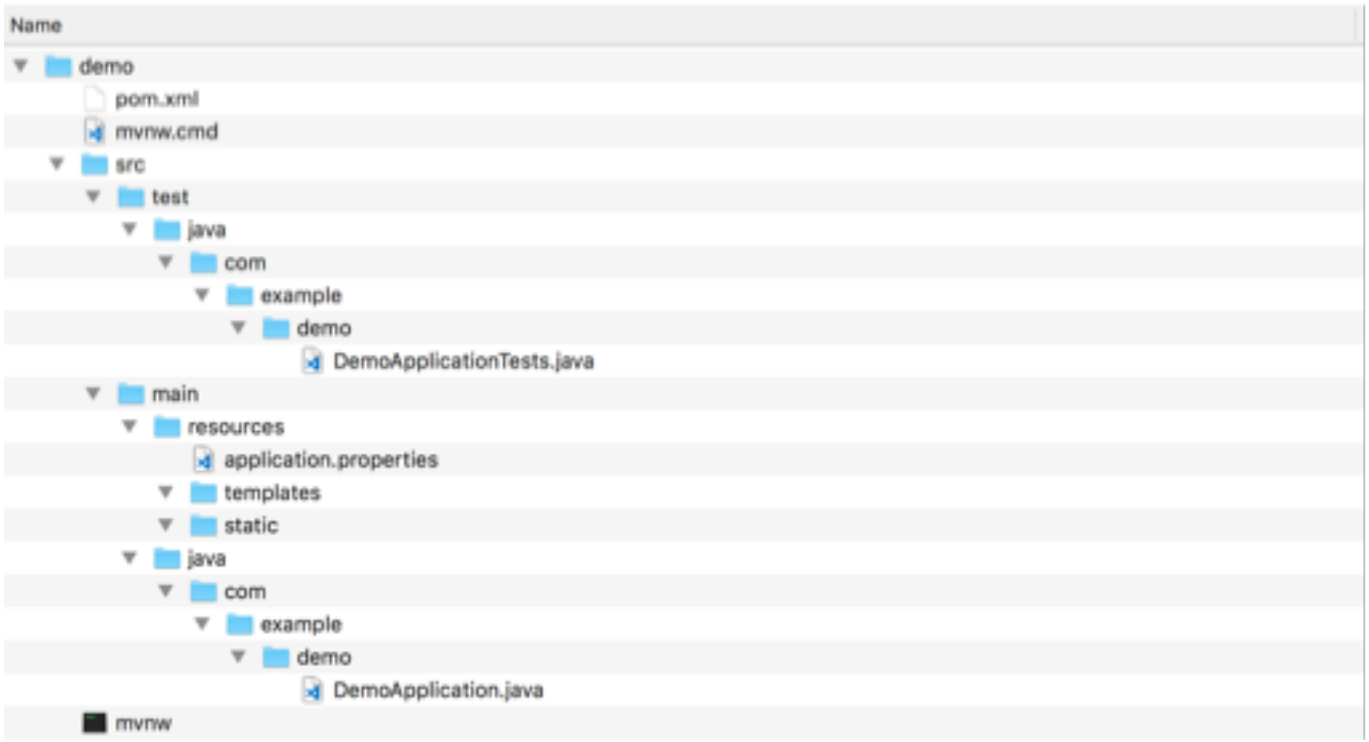
New spring boot project (WEB)

- goto url https://start.spring.io/

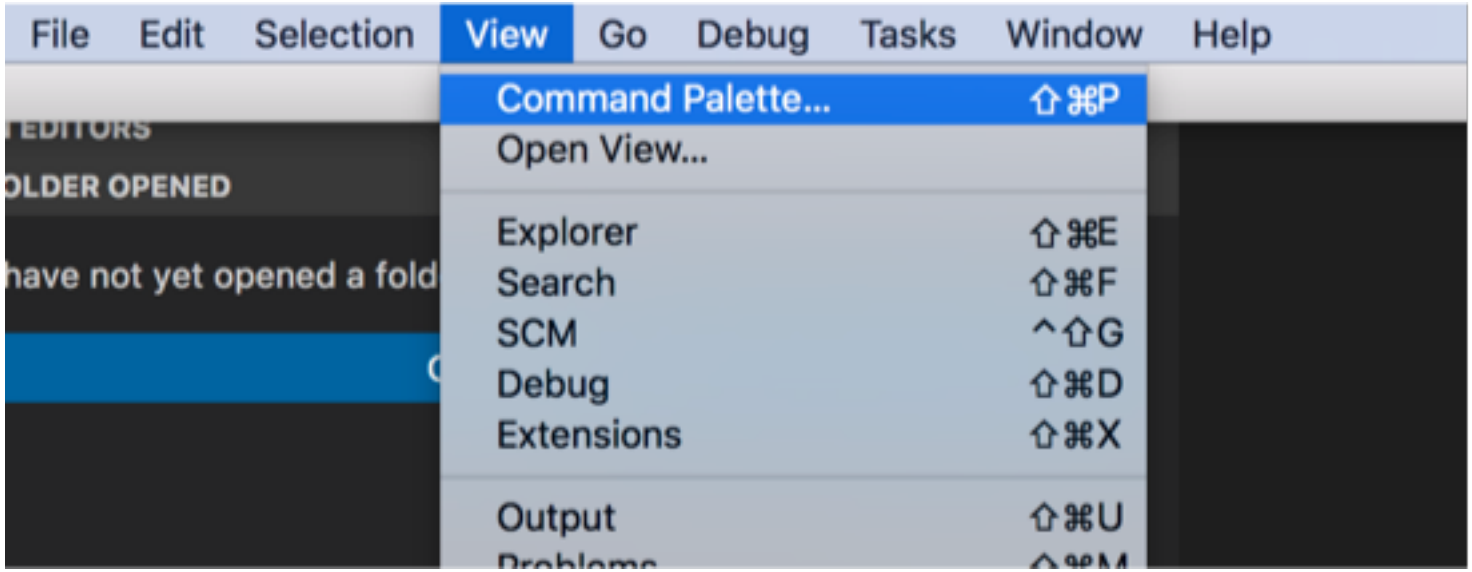


New spring boot project (WEB)

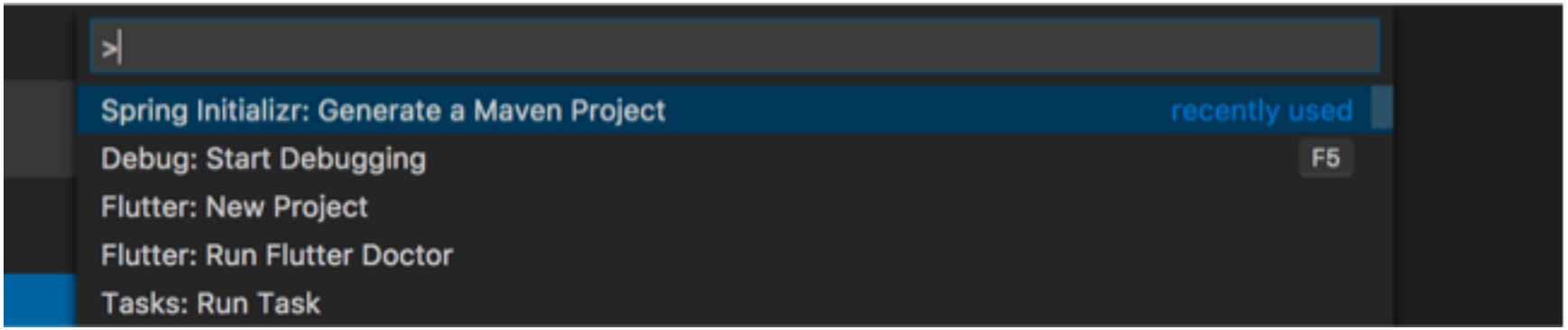
- หลังจากกดปุ่ม Generate Project ตัว web จะทำการสร้าง file นามสกุล zip มาให้ตามชื่อ artifect ที่ได้ระบุไว้เช่น demo.zip
- หลังจากนั้นให้ทำการแตก file จะได้ file ที่มีโครงสร้างดังภาพ



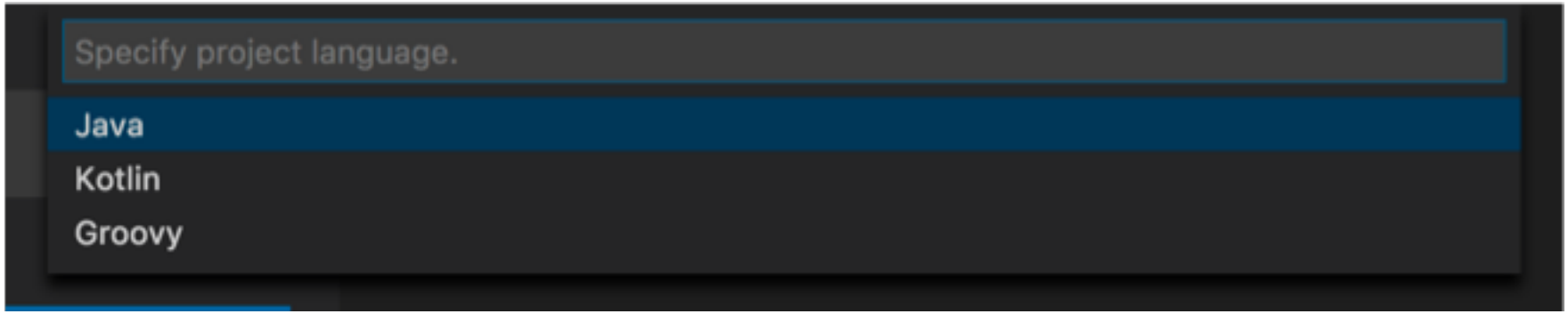
New spring boot project (VS Code)



New spring boot project (VS Code)



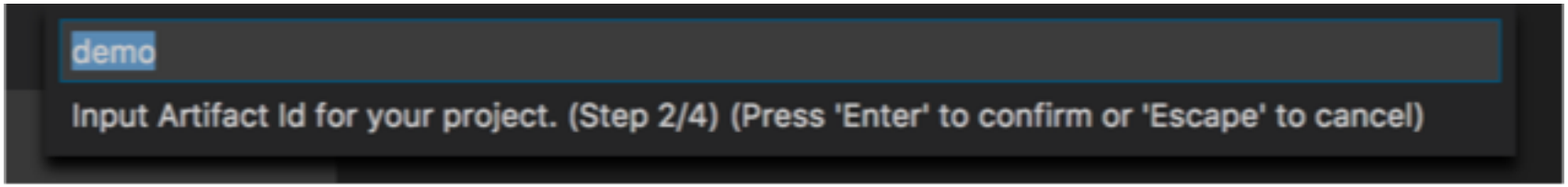
เลือก Spring Initializr: Generate a Maven Project



เลือก Java

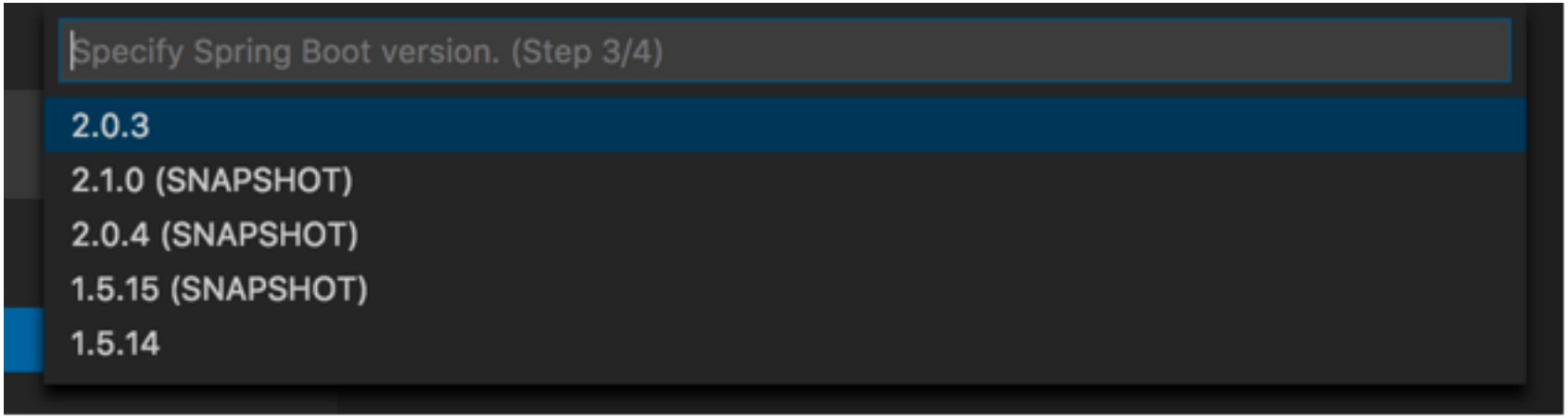
New spring boot project (VS Code)

ระบุ Group Id ของ project อันนี้จะกลายเป็นชื่อ package



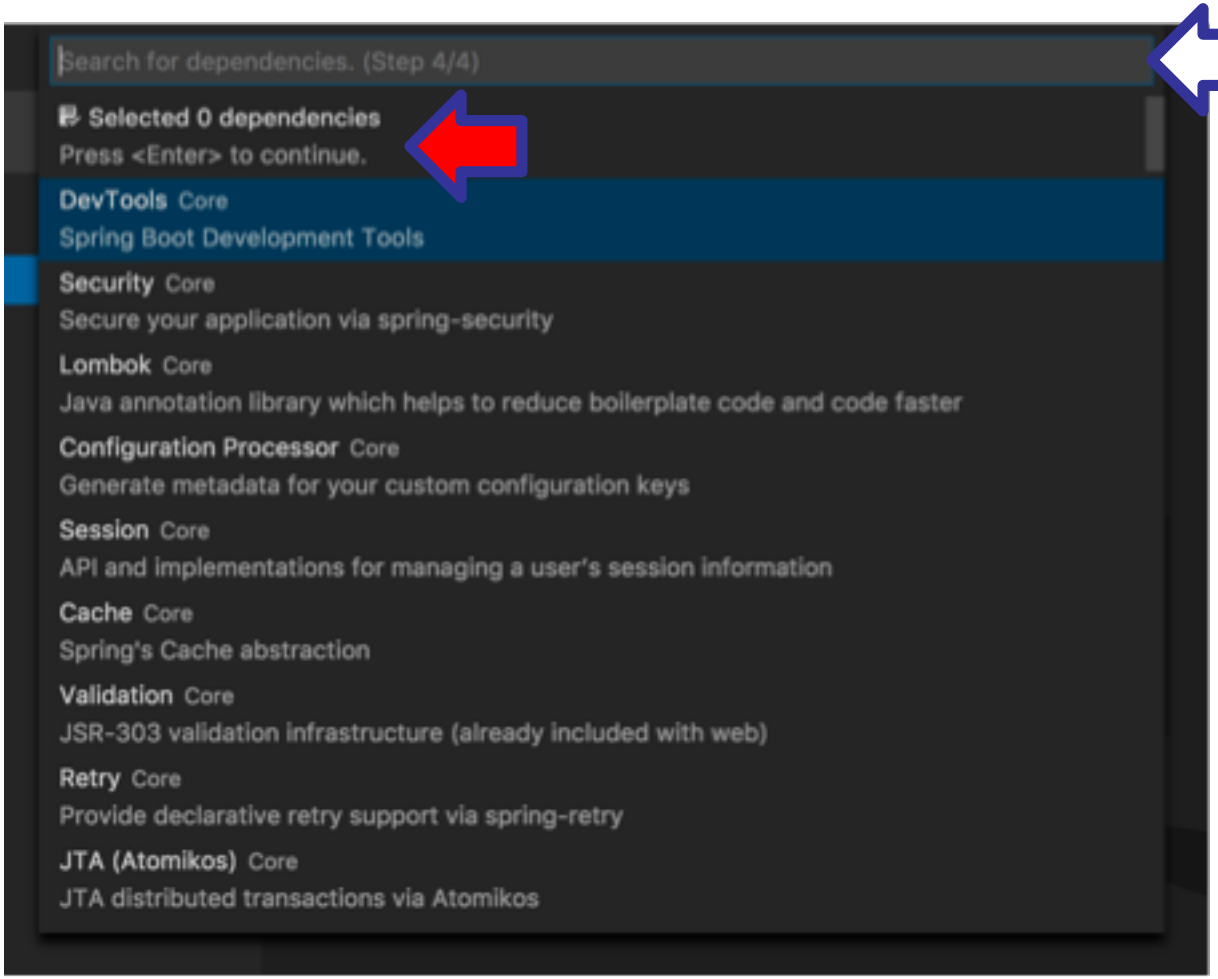
ระบุ Artifact Id ของ project อันนี้จะกลายเป็นชื่อ project

New spring boot project (VS Code)



เลือก version ของ spring boot

New spring boot project (VS Code)

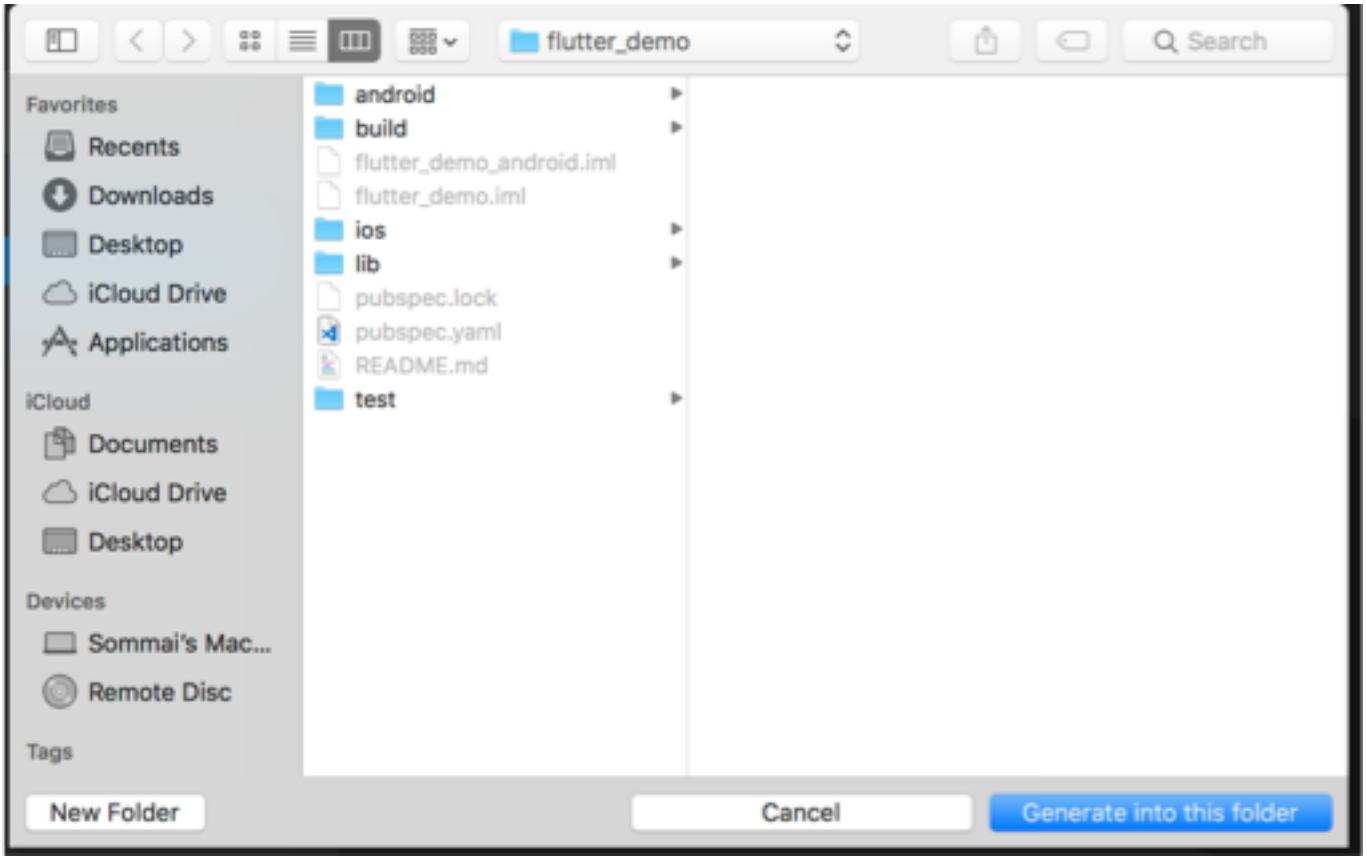


ค้นหา dependencies ที่ต้องการติดตั้ง

หลังจากที่เลือกครบแล้ว ให้กดตรงเครื่องหมายลูกศรสีแดง เพื่อดำเนินการต่อ

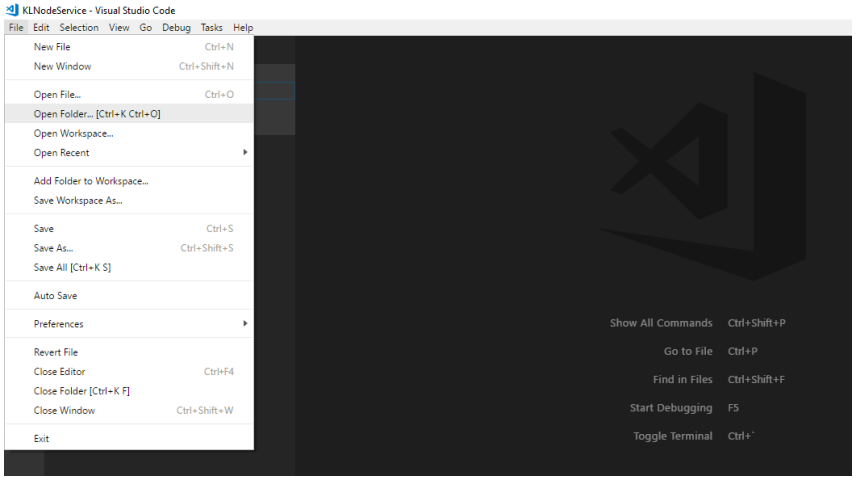
New spring boot project (VS Code)

ระบุ folder ปลายทางที่ต้องการให้สร้าง

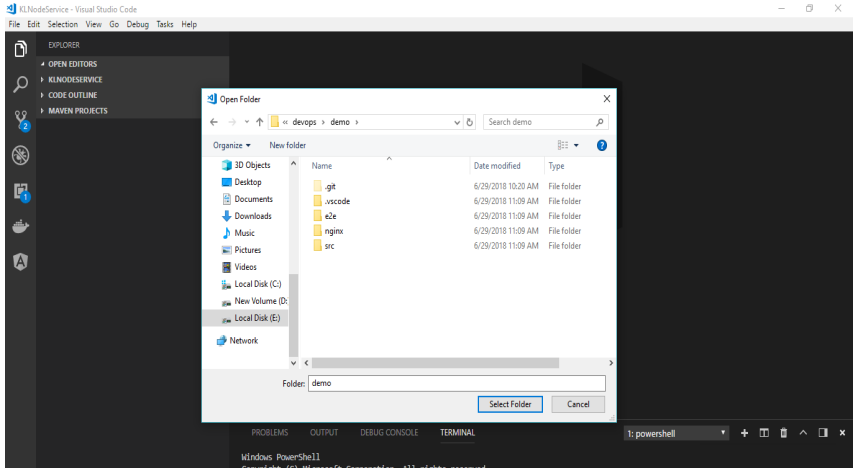


Open project in Visual Studio Code

เลือก menu File > Open Folder



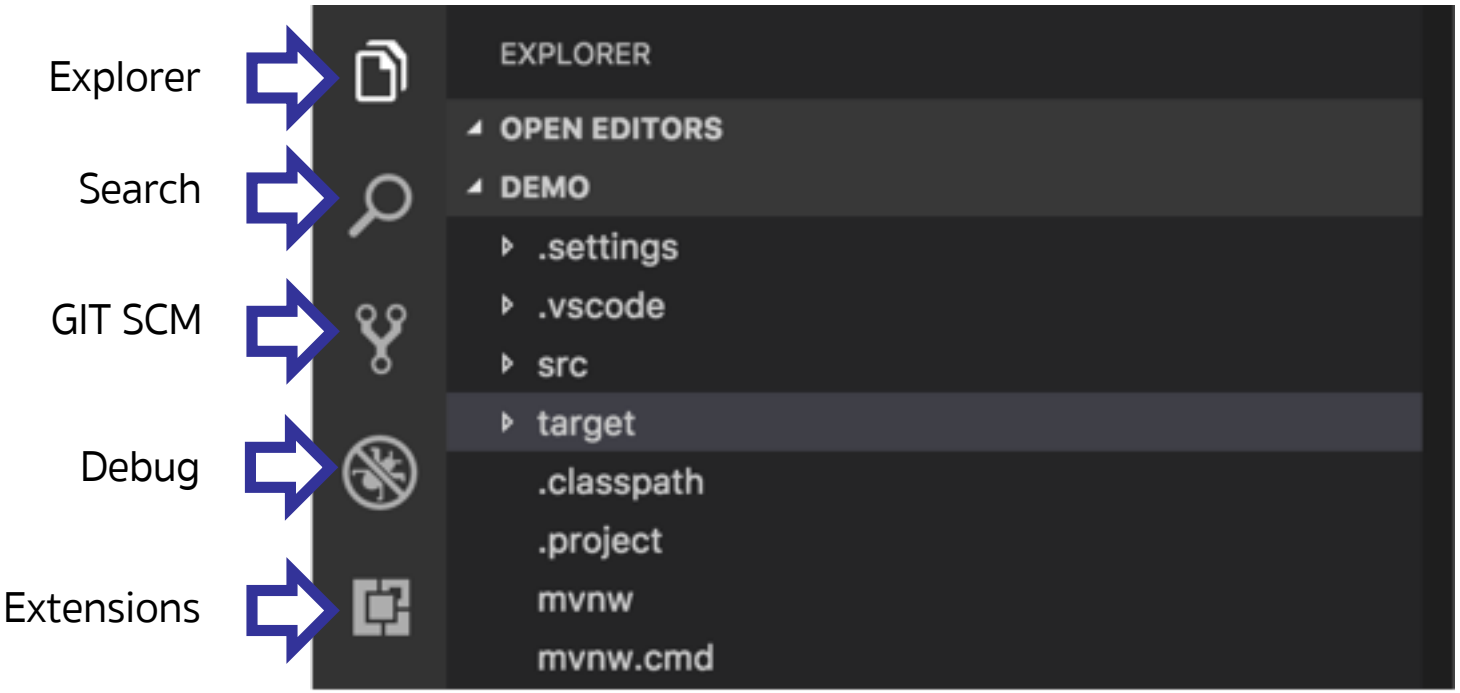
เลือก Folder ที่ต้องการ



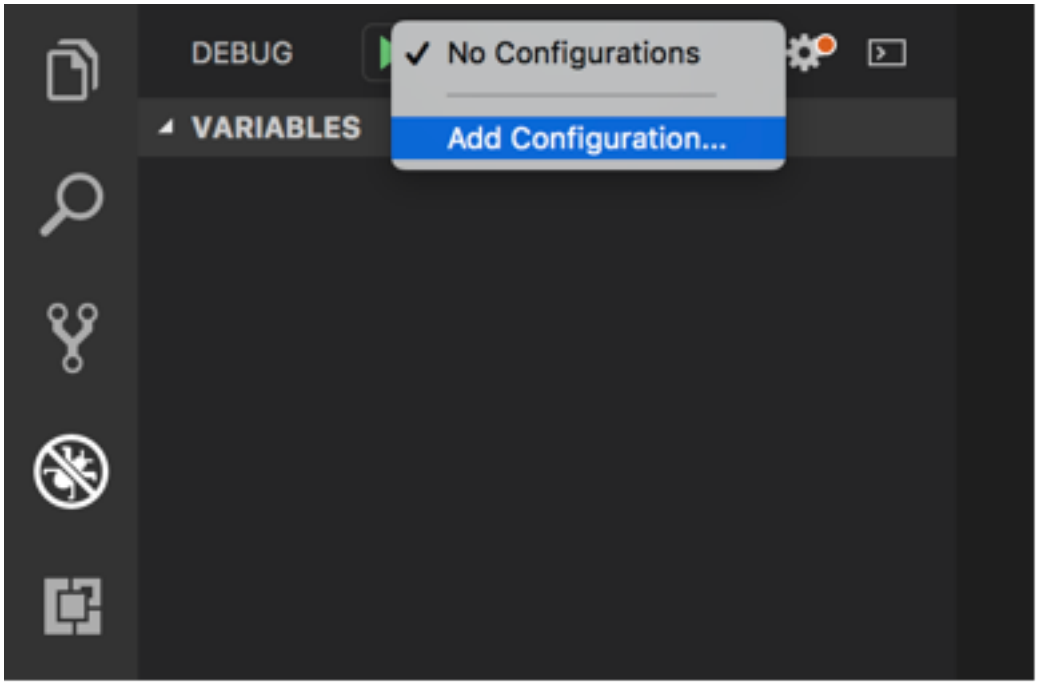
coding spring boot with

VISUAL STUDIO CODE

Overview

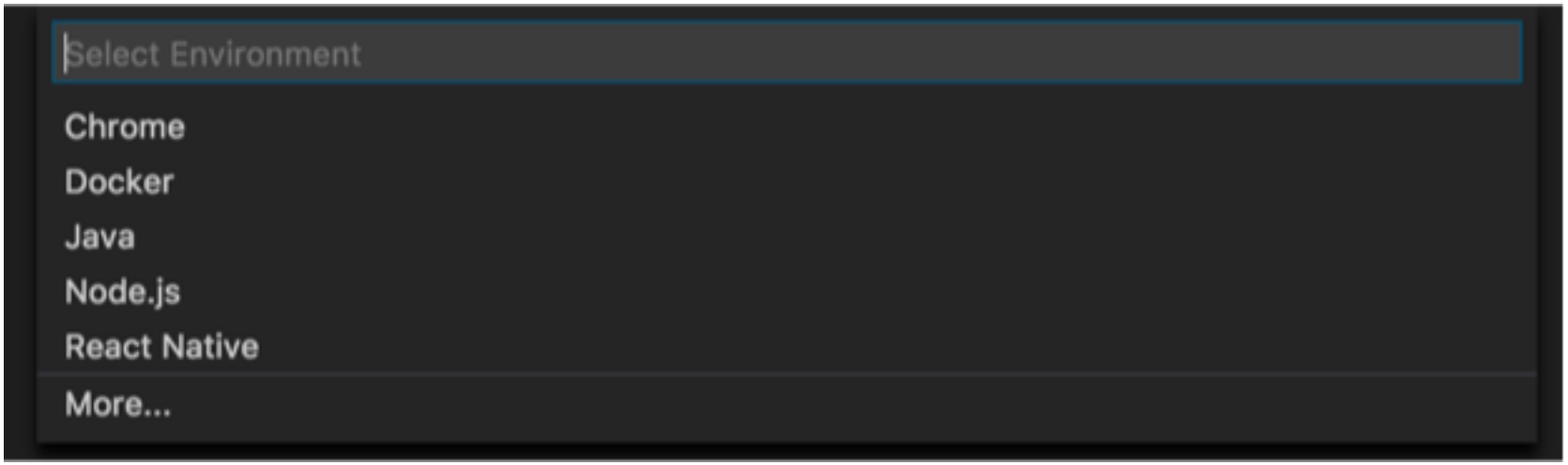


Debug



เลือก Add Configuration

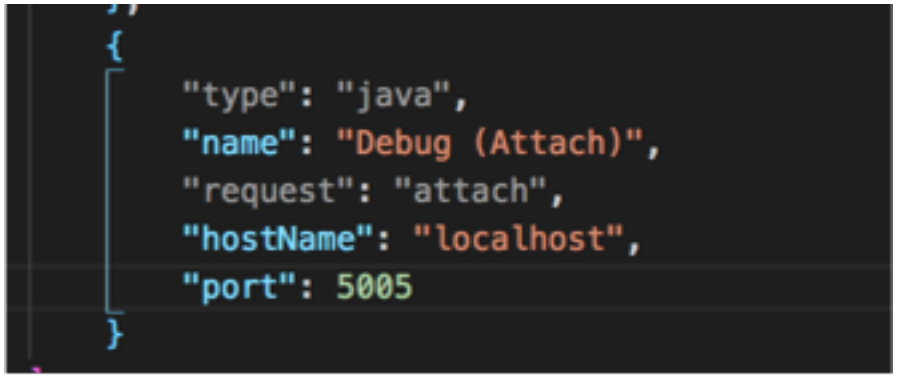
Debug



เลือก Java

Debug

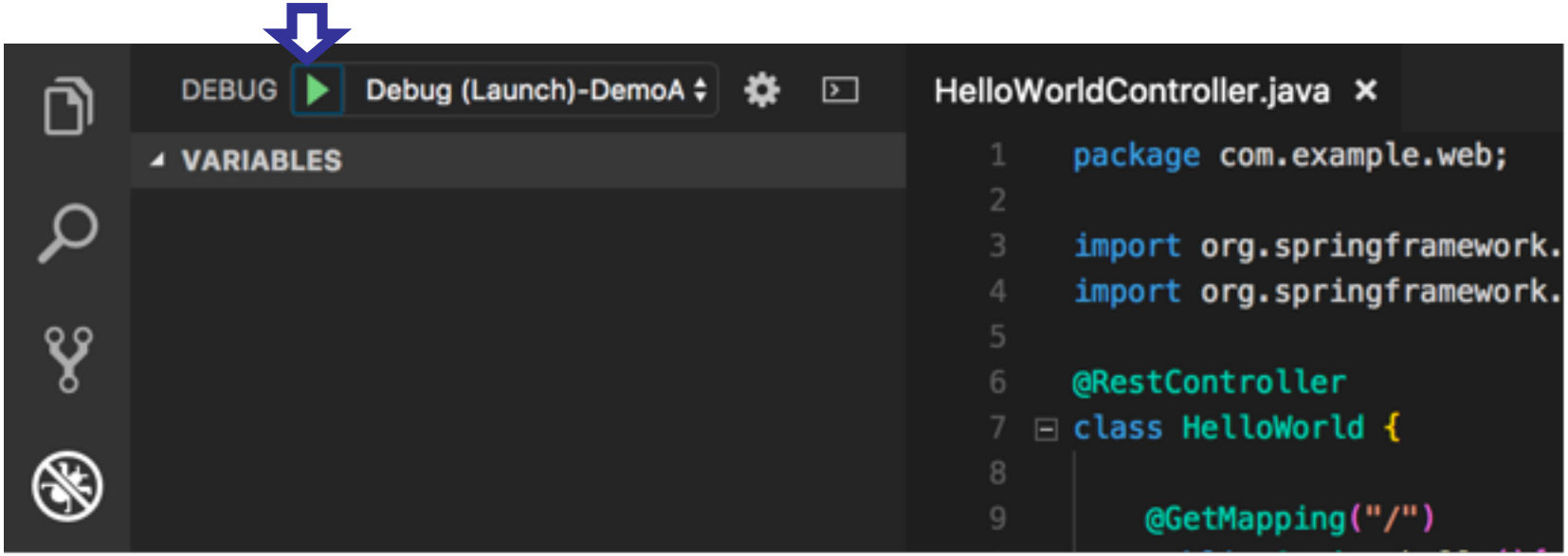
- จะมี Debug อยู่ 2 mode ที่ vs code เตรียมไว้ให้คือ
  - launch เริ่ม Debug จาก class main
  - attach เป็นการ remote debug โดย server ต้อง start แบบ debug mode ด้วยคำสั่ง ดังนี้
    - mvn spring-boot:run -Dspring-boot.run.jvmArguments="-Xdebug -Xrunjdwp:transport=dt_socket,server=y,suspend=y,address=5005"
- mode attach ต้องแก้ port เป็น 5005 ดังตัวอย่าง



ขั้นตอนการ Debug

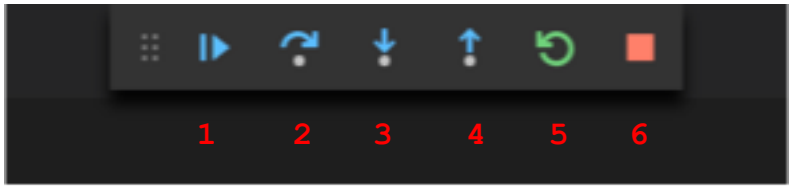
สร้าง breakpoint ใน code ตรงส่วนที่ต้องการ debug โดยกดตรงหน้าตัวเลขหน้าบรรทัด

ขั้นตอนการ Debug



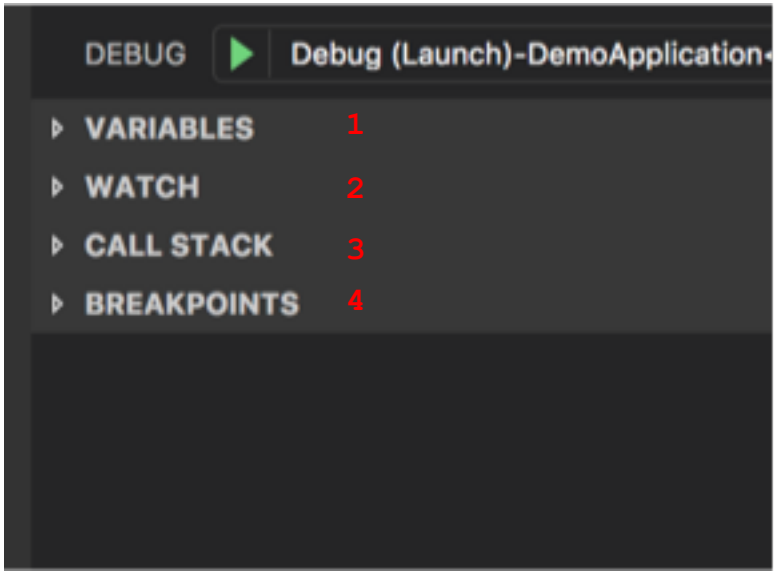
กดปุ่ม สีเขียวเพื่อเริ่มการ Debug code
เมื่อ Program ทำงานไปถึงจุดที่สั่ง break point ก็จะหยุดการทำงานเพื่อรอ

ขั้นตอนการ Debug



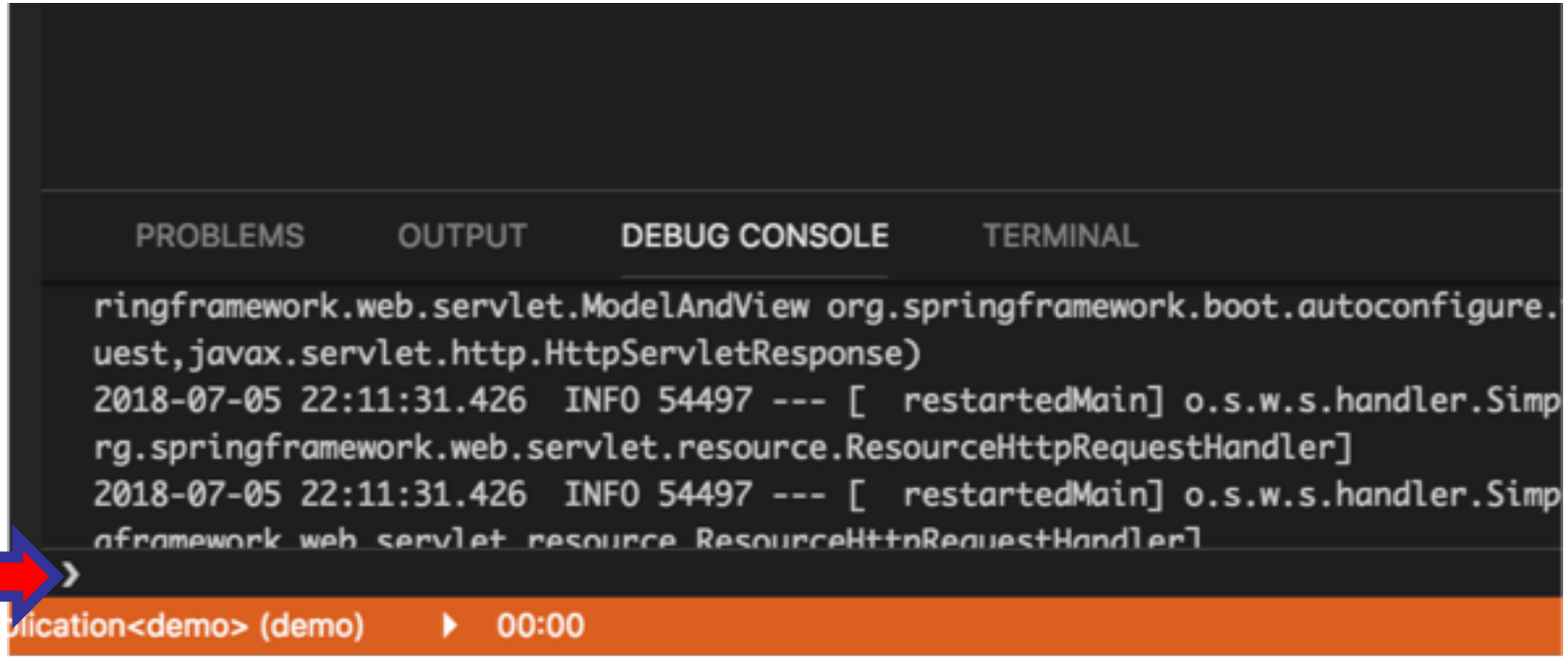
1 = run program ต่อไป
2 = ข้ามไปทำคำสั่งต่อไป ภายใน function scope ที่ break point อยู่
3 = เข้าไปทำคำสั่งที่อยู่ในภายใน function
4 = ย้อนกลับออกมาจาก function
5 = เริ่มการ debug ใหม่
6 = หยุดการ debug

ขั้นตอนการ Debug



1 = ค่าของตัวแปร
2 = ค่าของตัวแปรที่เลือก
3 = ลำดับขั้นในการเรียก
4 = จุด breakpoint ทั้งหมด

ขั้นตอนการ Debug



Debug Console คือส่วนที่แสดง log ของการทำงานของโปรแกรม

สามารถพิมพ์คำสั่งเพื่อทดสอบโปรแกรมได้ที่ช่องตรงลูกศรสีแดง

Rest API with

SPRING REST

Controller [@RestController]

```
@RestController
public class MainController {

    @RequestMapping("/")
    public String index(Model model) {
        return "Hello World";
    }

}
```

@RequestMapping

```
@RequestMapping("/url")
@RequestMapping(method = RequestMethod.GET, value = "/url")
@RequestMapping(method = RequestMethod.POST)
public Map<String, Object> save (
    @RequestBody Map<String, Object> input,
     @RequestParam (value="name", required=false, defaultValue="World")     String name
) {}

@RequestMapping(method = RequestMethod.GET, value = "/{name}")
public ArrayList<Map<String, Object>> index(
     @PathVariable String name
) { }
```

REST Mapping

@GetMapping ใช้สำหรับ map method get
@PutMapping ใช้สำหรับ map method put
@PostMapping ใช้สำหรับ map method post
@DeleteMapping ใช้สำหรับ map method delete
@ModelAttribute ใช้สำหรับ map submit form model

connect to rdbms with

SPRING JDBC

ติดตั้ง library my sql (pom.xml)

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

<dependency>
        <groupId>mysql</groupId>
        <artifactId>mysql-connector-java</artifactId>
</dependency>
```

application.properties

```
spring.datasource.url=jdbc:mysql://localhost:3306/db_example
spring.datasource.username=springuser
spring.datasource.password=ThePassword
```

Example call jdbc with sql statement

```
public class HelloController {

    @Autowired
    DataSource dataSource;

    @Autowired
    Simple simple;

    @Value("${spring.datasource.url}")
    String url;

    @RequestMapping(method = RequestMethod.GET, value = "/{name}")
    public ArrayList<Map<String, Object>> index(@PathVariable String name) {
        ArrayList<Map<String, Object>> arr = new ArrayList<>();
        String v1 =  this.simple.methodOne();
        String rest = this.simple.methodTwo(v1);
        Map<String, Object> ret = new HashMap<>();
        ret.put("result", "Hello World zzzyy " + name + rest);
        arr.add(ret);
        try{
            Statement stmt = this.dataSource.getConnection().createStatement();
            ResultSet res = stmt.executeQuery("select * from ms_customer");
            while(res.next()){
                int cCount = res.getMetaData().getColumnCount();
```

Data repository with

SPRING DATA JPA

application.properties

```
spring.datasource.url=jdbc:mysql://localhost:3306/db_example
spring.datasource.username=springuser
spring.datasource.password=ThePassword
spring.datasource.driver=com.mysql.jdbc.Driver
spring.jpa.database-platform=org.hibernate.dialect.MySQL5InnoDBDialect
spring.jpa.hibernate.ddl-auto=update
spring.jpa.show-sql=true
```

dependency [pom.xml]

```
<!-- JPA Data (We are going to use Repositories, Entities, Hibernate, etc...) -->

<dependency>
<groupId>org.springframework.boot</groupId>
<artifactId>spring-boot-starter-data-jpa</artifactId>
</dependency>

<!-- Use MySQL Connector-J -->

<dependency>
<groupId>mysql</groupId>
<artifactId>mysql-connector-java</artifactId>
</dependency>
```

Entity

Class Annotations

- @Entity - Required for Hibernate to store/retrieve instances of the class to/from the database. Every field of the class not marked @Transient will be stored in the database (see below for more on @Transient).

- @Transactional - Most often used on CrudRepository interfaces. Specifies that if any data operation within the class throws a runtime exception, all associated database queries should be rolled back (that is, undone). This can prevent data corruption caused by exceptions.

- @Table - *Optional*. Specifies the name of the table in the given database used to store the objects properties. If omitted, the table name is generated via the default rules.

Entity

Field Annotations

- @NotNull - This is not actually a JPA annotation -- it is part of the javax.validation.constraints package -- but Hibernate enforces it as well. Specifies that the field may not be null.

- @Column - Specifies the name of the column in the given table used to store the field. If omitted, the column name is generated via the configured or default naming convention. There are several attributes -- such as nullable and unique-- that result in database-level restrictions being applied (i.e. in database constraints rather than Hibernate constraints).

Entity

Field Annotations

- @Id - The field should be considered an identifier for the class. In particular, the corresponding column in the database should be a primary key. A field with this annotation must one of: a primitive type, a primitive wrapper type (e.g. Integeror Float), String, java.util.Date, or a few others (see documentation link below).

- @GeneratedValue - Specifies that the field should be generated by Hibernate. This annotation can be configured to use different value generation strategies.

- @OneToMany - Specifies a field that is a collection of other persistent objects.

Entity

Field Annotations

- @ManyToOne - The inverse (or "other side") of the @OneToMany annotation. This is used within a class that is "owned" by another class, to annotate a field that points back to the "owner". For example, with Item and Category classes (where Item is contained in a Category, that is, a Category has many Item objects), the Item class can have a category field that points to the object that owns it.

- @OneToOne - Specifies a field that is a other persistent objects.

Entity

Field Annotations

- @JoinColumn - Typically used in conjunction with @OneToMany, this annotation specifies the column on the "owned" object's table that should be used to identify it's owner. In the Item/Category example, the value of the category id column specifies the id of the Category that owns the Item.

- @Transient - Specifies that Hibernate *should not* store the field in the database.

Many To one Entity

```java
@Entity
@Transactional
@Table( name="sc_user" )
public class User {
    @Id
    @GeneratedValue(strategy=GenerationType.AUTO)
    private Integer id;

    @Column( name="user_name", length=20)
    private String name;

    @NotNull
    @Column( length=15)
    private String email;

    @ManyToOne
    @JoinColumn(name = "profile")
    private Profile profile;

    @Transient
    private String remark;


    public Profile getProfile() {
        return profile;
    }

    public void setProfile(Profile profile) {
        this.profile = profile;
    }

    public User (){

    }
    public User(String name, String email){
        this.name = name;
        this.email = email;
    }

}
```

One to many Entity

```java
@Entity
public class Profile {

    @Id
    @GeneratedValue(strategy=GenerationType.AUTO)
    private Integer id;

    private String name;
    private String role;

    @OneToMany( mappedBy="profile", cascade=CascadeType.ALL)
    private Set<User> users;

    public Profile(){

    }

    public Profile(String name, String role){

    }

    public Set<User> getUsers(){
        return this.users;
    }

    public void setUsers(Set<User> users){
        this.users = users;
    }
}
```

One to one Entity

```java
@Entity
public class UserDetail {
    @Id
    @GeneratedValue(strategy=GenerationType.AUTO)
    private Integer id;

    private String phone;

    @OneToOne(fetch=FetchType.LAZY)
    @JoinColumn(name="id")
    private User user;
}
```

Repositories

The central interface in the Spring Data repository abstraction is Repository. It takes the domain class to manage as well as the ID type of the domain class as type arguments. This interface acts primarily as a marker interface to capture the types to work with and to help you to discover interfaces that extend this one. The CrudRepository provides sophisticated CRUD functionality for the entity class that is being managed.

CrudRepository interface

```
public interface CrudRepository<T, ID extends Serializable>
  extends Repository<T, ID> {

  <S extends T> S save(S entity);      ❶

  Optional<T> findById(ID primaryKey); ❷

  Iterable<T> findAll();               ❸

  long count();                        ❹

  void delete(T entity);               ❺

  boolean existsById(ID primaryKey);   ❻

  // … more functionality omitted.
}
```

CrudRepository interface

1. Saves the given entity.
2. Returns the entity identified by the given ID.
3. Returns all entities.
4. Returns the number of entities.
5. Deletes the given entity.
6. Indicates whether an entity with the given ID exists.

Query Creation

The query builder mechanism built into Spring Data repository infrastructure is useful for building constraining queries over entities of the repository. The mechanism strips the prefixes find...By, read...By, query...By, count...By, and get...By from the method and starts parsing the rest of it. The introducing clause can contain further expressions, such as a Distinct to set a distinct flag on the query to be created. However, the first By acts as delimiter to indicate the start of the actual criteria. At a very basic level, you can define conditions on entity properties and concatenate them with And and Or. The following example shows how to create a number of queries:

CrudRepository (Example)

```java
package hello;

import java.util.List;

import org.springframework.data.repository.CrudRepository;

interface ProfileRepository extends CrudRepository<Profile, Long> {

    List<Profile> findByNameAndRole(String name, String role);

    // Enables the distinct flag for the query
    List<Profile> findDistinctNameByNameOrRole(String name, String role);
    List<Profile> findProfileDistinctByNameOrRole(String name, String role);

    // Enabling ignoring case for an individual property
    List<Profile> findByNameIgnoreCase(String name);
    // Enabling ignoring case for all suitable properties
    List<Profile> findByNameAndRoleAllIgnoreCase(String name, String role);

    // Enabling static ORDER BY for a query
    List<Profile> findByNameOrderByRoleAsc(String name);
    List<Profile> findByNameOrderByRoleDesc(String name);
}
```

Pagination

```java
package hello;

import org.springframework.data.domain.Page;
import org.springframework.data.domain.Pageable;
import org.springframework.data.repository.CrudRepository;

import hello.User;

// This will be AUTO IMPLEMENTED by Spring into a Bean called userRepository
// CRUD refers Create, Read, Update, Delete

public interface UserRepository extends CrudRepository<User, Long> {

    Iterable <User> findByEmail(String email);
    Page <User> findByEmail(String email, Pageable pagable);
    Iterable <User> findByName(String name);
    Iterable <User> getByEmail(String email);
}
```

Pagination

`page`	Page you want to retrieve.
`size`	Size of the page you want to retrieve.
`sort`	Properties that should be sorted by in the format `property,property(,ASC|DESC)`. Default sort direction is ascending. Use multiple `sort` parameters if you want to switch directions, e.g. `?sort=firstname&sort=lastname,asc`.

ตัวอย่าง url

```
http://localhost:8080/demo/all?page=0&size=10&sort=email,asc
```

วิธีการเรียกใช้ใน code

```
@GetMapping(path="/byEmail")
public @ResponseBody Page<User> getByEmail(
    @RequestParam String email,
    Pageable page
){
    System.out.println(userRepository.findByName("First"));

    return userRepository.findByEmail(email, page);
}
```

Limiting Query Results

```
User findFirstByOrderByLastnameAsc();

User findTopByOrderByAgeDesc();

Page<User> queryFirst10ByLastname(String lastname, Pageable pageable);

Slice<User> findTop3ByLastname(String lastname, Pageable pageable);

List<User> findFirst10ByLastname(String lastname, Sort sort);

List<User> findTop10ByLastname(String lastname, Pageable pageable);
```

Microservice with

SPRING BOOT

Centralize config with

CONFIG SERVER

pom.xml

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

application.properties

server.port=8888

spring.cloud.config.server.git.uri=<GIT URI>

spring.cloud.config.server.git.username=<USER NAME>

spring.cloud.config.server.git.password=<PASSWORD>

Enable Config Server

```
package com.example.configserver;

import org.springframework.boot.SpringApplication;
import org.springframework.boot.autoconfigure.SpringBootApplication;
import org.springframework.cloud.config.server.EnableConfigServer;

@SpringBootApplication
@EnableConfigServer
public class DemoApplication {

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

Git config file name

- file config ที่อยู่บน git ต้องอยู่ในรูปแบบ
  - <service_name>.properties
  - <service_name>.yml
- ตอนที่ client มา load config ไป จะดูที่ ชื่อ service name ที่ถูกตั้งค่าไว้ใน เช่น ใน project demo เราตั้งชื่อ service ว่า
  - spring.application.name=demo-service
- ตอนที่ start service demo-service มันจะวิ่งมาค้นหา file demo-service.properties ใน config server

use config from server with

CONFIG CLIENT

pom.xml

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

application.properties

management.endpoints.web.exposure.include=*

bootstrap.properties

spring.application.name=demo-service

spring.cloud.config.uri=http://localhost:8888

Microservice with

EUREKA SERVER

pom.xml

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

application.properties

```
# Give a name to the eureka server
spring.application.name=eureka-server

# default port for eureka server
server.port=8761

# eureka by default will register itself as a client. So, we need to set it to false.
# What's a client server? See other microservices (image, gallery, auth, etc).
eureka.client.register-with-eureka=false
eureka.client.fetch-registry=false
```

Enable EurekaServer

```
package com.eureka.server;

import org.springframework.boot.SpringApplication;
import org.springframework.boot.autoconfigure.SpringBootApplication;
import org.springframework.cloud.netflix.eureka.server.EnableEurekaServer;

@SpringBootApplication
@EnableEurekaServer              // Enable eureka server

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

Service Discoverry with

EUREKA DISCOVERY

pom.xml

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

application.properties

```
spring.application.name=demo-service
server.port=8200
eureka.client.service-url.default-zone=http://localhost:8761/eureka
```

Enable EurekaClient

```
package com.example.demo;

import org.springframework.boot.SpringApplication;
import org.springframework.boot.autoconfigure.SpringBootApplication;
import org.springframework.cloud.netflix.eureka.EnableEurekaClient;
import org.springframework.context.annotation.ComponentScan;

@SpringBootApplication
@ComponentScan(basePackages={"com.example.*"})
@EnableEurekaClient
public class DemoApplication {

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

Call to another service

```
@Autowired
private RestTemplate restTemplate;

@RequestMapping("/persons")
public void getPersons() {
        List<Object> persons =
                restTemplate.getForObject("http://demo/persons/", List.class);
    }
```

Cloud Routing with

ZUUL

pom.xml

....

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

....

application.properties

```
server.port=8762
spring.application.name=zuul-server
eureka.client.service-url.default-zone=http://localhost:8761/eureka/

# A prefix that can added to beginning of all requests.
#zuul.prefix=/api

# Disable accessing services using service name (i.e. gallery-service).
# They should be only accessed through the path defined below.
zuul.ignored-services=*

# Map paths to services
zuul.routes.XXX.path=/x/**
zuul.routes.XXX.service-id=demo-service
zuul.routes.b.path=/bbb/**
```

Enable Zuul Proxy

```
package com.comp.zuul.zuulserver;

import org.springframework.boot.SpringApplication;
import org.springframework.boot.autoconfigure.SpringBootApplication;
import org.springframework.cloud.netflix.eureka.EnableEurekaClient;
import org.springframework.cloud.netflix.zuul.EnableZuulProxy;

@SpringBootApplication
@EnableZuulProxy
@EnableEurekaClient
public class DemoApplication {

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

security with

SPRING SECURITY

JWT

- JSON Web Token (JWT) is an open standard (RFC 7519) that defines a compact and self-contained way for securely transmitting information between parties as a JSON object. This information can be verified and trusted because it is digitally signed. JWTs can be signed using a secret (with the **HMAC** algorithm) or a public/private key pair using **RSA** or **ECDSA**.
- Although JWTs can be encrypted to also provide secrecy between parties, we will focus on *signed* tokens. Signed tokens can verify the *integrity* of the claims contained within it, while encrypted tokens *hide* those claims from other parties. When tokens are signed using public/private key pairs, the signature also certifies that only the party holding the private key is the one that signed it.

setup on proxy server [zuul]

pom.xml

....

```
<dependency>
        <groupId>org.springframework.boot</groupId>
        <artifactId>spring-boot-starter-security</artifactId>
</dependency>
<dependency>
        <groupId>io.jsonwebtoken</groupId>
        <artifactId>jjwt</artifactId>
        <version>0.9.0</version>
</dependency>
```

....

application.properties

```
# Map path to auth service
zuul.routes.auth-service.path=/auth/**
zuul.routes.auth-service.service-id=AUTH-SERVICE

strip-prefix to false
zuul.routes.auth-service.strip-prefix=false

# Exclude authorization from sensitive headers
zuul.routes.auth-service.sensitive-headers=Cookie,Set-Cookie
```

SecurityTokenConfig

```java
package com.comp.zuul.zuulserver;

import javax.servlet.http.HttpServletResponse;
import org.springframework.http.HttpMethod;
import org.springframework.security.config.annotation.web.builders.HttpSecurity;
import org.springframework.security.config.annotation.web.configuration.EnableWebSecurity;
import org.springframework.security.config.annotation.web.configuration.WebSecurityConfigurerAdapter;
import org.springframework.security.config.http.SessionCreationPolicy;
import org.springframework.security.web.authentication.UsernamePasswordAuthenticationFilter;

@EnableWebSecurity
public class SecurityTokenConfig extends WebSecurityConfigurerAdapter {

    @Override
    protected void configure(HttpSecurity http) throws Exception {
        http
        .csrf().disable()
            // make sure we use stateless session; session won't be used to store user's state.
            .sessionManagement().sessionCreationPolicy(SessionCreationPolicy.STATELESS)
        .and()
            // handle an authorized attempts
            .exceptionHandling().authenticationEntryPoint((req, rsp, e) -> rsp.sendError(HttpServletResponse.SC_UNAUTHORIZED))
        .and()
            // Add a filter to validate the tokens with every request
            .addFilterAfter(new JwtTokenAuthenticationFilter(), UsernamePasswordAuthenticationFilter.class)
        // authorization requests config
        .authorizeRequests()
            // allow all who are accessing "auth" service
            .antMatchers(HttpMethod.POST, "").permitAll()
            // must be an admin if trying to access admin area (authentication is also required here)
            .antMatchers("/demo" + "/admin/**").hasRole("ADMIN")
            // Any other request must be authenticated
            .anyRequest().authenticated();
    }
}
```

JwtTokenAuthenticationFilter

```java
package com.comp.zuul.zuulserver;

import java.io.IOException;

import javax.servlet.FilterChain;
import javax.servlet.ServletException;
import javax.servlet.http.HttpServletRequest;
import javax.servlet.http.HttpServletResponse;

import org.springframework.web.filter.OncePerRequestFilter;

public class JwtTokenAuthenticationFilter extends  OncePerRequestFilter {
    @Override
    protected void doFilterInternal(HttpServletRequest request, HttpServletResponse response, FilterChain chain)
            throws ServletException, IOException {

            /**
             * YOUR BUSINESS LOGIC HERE
             */
            }
}
```

setup on auth service

pom.xml

```
<dependency>
        <groupId>org.springframework.boot</groupId>
        <artifactId>spring-boot-starter-web</artifactId>
</dependency>
 <dependency>
        <groupId>org.springframework.cloud</groupId>
        <artifactId>spring-cloud-starter-netflix-eureka-client</artifactId>
</dependency>
<dependency>
        <groupId>org.springframework.boot</groupId>
        <artifactId>spring-boot-starter-security</artifactId>
</dependency>
<dependency>
        <groupId>io.jsonwebtoken</groupId>
        <artifactId>jjwt</artifactId>
        <version>0.9.0</version>
</dependency>
```

application.properties

```
spring.application.name=auth-service
server.port=9100
eureka.client.service-url.default-zone=http://localhost:8761/eureka
```

Implement Class

- WebSecurityConfigurerAdapter
- UserDetailsService
- UsernamePasswordAuthenticationFilter

ldap

```
<dependency>
    <groupId>org.springframework.ldap</groupId>
    <artifactId>spring-ldap-core</artifactId>
</dependency>
<dependency>
    <groupId>org.springframework.security</groupId>
    <artifactId>spring-security-ldap</artifactId>
</dependency>
<dependency>
    <groupId>com.unboundid</groupId>
    <artifactId>unboundid-ldapsdk</artifactId>
</dependency>
```

Example code (java)

```java
@Override
public void configure(AuthenticationManagerBuilder auth) throws Exception {
    auth
            .ldapAuthentication()
            .userDnPatterns("uid={0},ou=people")
            .groupSearchBase("ou=groups")
            .contextSource()
            .url("ldap://localhost:8389/dc=springframework,dc=org")
            .and()
            .passwordCompare()
            .passwordEncoder(new LdapShaPasswordEncoder())
            .passwordAttribute("userPassword");
}
```

Circuit Breaker with

HYSTRIX

pom.xml

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

@HystrixCommand annotation

```
@HystrixCommand(fallbackMethod = "fallback")
@RequestMapping("/{id}")
public void getPersons() {
        List<Object> persons =
        restTemplate.getForObject("http://demo/persons/", List.class);
}

public void fallback(Throwable hystrixCommand) {
        System.out.println("get Person error")
}
```

Log Tracing with

SLEUTH

pom.xml

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

Logger

```
import org.slf4j.Logger;
import org.slf4j.LoggerFactory;

// ...
private static final Logger LOGGER =
LoggerFactory.getLogger(HomeController.class);

public Gallery getGallery(@PathVariable final int id) {
  LOGGER.info("Creating gallery object ... ");
  // ...
  LOGGER.info("Returning images ... ");
  return images;
}
// ...
```

trace and span ids in the console logs

```
INFO [gallery-service,adcd5217a36fe469,8639d164315daca9,false] ...
```

Any questions?