Java 8

Classical : Imperative

How

Object mutability

Java 8 : Declarative Style

What we want

Object immutability

Interface:

default method (definition)

static method (definition)

collection api

interface (10 functionalities + 2)

stream

Object Oriented approach : interface

Functional Interface :

Contain only one abstract method

might have static , default method in any count

Lambda:

anonymous function

no method param type, return type

not be encapsulated in any class

can be assigned to a variable of functional interface

```
() -> <single line>
()->{
        // multi line
      }
```

```
(msg)->{}
msg -> {}
(a,b) -> {}
(a,b)->{
            int sum = a+b;
           return sum;
           }
(a,b)-> a+b; // by default associated with return statement
```

the method signature of the only abstract method of Functional interface must match with method signature of lambda expression

java.util.function

functional interface containing some very common prototype method

4 categories

- Consumer
- Predicate
- Function
- Supplier

Consumer :

```
void accept(<T>)
```

Predicate

```
boolean test(<T>)
```

Function

```
<R> apply(<T>);
```

Supplier

```
<T> get()
```

Variants

Consumer : BiConsumer (Generic)

void accept(<T>,<M>)

Primitive type implementation

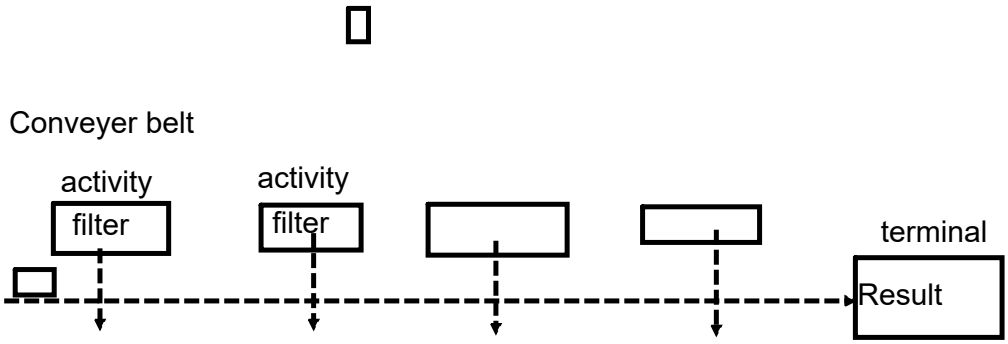
IntConsumer()

Predicate:

BiPredicate, Primitive type implementation

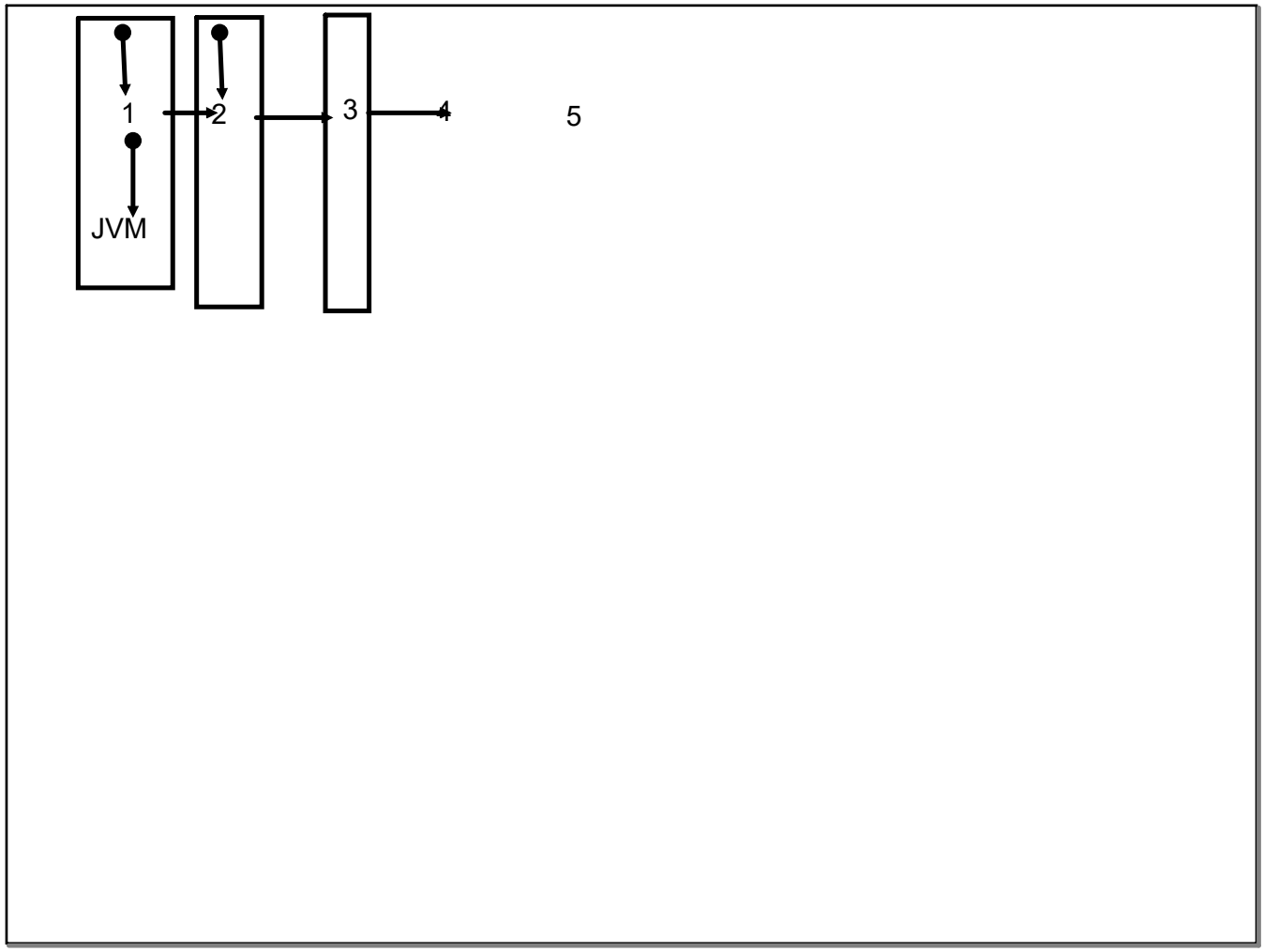
Function : BiFunction

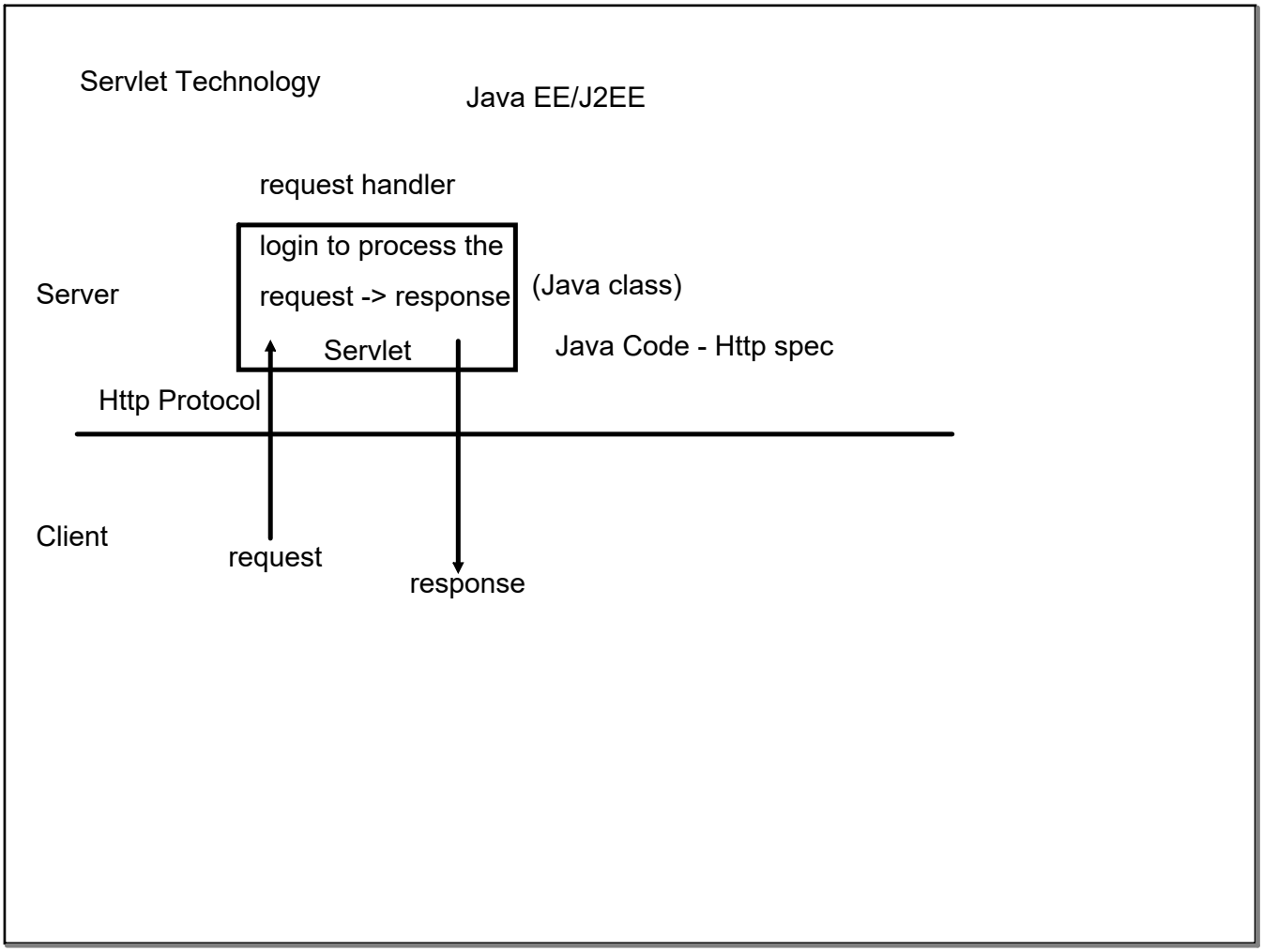
Functional programming remove overhead of creating objects and loading class files



Parallel Processing not to be preferred

1. when an external mutable object is involved
2. when the stream activities involve some inherent complexity


1
2
3
4
5
JVM


Servlet Technology
Java EE/J2EE
request handler
login to process the
request -> response
(Java class)
Server
Servlet
Java Code - Http spec
Http Protocol
Client
request
response

Java EE

Servlet

Java Class

class MyServ extends GenericServlet/HttpServlet{

}

GenericServlet : Support only generic Http Verb (Form verbs) get/post

HttpServlet : identifies HTTP Verbs (get,post,put,delete)

identifies intention of http verb

```
class MyServ extends GenericServlet/HttpServlet{
      <---- lifecycle ------>
      init (load)
      service(GenericServlet) (doPost,doGet,doPut,doDelete: HttpServlet) : request/response
      destroy (unloaded)
}

  service/(doPost,doGet,doPut,doDelete) (HttpServletRequest request,
                                                HttpServletResponse response){

  }
```

Named Core Datatypes of TS

number	-1/5.3/200 5~5.0
string	'Hello',"Hello",`Hello`
boolean	true/false

Spring

- Spring Core
- Spring MVC (maven)
- Spring Boot

Spring Framework : Servlet technology

CORE

Bean Factory

IoC

DI

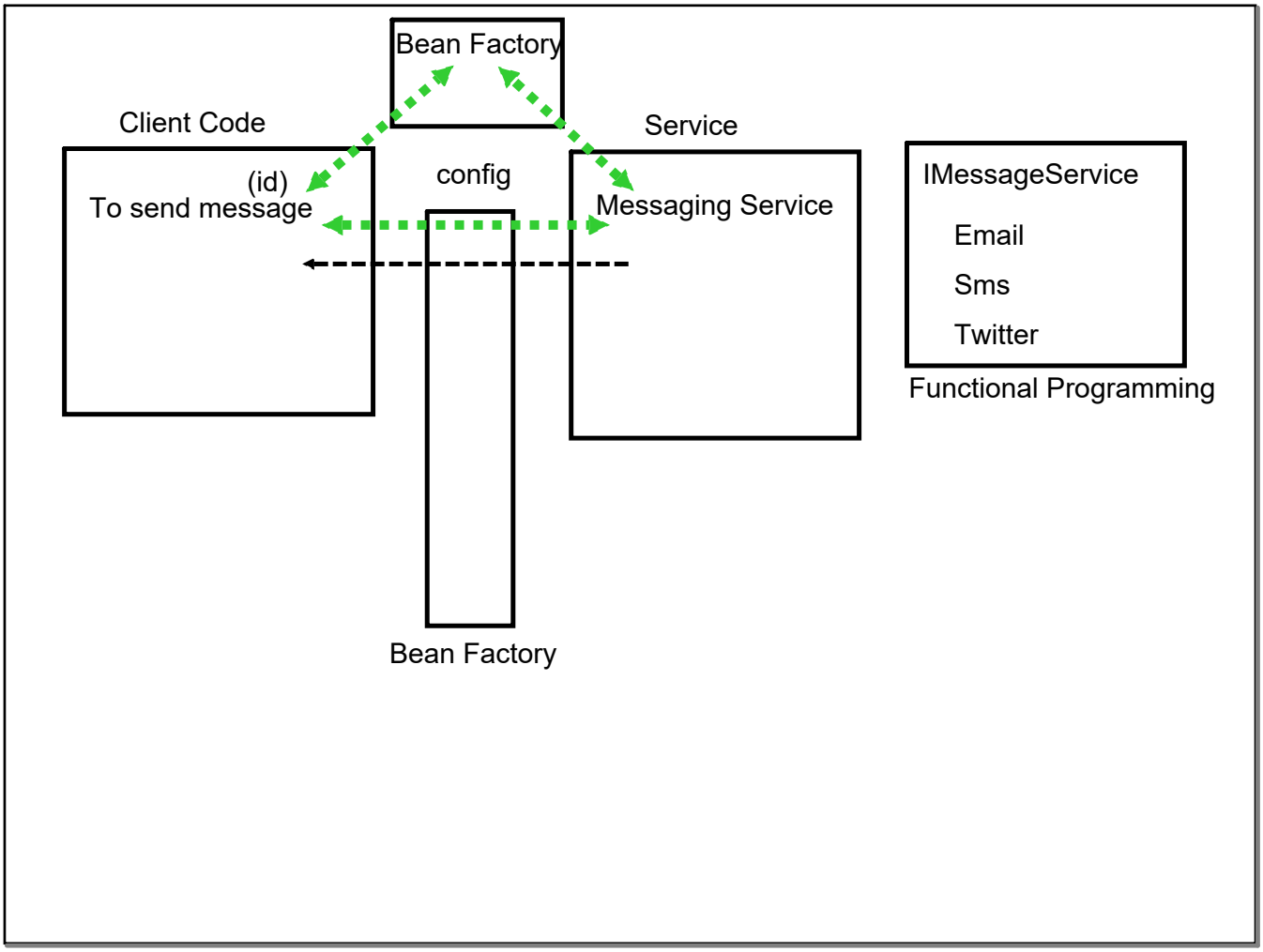
AOP

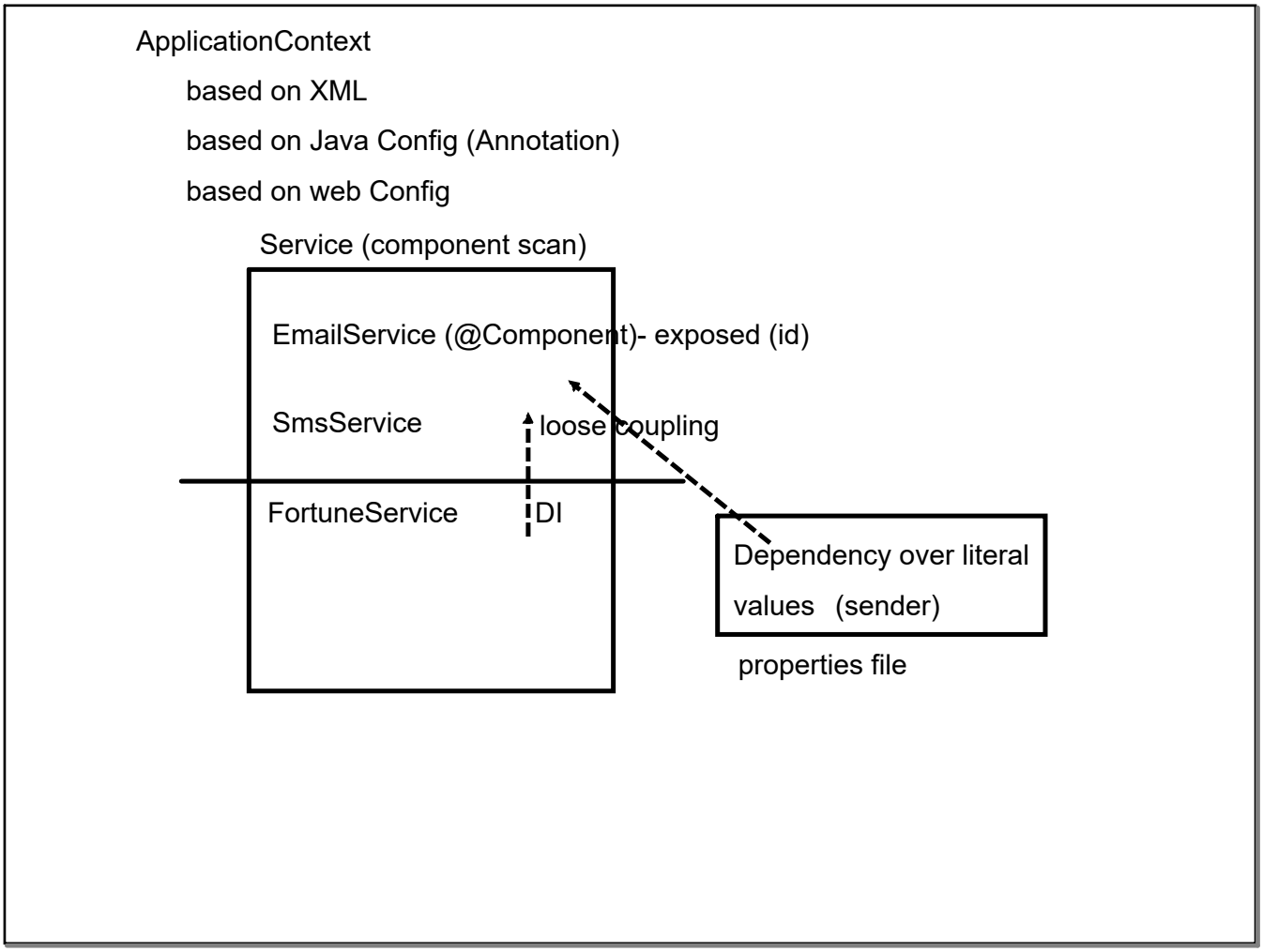
IoC : Outsourcing the creation and management of object

Bean : Java Object managed by container

AOP : Aspect Oriented Programming (Proxy)

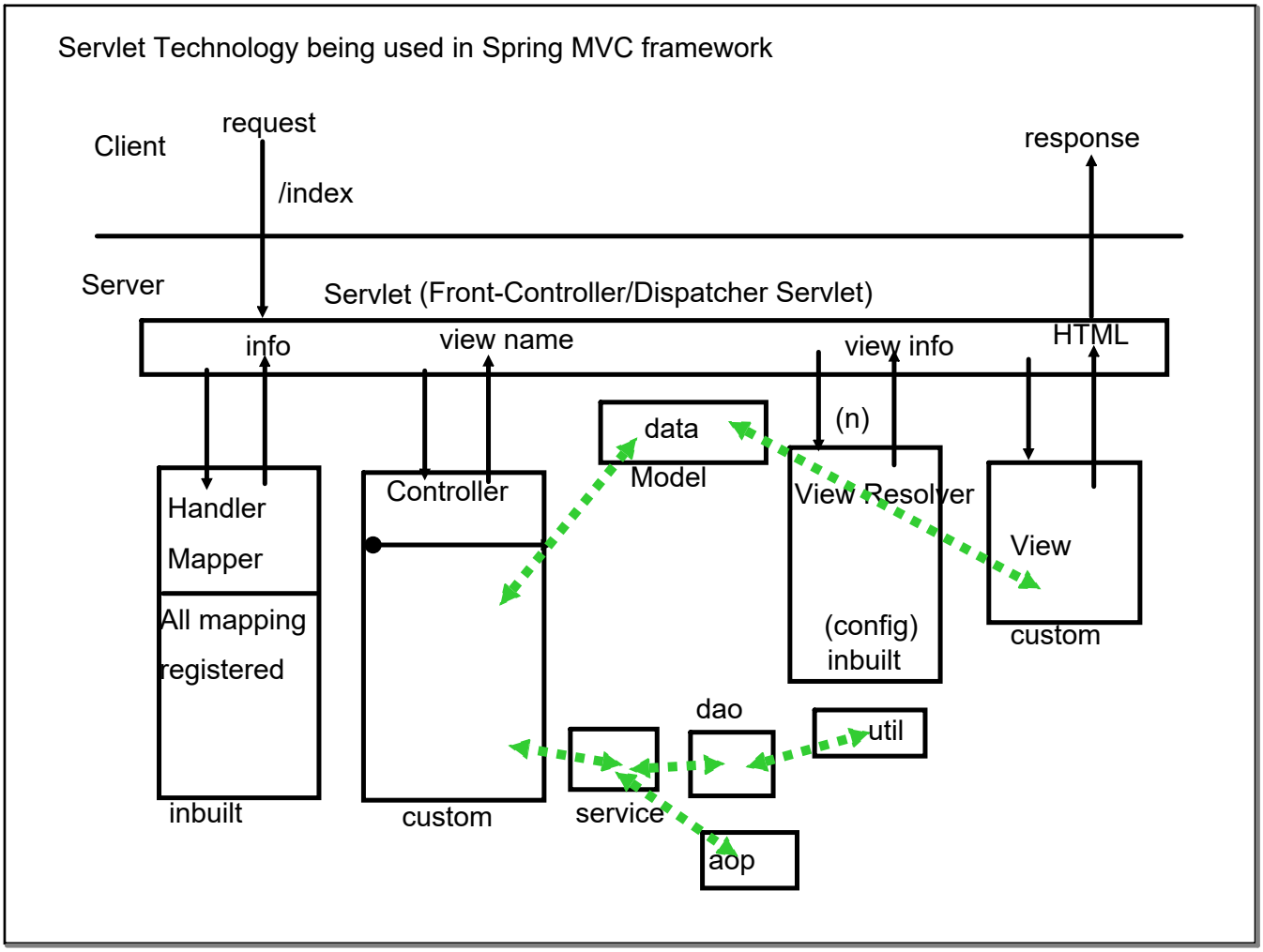
Clean, Loosly Coupled, reusable JAva Code


Bean Factory
Client Code
Service
(id)
To send message
config
Messaging Service
IMessageService
Email
Sms
Twitter
Functional Programming
Bean Factory


ApplicationContext
based on XML
based on Java Config (Annotation)
based on web Config
Service (component scan)
EmailService (@Component)- exposed (id)
SmsService
loose coupling
FortuneService
DI
Dependency over literal values (sender)
properties file

Scope : Singleton (Default) Prototype	request : single request-response cycle session : all request-response cycle for a particular user global : all request-response cycle for all user(web context)

Spring Context does not maintains complete lifecycle of Prototype bean


Servlet Technology being used in Spring MVC framework
Client
request
/index
response
Server
Servlet (Front-Controller/Dispatcher Servlet)
info
view name
view info
HTML
data
Model
(n)
Handler
Mapper
All mapping
registered
inbuilt
Controller
custom
View Resolver
(config)
inbuilt
View
custom
dao
util
service
aop

Maven:

Dependency Management

Standard folder/file system

build

test

documentation

pom : project object model

all config related to maven activity

web.xml : a must file for servlet config

web.xml : Servlet config

Custom spring servlet config (java):

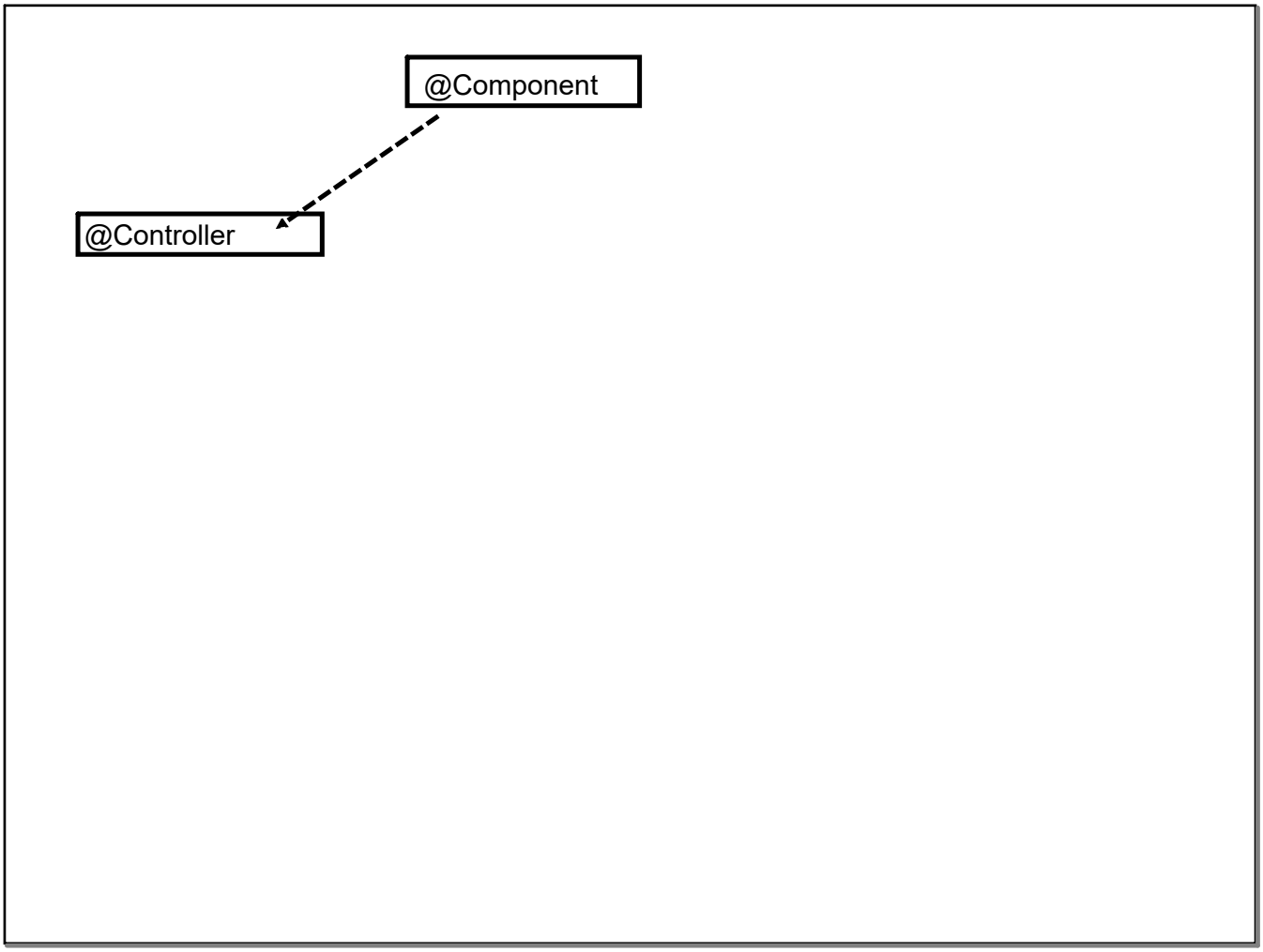
inbuilt servlet : register that servlet (DispatcherServlet : config)

config code: as per more requirement

controller code (multiple support layers)

model : data structure

views : presentation purpose


@Component
@Controller

View Resolver:

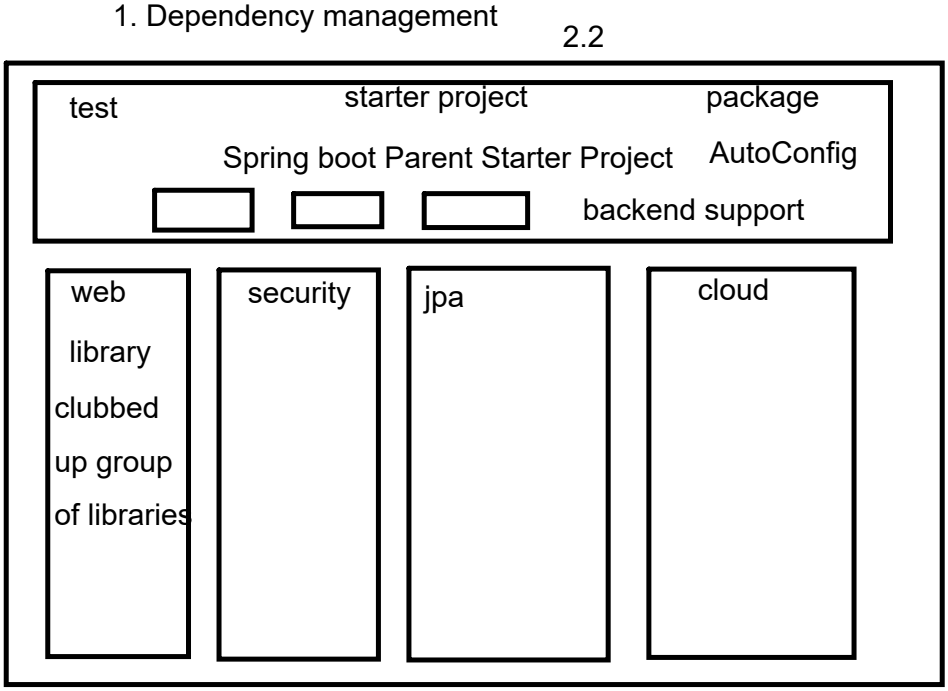
- Single View File (jsp)
- Modular View File (Tiles)
- Multipart response (as downloadable file)

=>What type of responses you want

=>What type of responses your view templates

Spring Boot:

1. Dependency management



Configuration:

Auto/Easy

=> Curated clubbed up Annotation

=>Added new annotation for custom config

=> property files : add correct key-values pair

=> adding dependency : will activate that feature and auto configure

some default behavior

spring-security (

spring-actuator

spring-devtool

web application

spring boot web application packaged as jar

standalone : executed like a simple java

Tomcat is embedded

Spring boot is self-sufficient for maven tool

eg : mvn package/test/clean/install

spring boot tool:

eg: mvnw package/test/clean/install

Spring boot application are by default

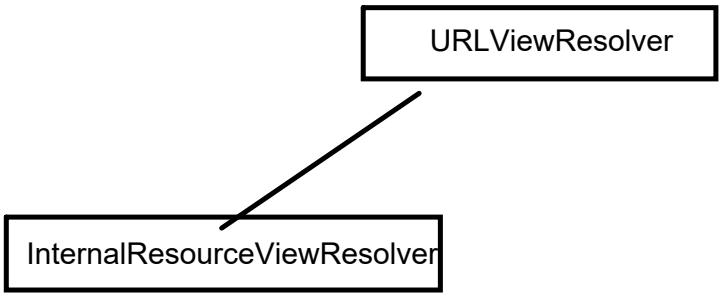
not configured to use jsp-jstl view templates

Spring boot is by default configured to use :

thymeleaf

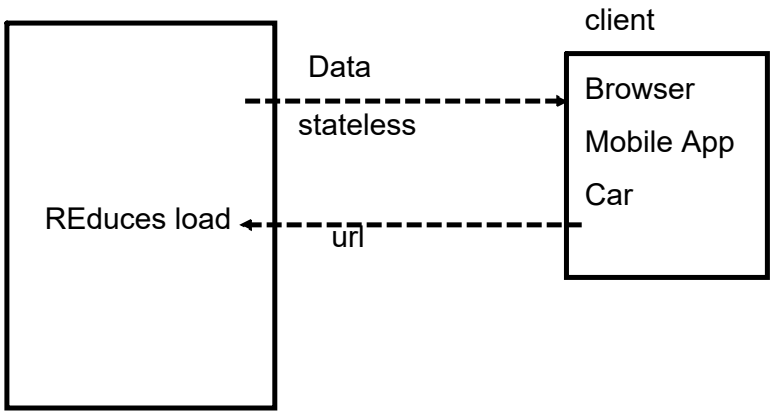
> java -jar bootapp.jar server.port=9091

InternalResourceViewResolver (



REST-WS

REpresentational State Transfer



1. how to generate a request ?
2. what is format in which data will arrive?

Request, REST :

=>purely the URL

=>Conventions for URL

=>ALL HTTP VERBS (intention)

eg :POST : add some

PUT : edit

SOAP / WSDL : programmatic request

REceiving data:

standard, simple as possible

JSON,XML,HTML,TEXT

Allowed to explore the concept of micro-service architecture

JAX-RS (specification)

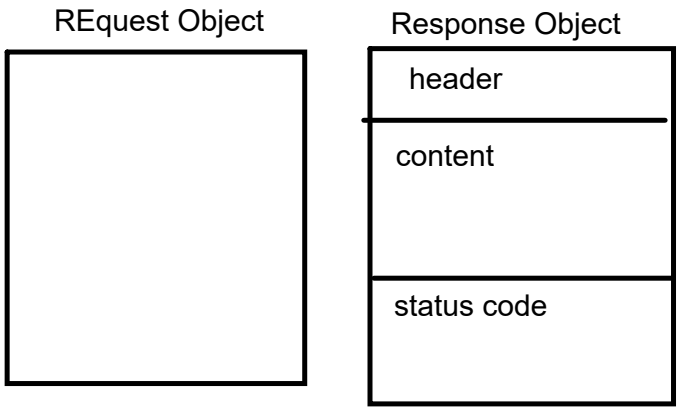
- Jersey
- Restlet
- RESTEasy
- Apache CXF

Spring :

- not a JAX-RS impelementation

@RestController

1. does auto : interconversion of JSON<->JAVA (jackson-databind project)
2. DEALS with Request /Response



Jackson - databind project :

uses the getter/setter method for interconversion

lombok project

Convention:

Employee

/api/employees	GET	: asking for all employee records (/api/get-all-records)
/api/employees/{id}	GET	: asking for a single emp record with id : {id}
/api/employees	POST	: a record is submitted (add)
/api/employees	PUT	: a record is submitted (update)
/api/employees/{id}	DELETE	: delete a record with id : {id}
/api/employess	DELETE	: a array of id is submitted
/api/employees/{id1}/{id2}	DELETE	

spring-data-rest

Actuators

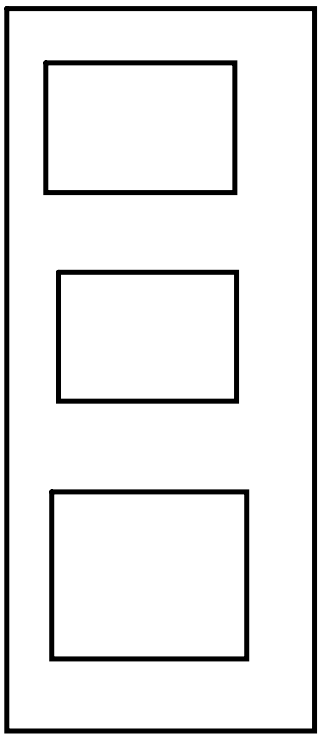
Microservice architecture

monolith :

Interdependency
Fragile in nature
deployment :
usage of resources
bound to specific technology
team division / management
new team member inclusion

---

1. does not easily integrate/comply agile
2. CI/CD implementation is a challenge



easy to maintain

different technology

isolated DB

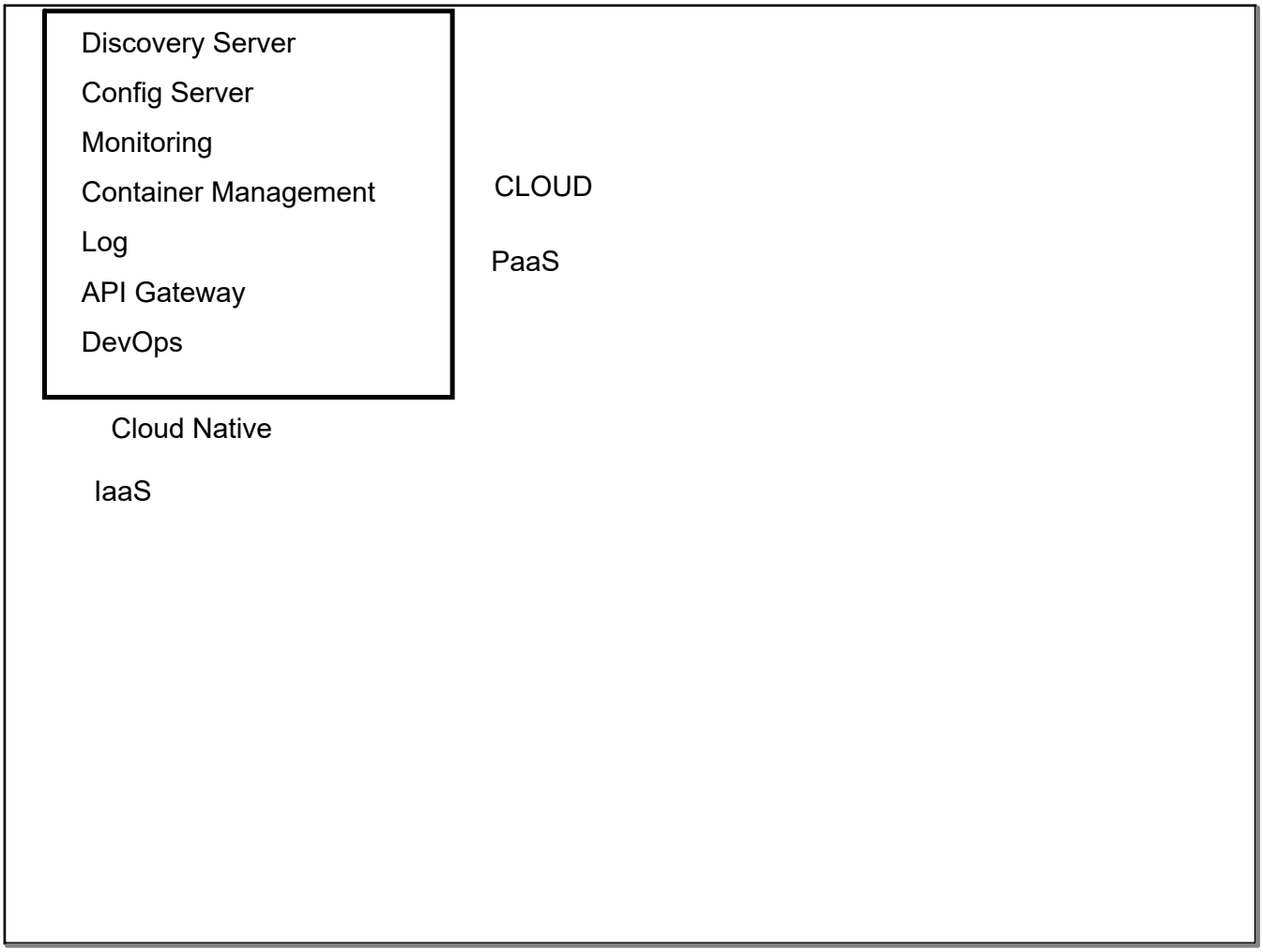
SOA ->

50% (microservice)(service)(SOA)

50% managment

Challenge :

Relationship : Tools/Support

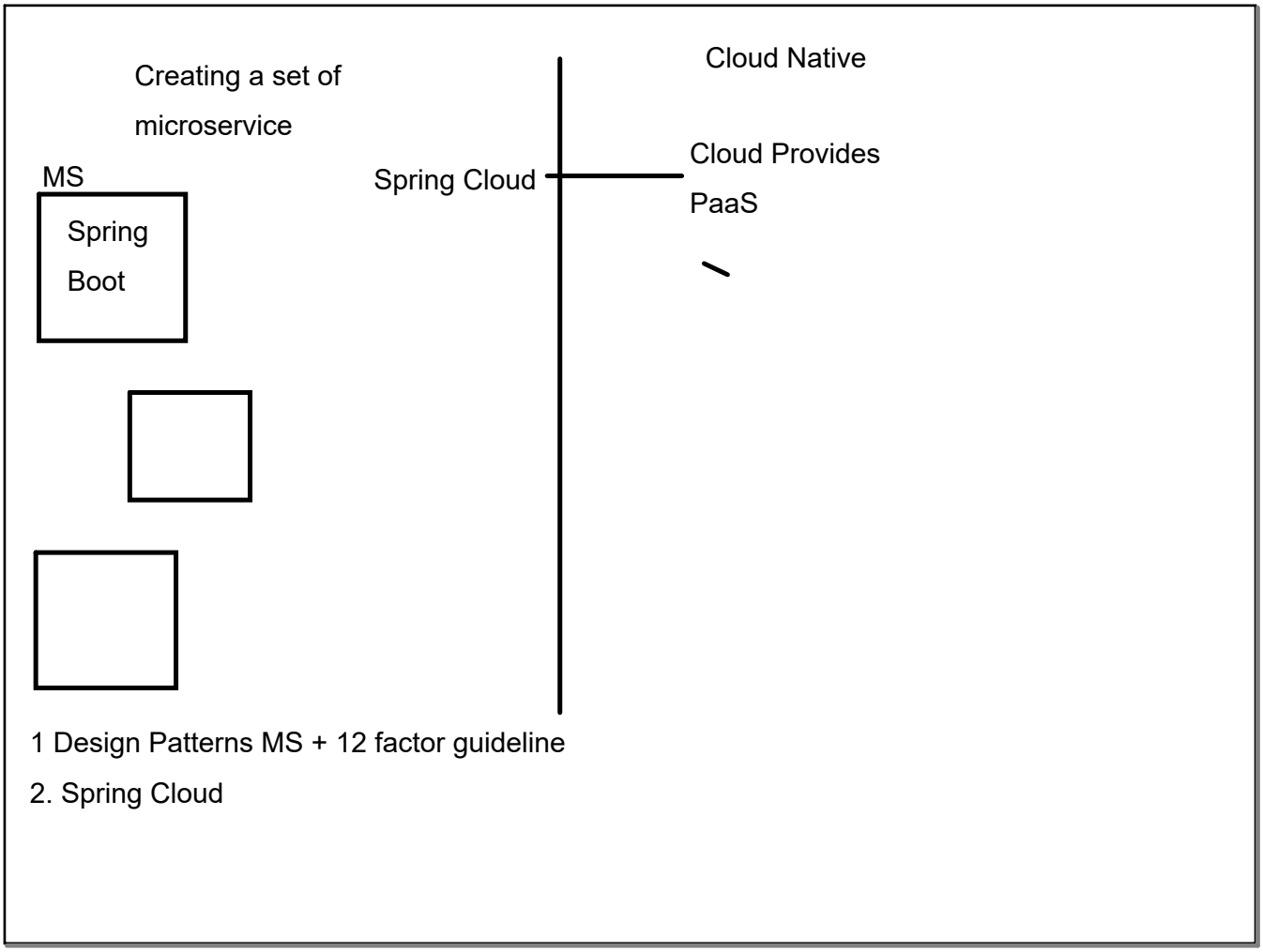

Discovery Server
Config Server
Monitoring
Container Management
Log
API Gateway
DevOps
CLOUD
PaaS
Cloud Native
IaaS

Spring boot :

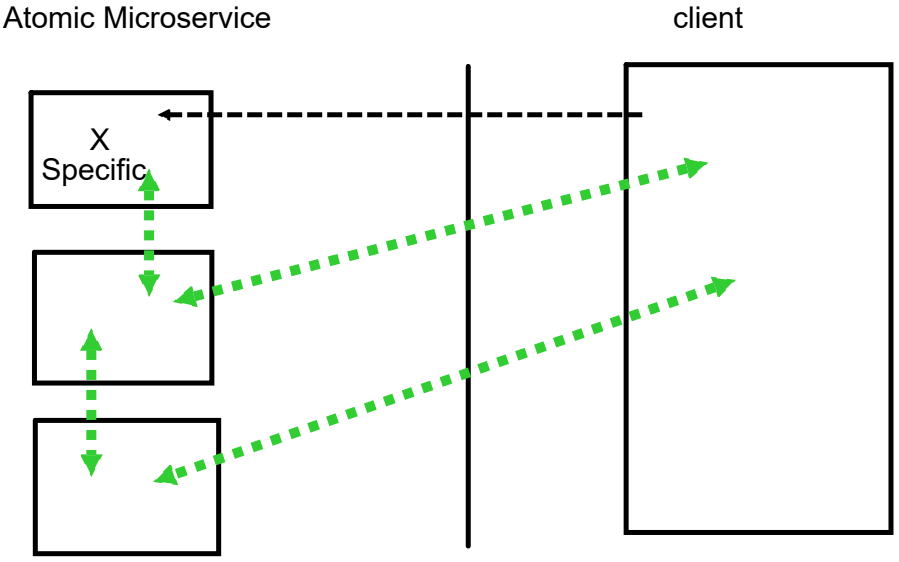
Spring / Spring MVC

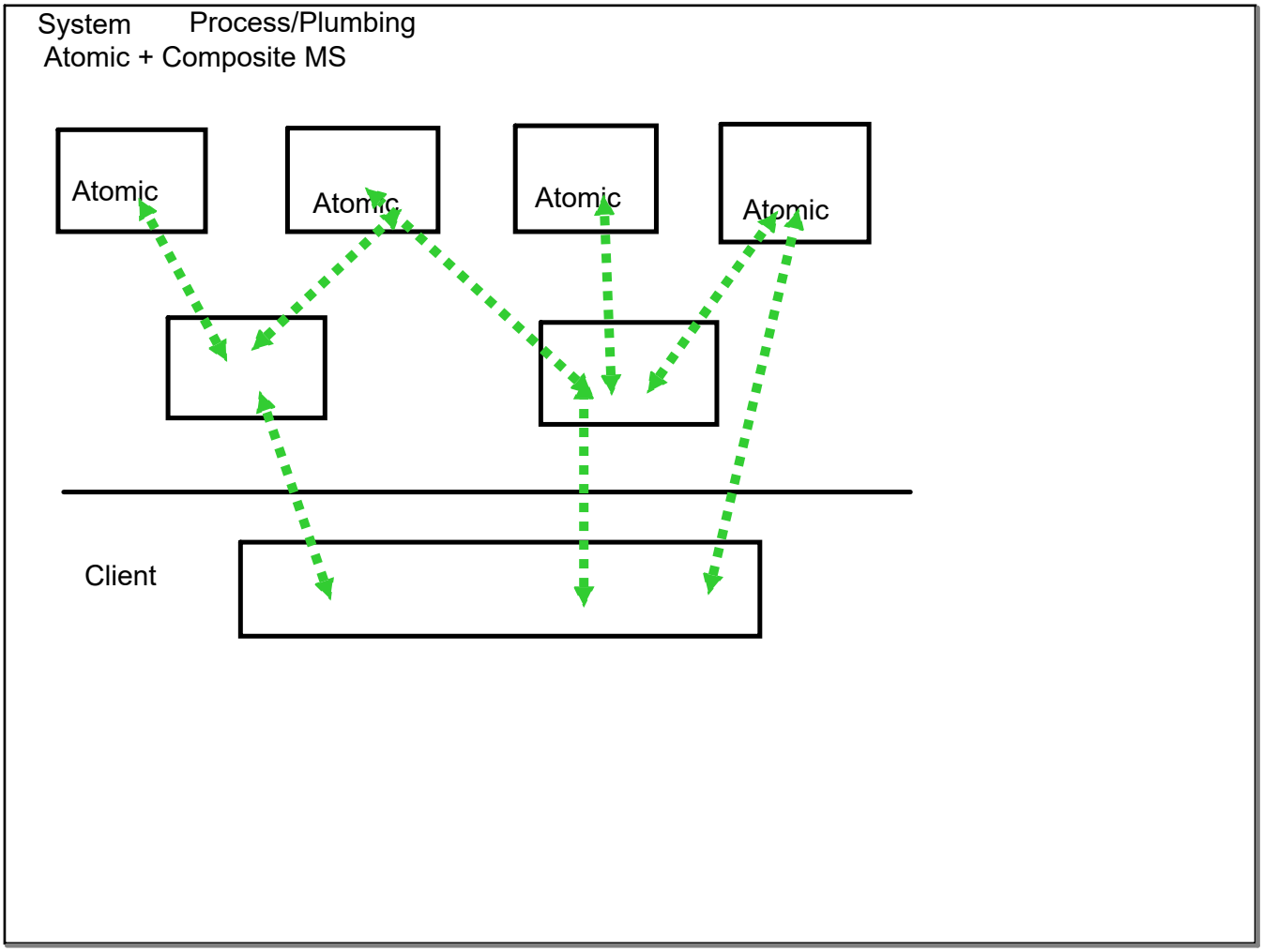
Most resonable default

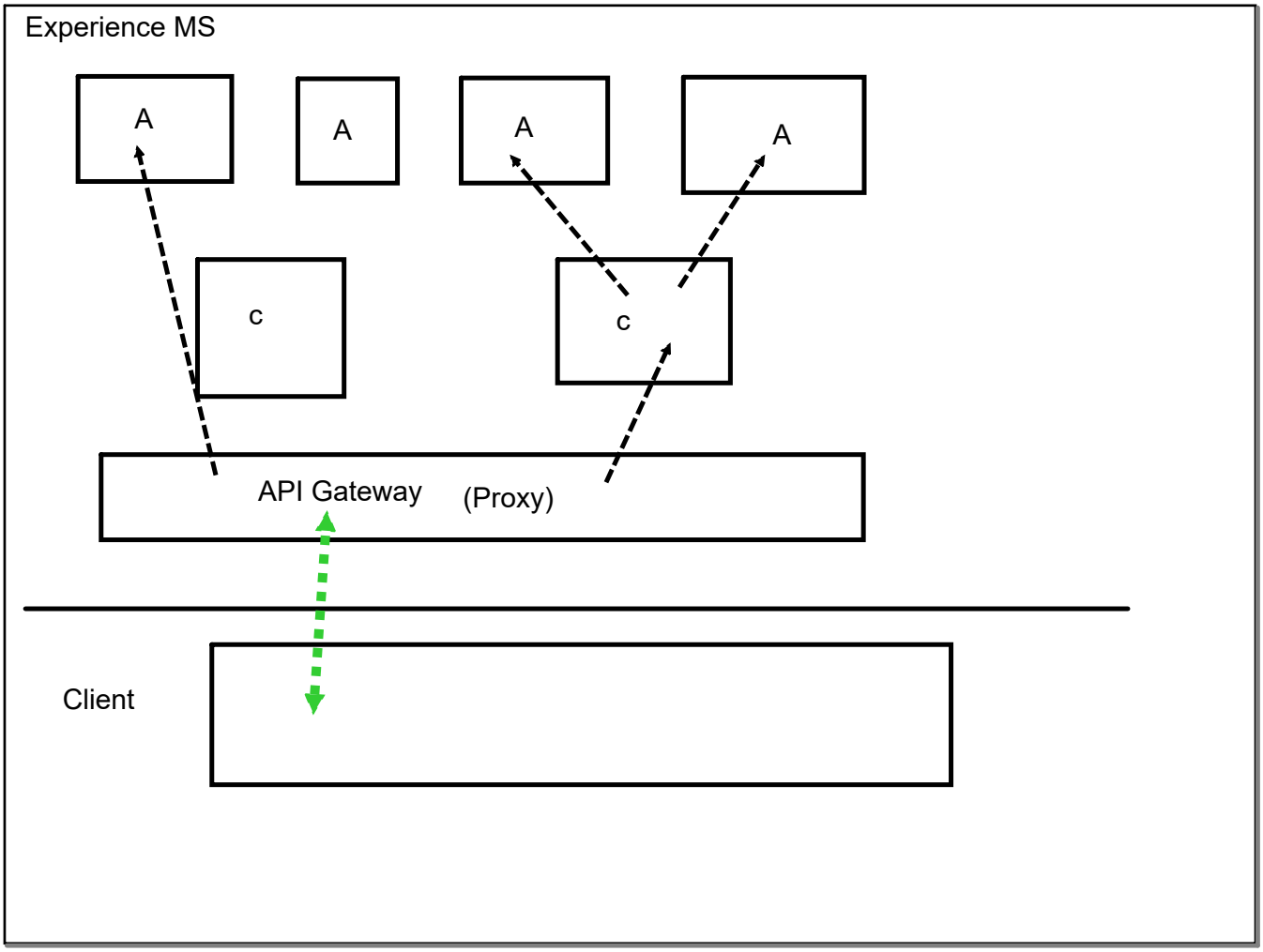
Integrates Spring cloud out of the box

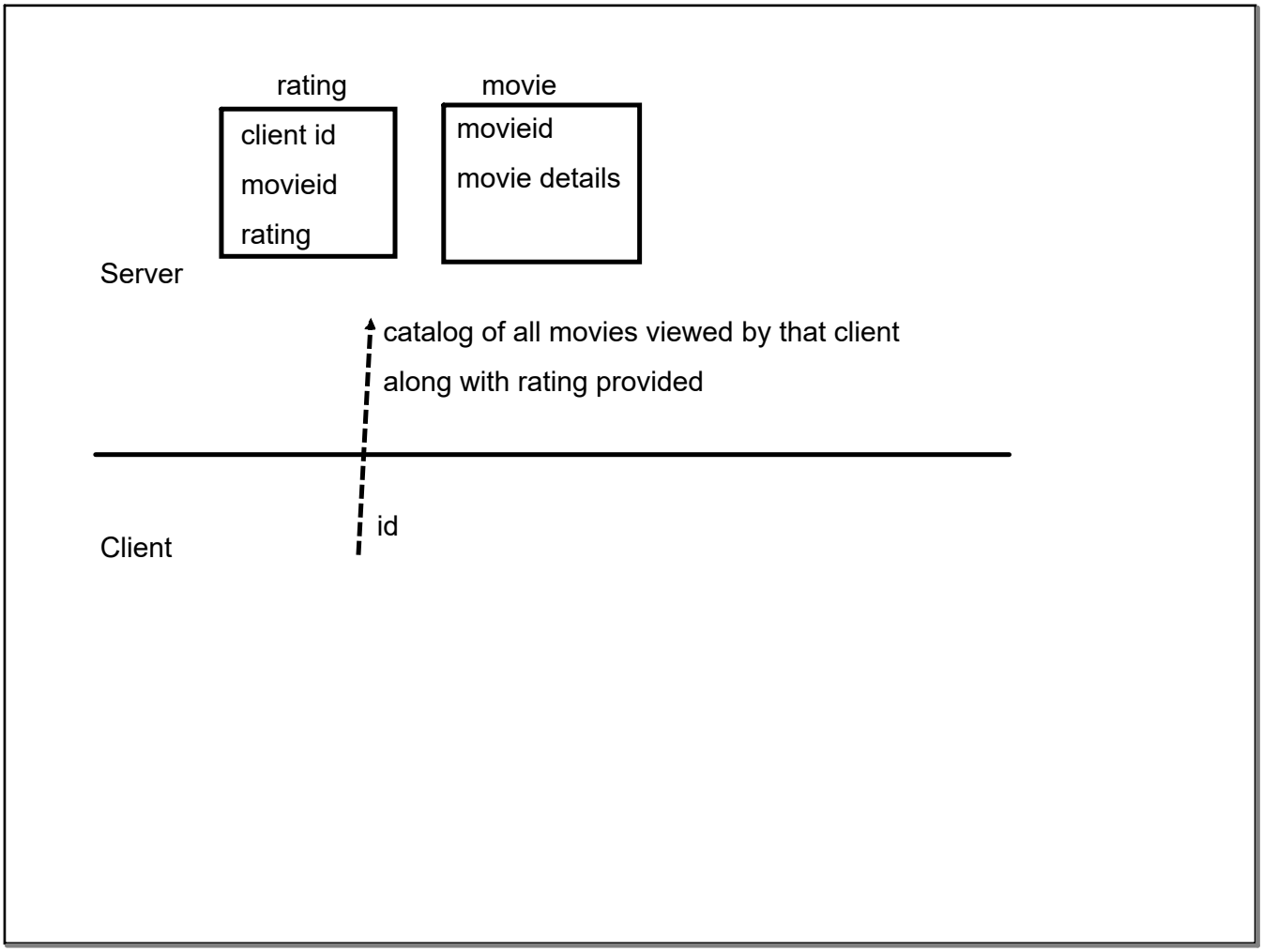

Creating a set of
microservice
MS
Spring
Boot
Spring Cloud
Cloud Native
Cloud Provides
PaaS
1 Design Patterns MS + 12 factor guideline
2. Spring Cloud

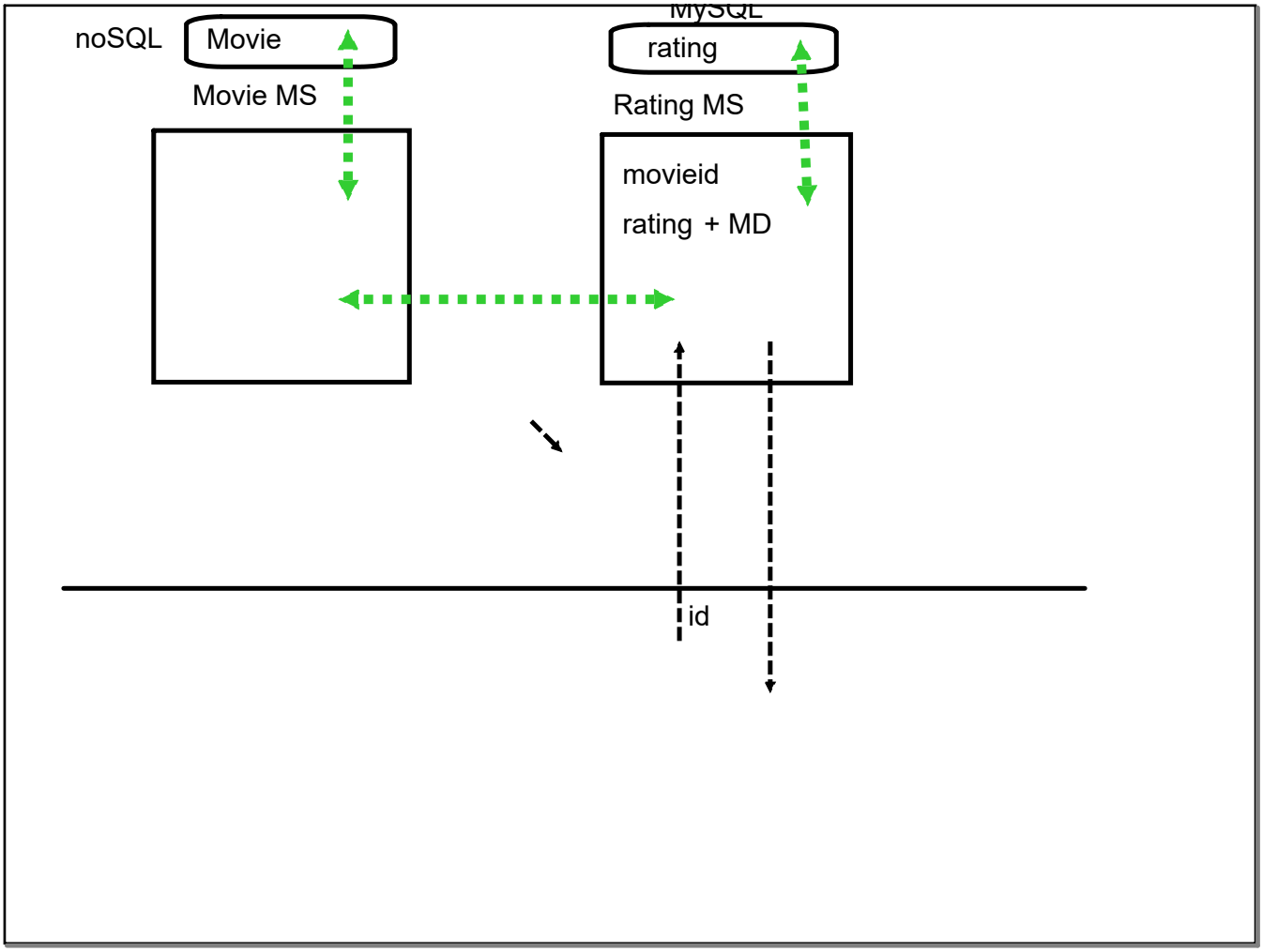
Service Granularity

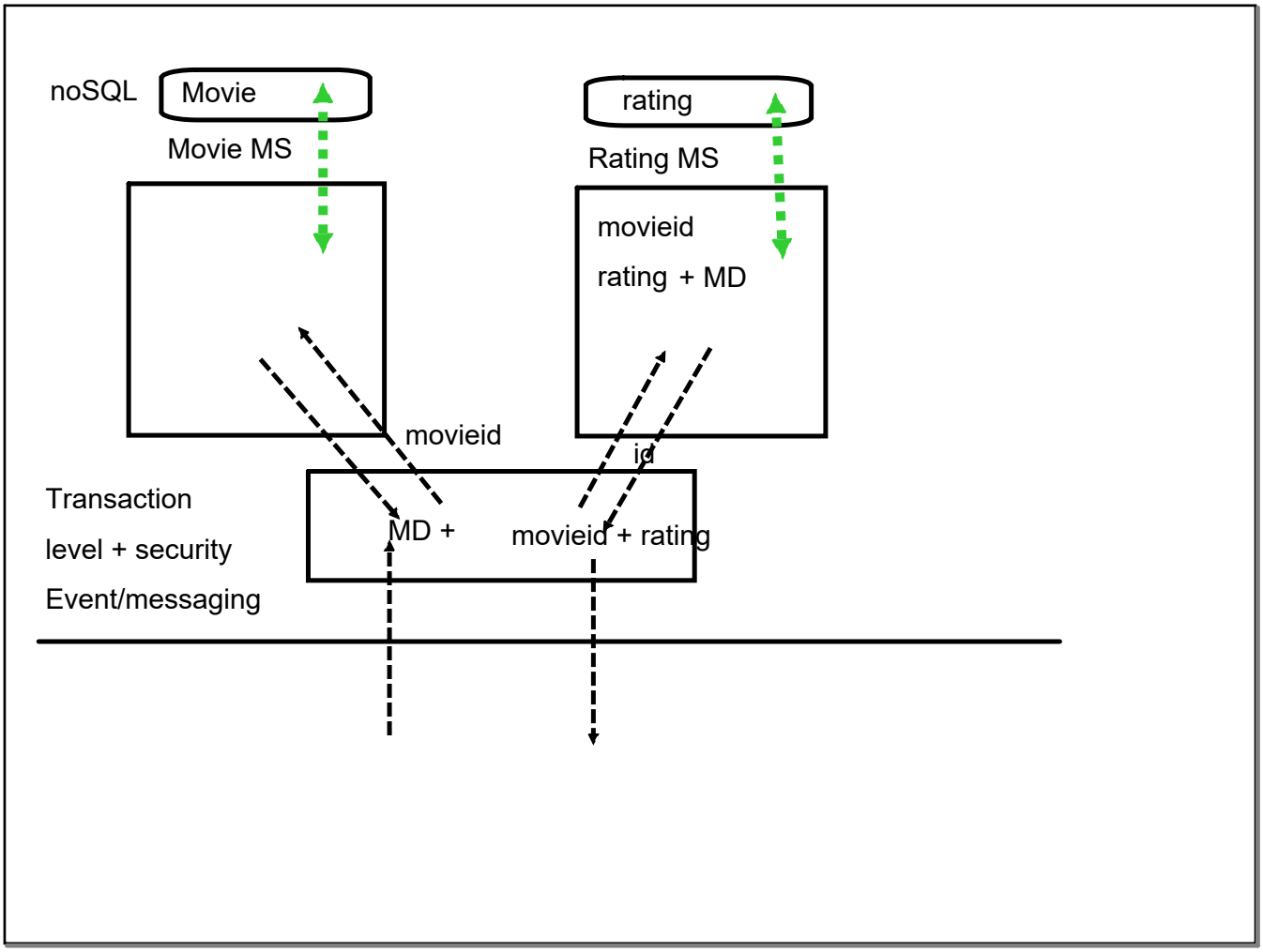



System
Process/Plumbing
Atomic + Composite MS
Atomic
Atomic
Atomic
Atomic
Client


Experience MS
A
A
A
A
c
c
API Gateway
(Proxy)
Client


rating
client id
movieid
rating
movie
movieid
movie details
Server
catalog of all movies viewed by that client
along with rating provided
id
Client


noSQL
Movie
Movie MS
MySQL
rating
Rating MS
movieid
rating + MD
id


noSQL
Movie
Movie MS
rating
Rating MS
movieid
rating + MD
movieid
id
Transaction
level + security
Event/messaging
MD +
movieid + rating

12-factor guildeline

Lightweight

Reactive

Stateless

Atomic

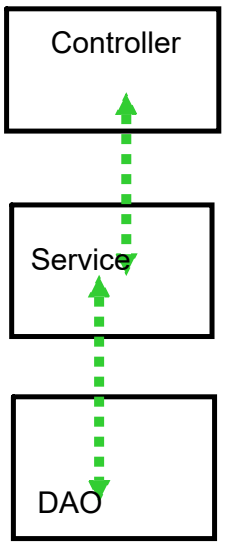
Externalized

Consistent

Resilient

Good Citizens

Versioned x.x.x



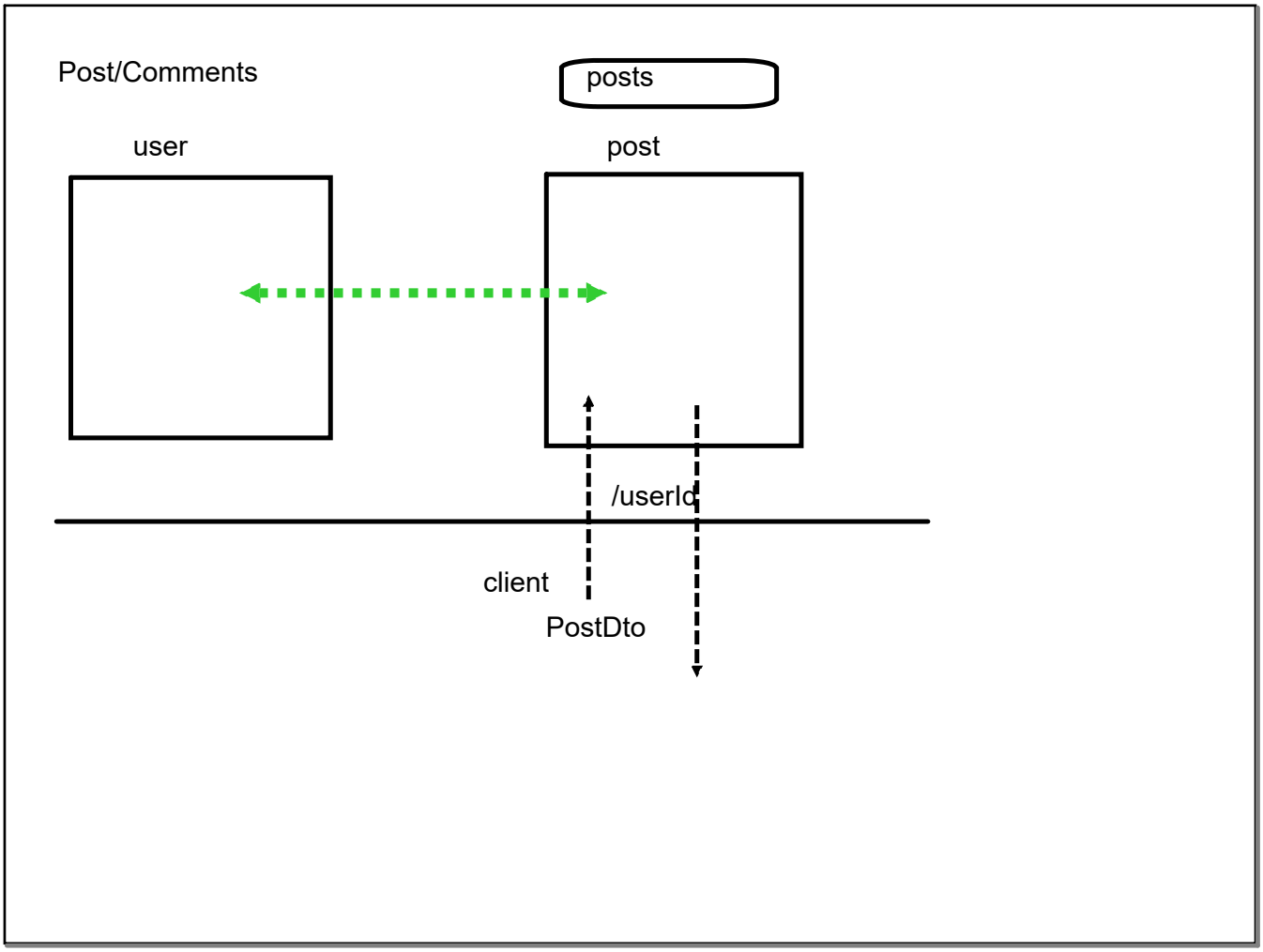
Spring-Data (persistent API)

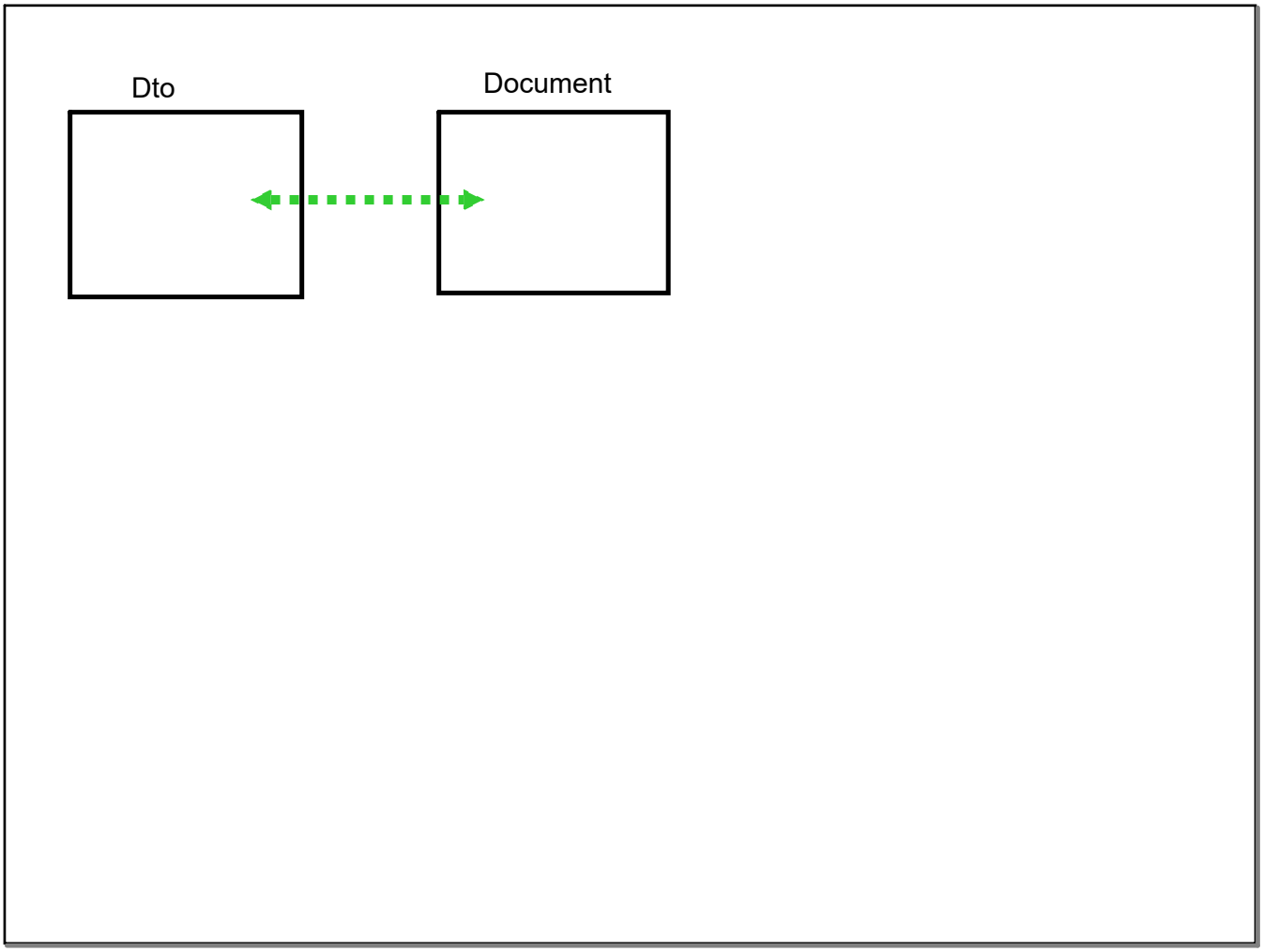
: Mysql : JPA

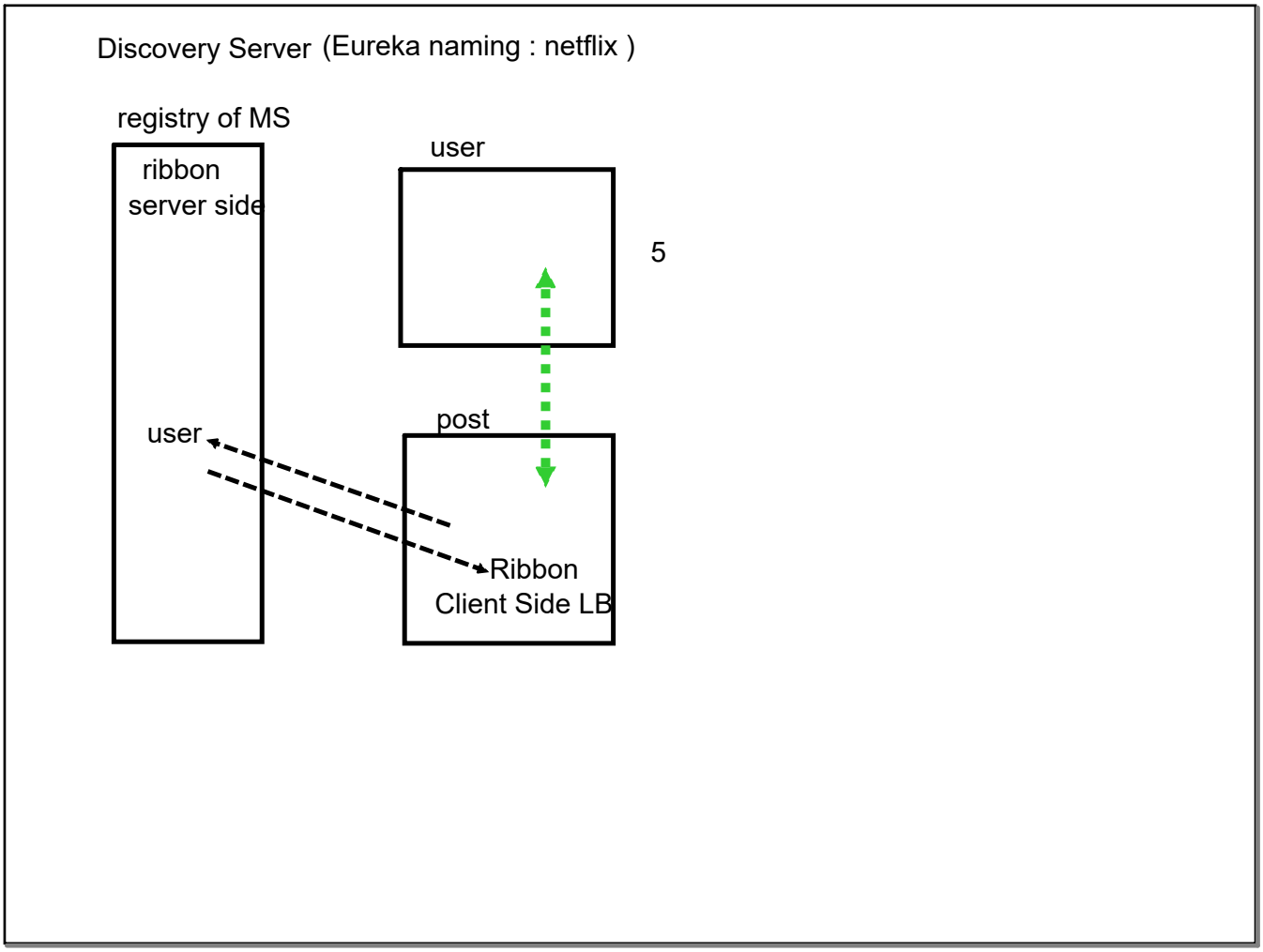
: Mongo-DB impl

=> Lots of pre-built DB interaction

=> Add custom method : implementation provided on the fly
proper naming convention


Post/Comments
posts
user
post
/userId
client
PostDto


Dto
Document


Discovery Server (Eureka naming : netflix)
registry of MS
ribbon
server side
user
5
user
post
Ribbon
Client Side LB

HTML : STRUCTURE

CSS : PRESENTATION

Javascript : BEHAVIOR

HTML-5

backward compatibility

Standardized the error handing

New Semantics Elements

Built-in API

audio/video

Semantically correct Structural elements

traditional : <p>,,

article,

section

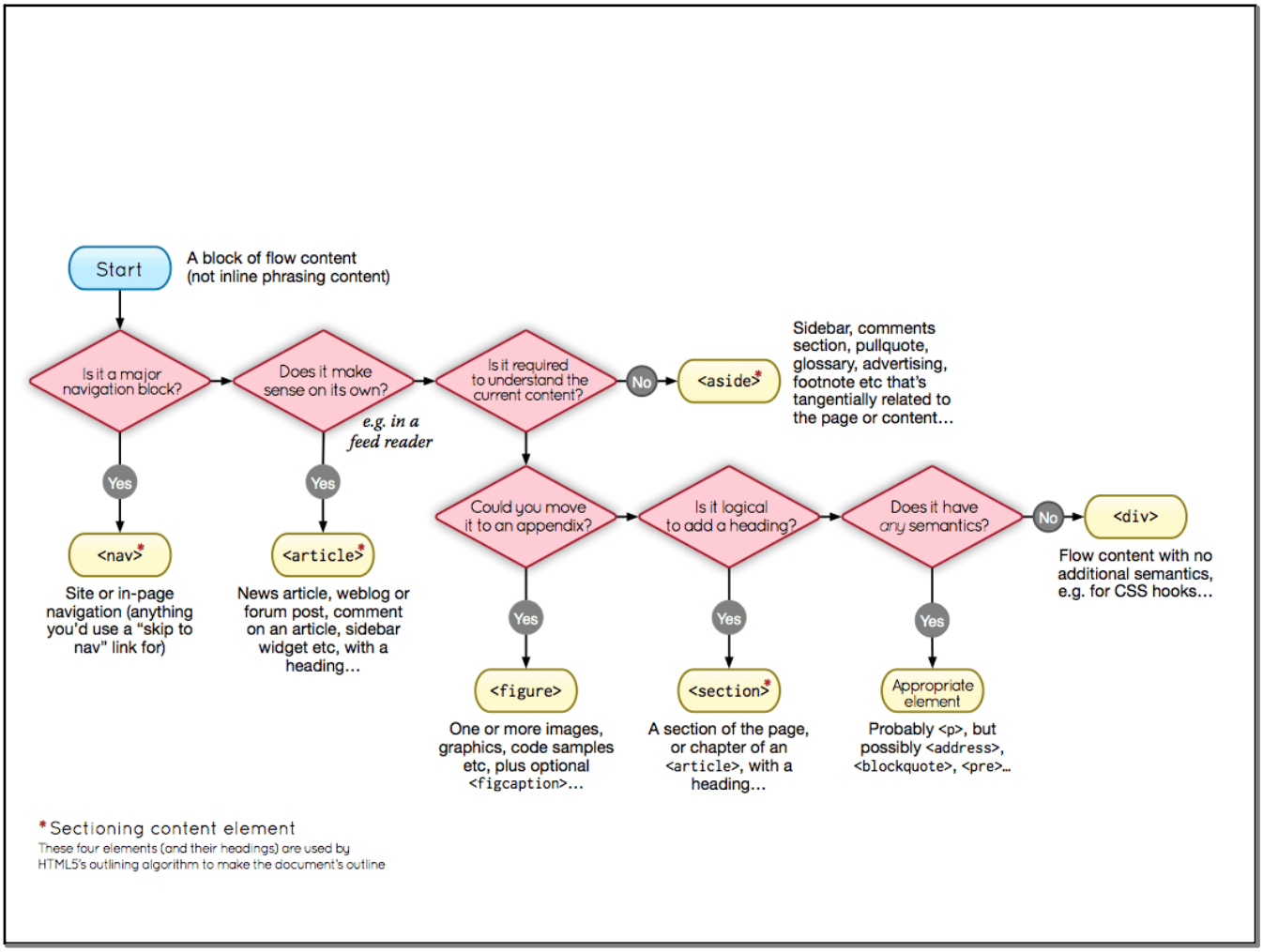
aside,

header,

footer

OUTLINE ALGORITHM :

- Smooth renderring
- Assisstive technology
- Search EO


Start
A block of flow content (not inline phrasing content)
Is it a major navigation block?
Yes
<nav>*
Site or in-page navigation (anything you'd use a "skip to nav" link for)
Does it make sense on its own?
e.g. in a feed reader
Yes
<article>*
News article, weblog or forum post, comment on an article, sidebar widget etc, with a heading…
Is it required to understand the current content?
No
<aside>*
Sidebar, comments section, pullquote, glossary, advertising, footnote etc that's tangentially related to the page or content…
Could you move it to an appendix?
Yes
<figure>
One or more images, graphics, code samples etc, plus optional <figcaption>…
Is it logical to add a heading?
Yes
<section>*
A section of the page, or chapter of an <article>, with a heading…
Does it have any semantics?
Yes
Appropriate element
Probably <p>, but possibly <address>, <blockquote>, <pre>…
No

Flow content with no additional semantics, e.g. for CSS hooks…
*Sectioning content element
These four elements (and their headings) are used by HTML5's outlining algorithm to make the document's outline

Categorization
- Metadata
- Metadata
- Interactive
- HEading
- Phrasing
- Sectioning

API
- DOM spec is part of HTML5

Built in APIs (internal activities)

A/V Api

Offline Application API

History API

WEb Protocol API

Drag n Drop API

Geolocation

2D Canvas

Local Storage

Session Storage

Messaging API

Local DB API

CSS

Cascade Style Sheet

SS : presentation rul

Cascading : rule for resolving conflicts with multiple SS applied on same elements

Browser SS	Location of style
external	Heirarchy of HTML
internal	Assembly of properties
inline	

selector { property : value}

p{color: #FFFFF}

Cascading rule

Specificity

element

(ID)

. Class

Bootstrap + JS

BootStrap : mobile first CSS library (device independent)

Grid System : use 5 grid breakpoint

extra small : <567 px : col (auto layout)

small 567-768 col-sm

medium 768-992 col-md

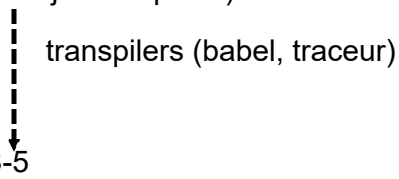
large 992-1200 col-lg

xl > 1200 col-xl

VAnilla JS (Ecma Script)

ES - 5

ES-5 > (external javascript file)



JAvascript (rich set of library allowed to integrate)

Objects

=> HTML/CSS code (DOM Tree)

=> Browser window

=> history

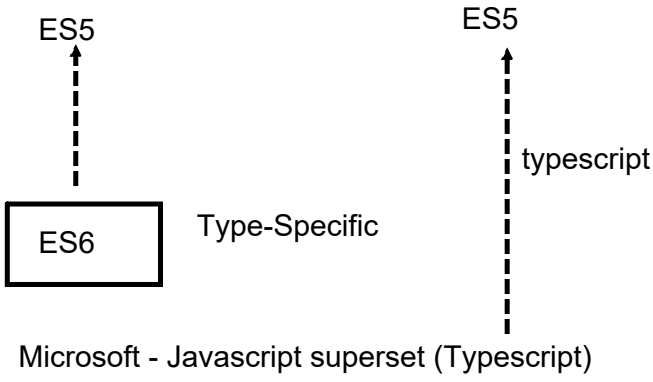
=> navigation

ES6

JS : making HTML page more dynamic/responsive/interactive

Server based logic --> Client (Outsource)

New Programming constructs



Microsoft - Javascript superset (Typescript)

```
function add(num1, num2){
    return num1 + num2;
}

add(20,30);  50
add('20','30'); 2030
```

named Type

interface/generic

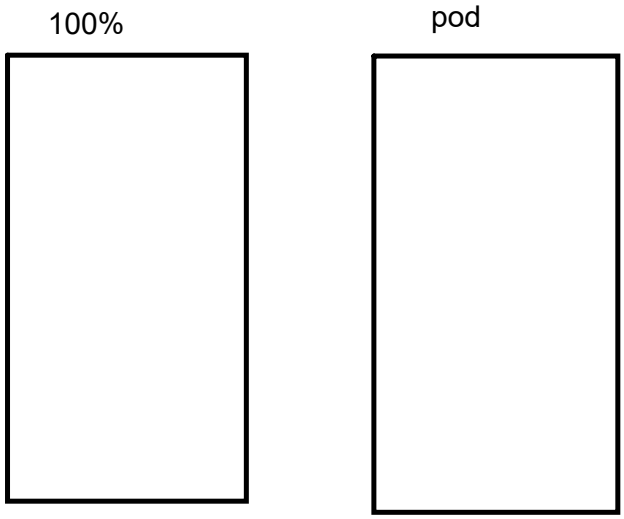
npm

npm install -g typescript

```
var button = document.querySelector("button");
var input1 = document.getElementById("num1");
var input2 = document.getElementById("num2");



function add(num1, num2){
    return num1 + num2;
}

button.addEventListener("click", function(){
    console.log(add(+input1.value, +input2.value));
});
```

=>Proper division

=>Management tools



Inter-microservice :

Discovery Server/Client

feign-client

load balancing

externalization :

- config
- security
- single point access

CQRS : Transaction

Event Driven - Messaging API

Fault Tolerance

Tracing

Documentation Swagger

Kubernetes

object : JavaScript objects, types of object

Tuple : fixed size, ordered array

enums

```
class Base{
    constructor(name : string){
    }
}

class Derived extends Base{

}

const der = new Derived("");
```

Angular :

=>SPA

=>DI

Structured Framework

=>Typescript

Babel + typescript

ES5 + HTML

Component based architecture

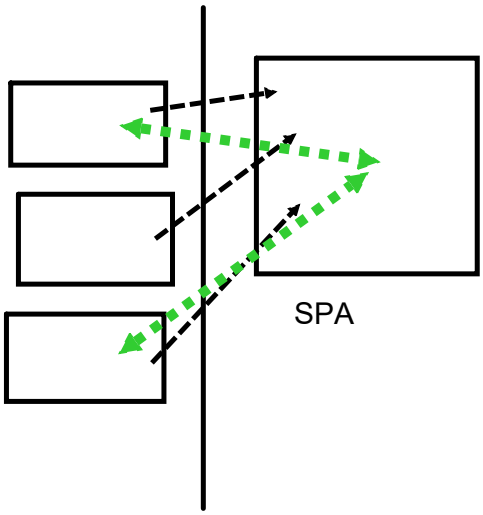
MVC : Model View Component

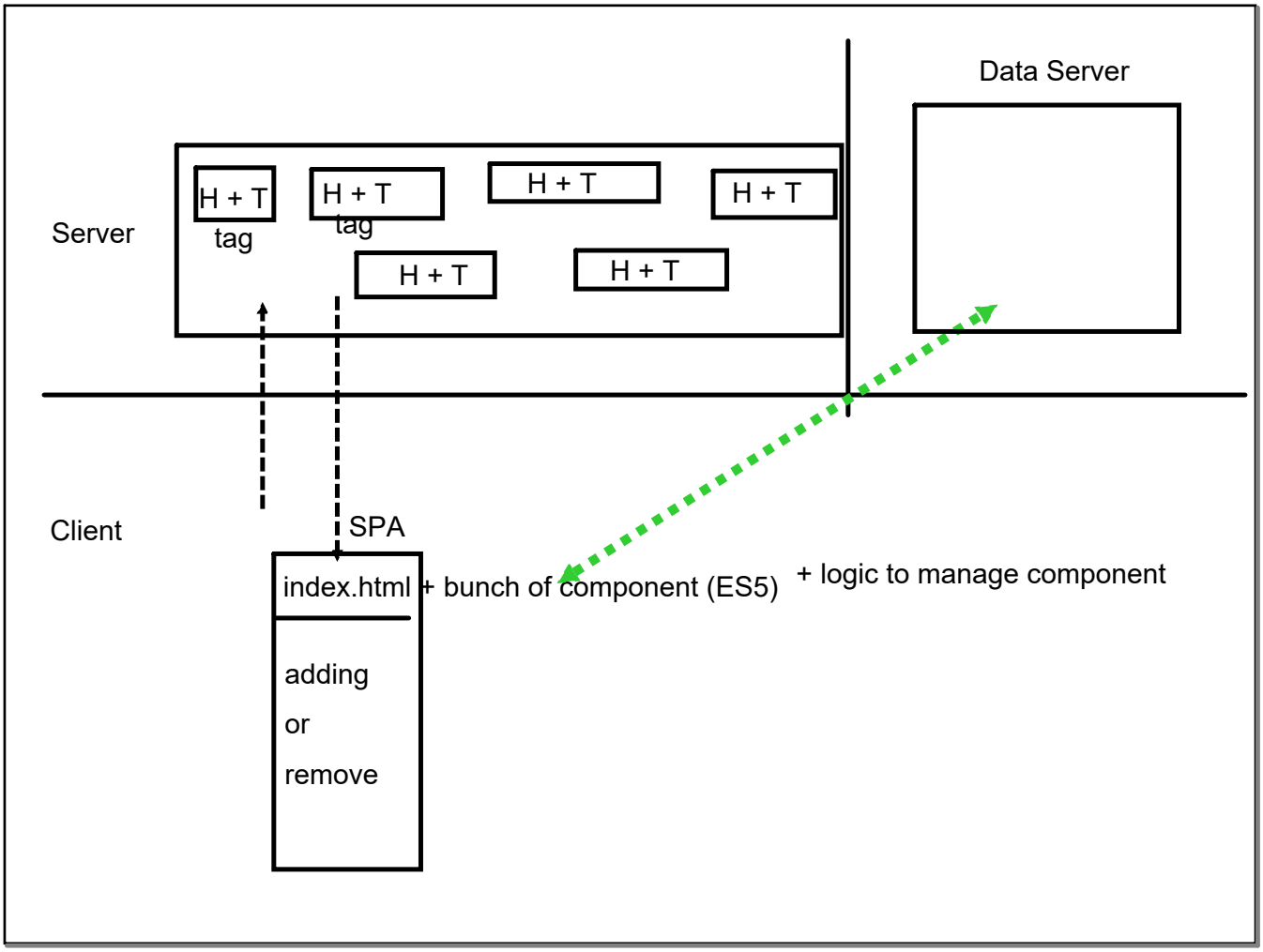
Component :

independent unit, reusable

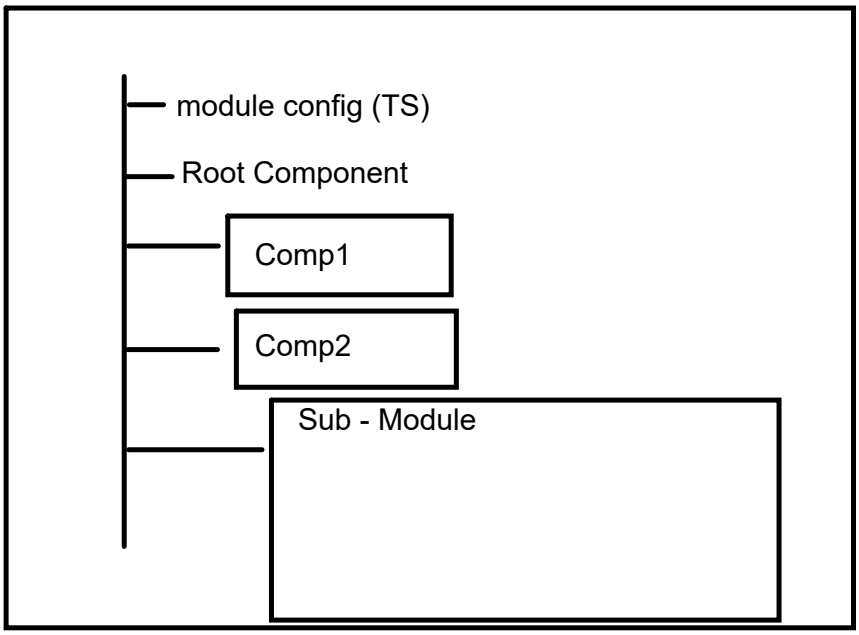
View + Logic

HTML + Typescript




Data Server
Server
H + T
tag
H + T
tag
H + T
H + T
H + T
H + T
Client
SPA
index.html
+ bunch of component (ES5)
+ logic to manage component
adding
or
remove

Modules (Packages)



NodeJS (npm)

to download and install angular CLI

=>npm install -g @angular/cli

Create a new Angular Application

=>ng new <app-name>

All npm :

package.json

npm install

Component :

=> TS class : config

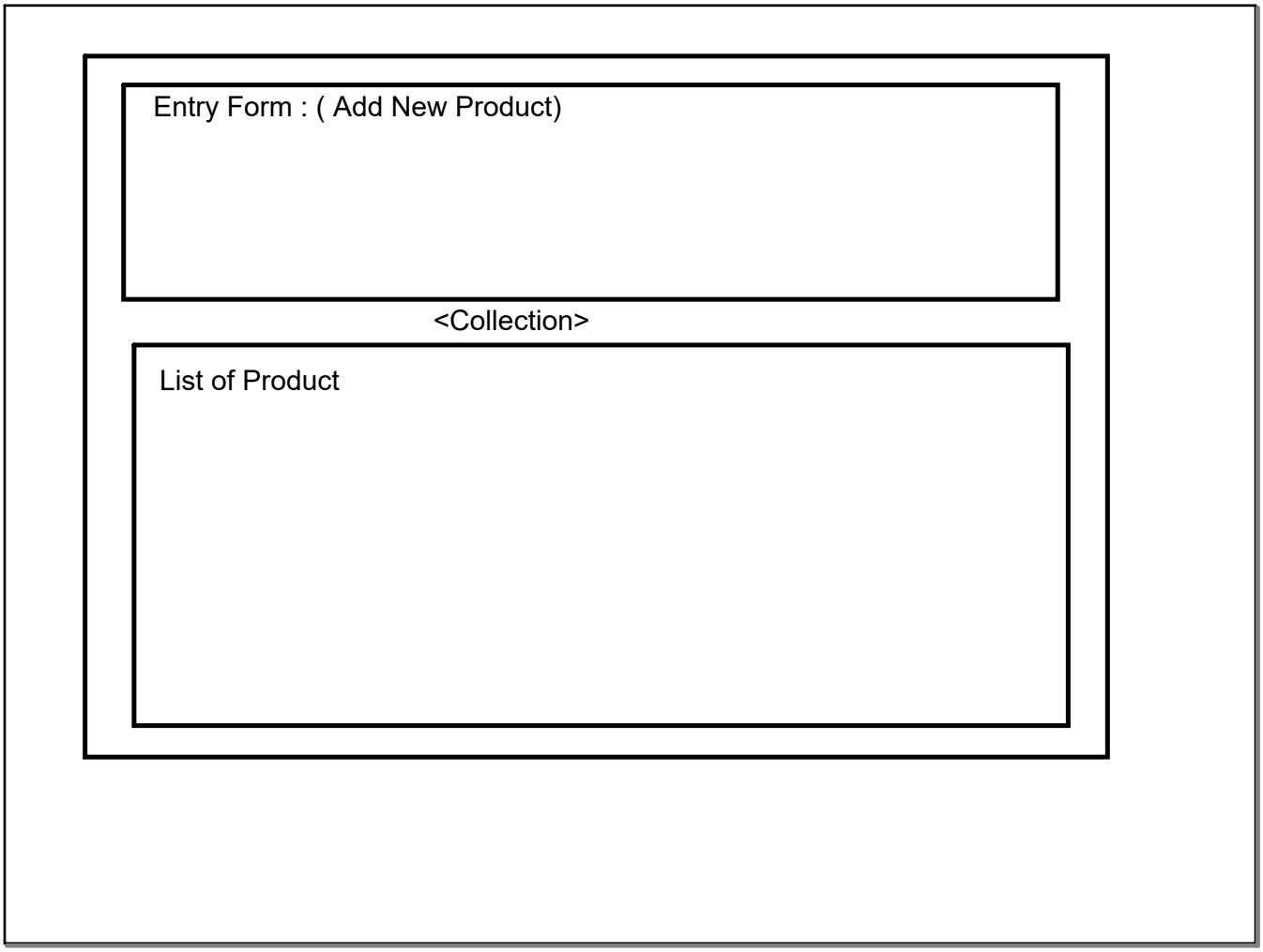
=> presentation : HTML

=> CSS

=> TS class : unit test code

Creating new component

ng generate component <component>


Entry Form : (Add New Product)
<Collection>
List of Product

1.. Single Component (New Data Entry, holding the collection, show the list)

2. Two Component (New Data Entry, holding the collection | show the list)

3. Three Component (New Data Entry | holding the collection | show the list)

show the list

show the detail of one product

-> show only image

-> show reviews

-> show purchase (cost + add to cart)

Directives : ngFor

Services : shared resources (functionality/algo/data)

Pipes | Customize/Transform the output

Angular directive :

helps to add simple programmatic constructs directly into HTML

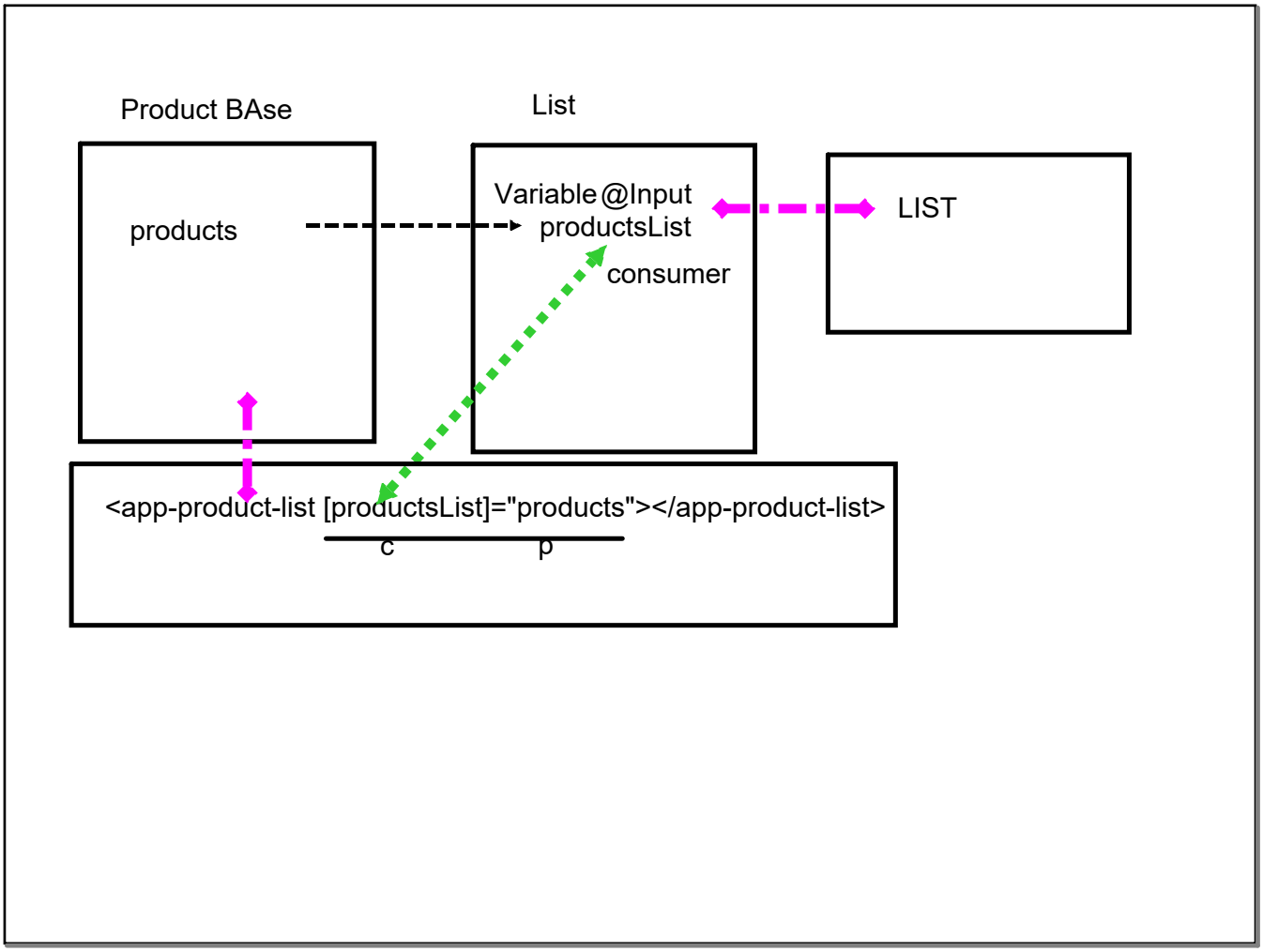
majorly as attributes of existing HTML Components

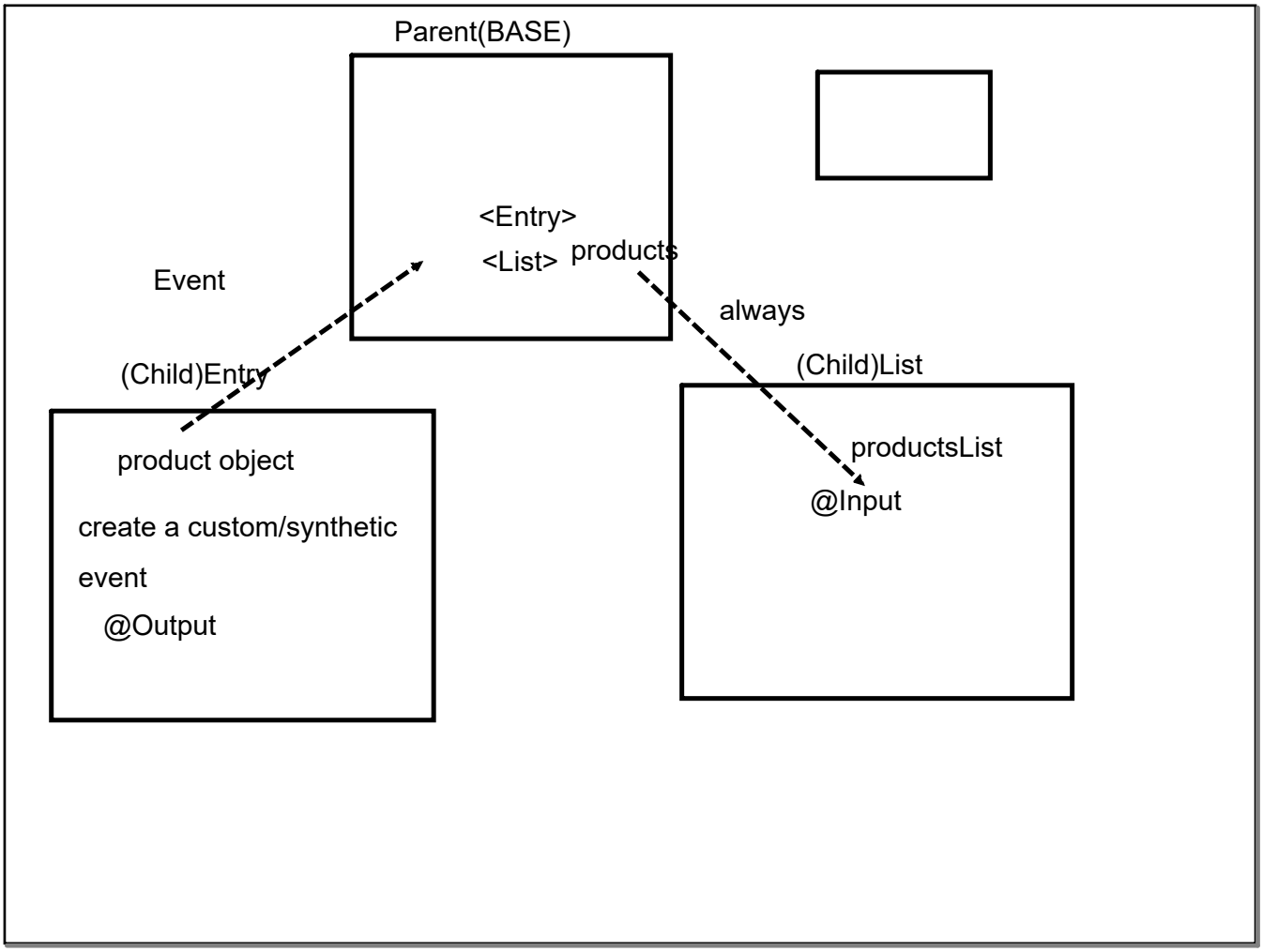
eg : FOR LOOP Directive

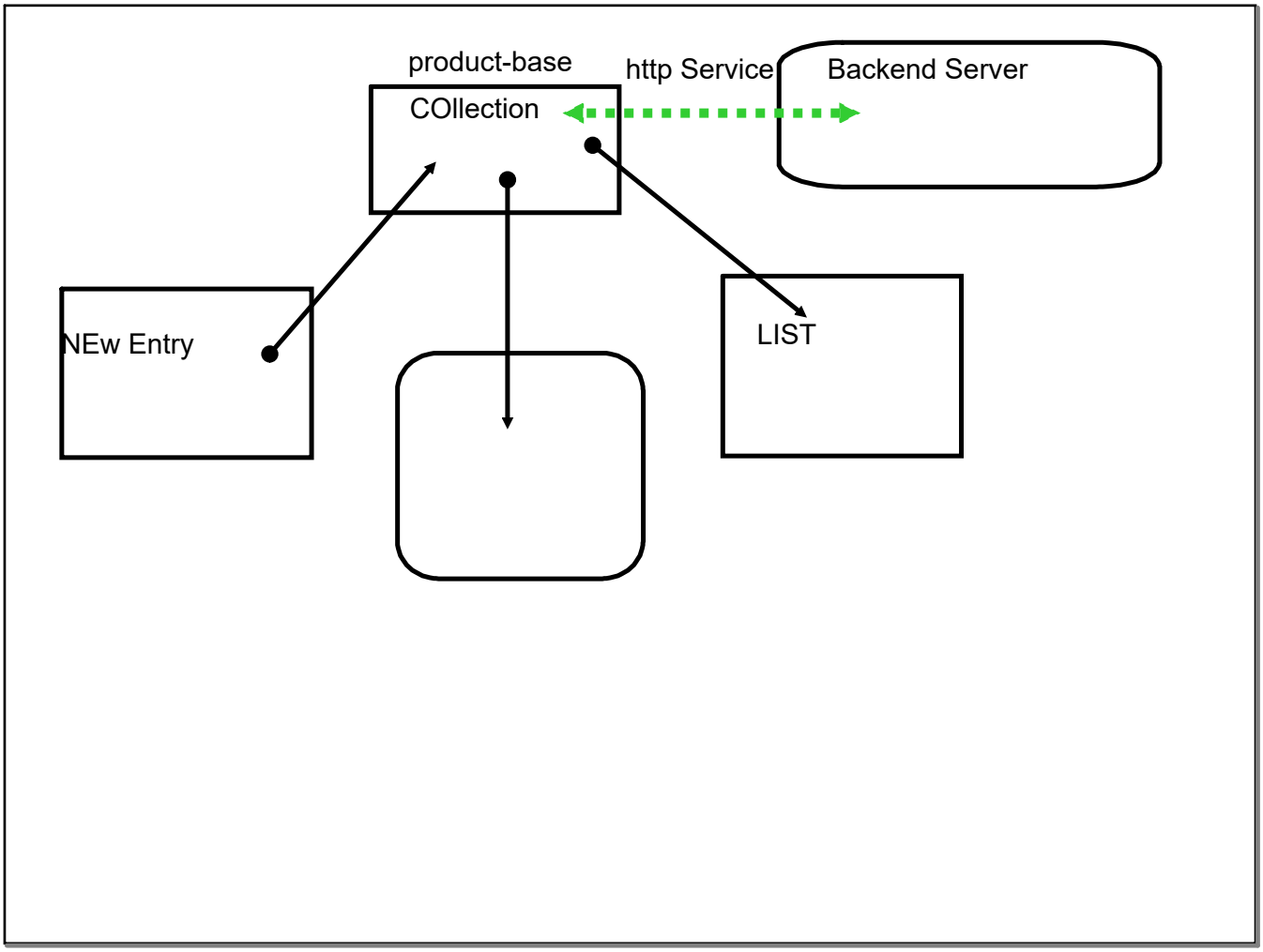
{{<var>}}

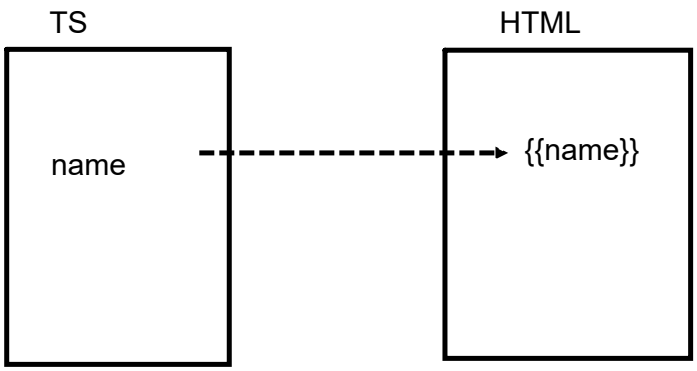
Form

<form></form>


Product BAse
List
products
Variable @Input
productsList
consumer
LIST
<app-product-list [productsList]="products"></app-product-list>
c
p


Parent(BASE)
<Entry>
<List>
products
Event
always
(Child)Entry
(Child)List
product object
create a custom/synthetic
event
@Output
productsList
@Input


product-base
COllection
http Service
Backend Server
NEw Entry
LIST



events : NO HTML EVENTS

events : synthetic events (custom events provided by ANGULAR)

event handling compatible to platform + TS

ngIf

<div *ngIf="<condition>">
Something....

condition :
true : div will be visible
false : div will not be visible

```
<div *ngIf="false">
    Something....
</div>
```
not be displayed

```
<div *ngIf="a > b">
    Something....
</div>
```

```
<div *ngIf="fun()">
    Something....
</div>
```

ngSwitch : controls the visibility

*ngFor

ngStyle

Single CSS property at a time

[style.<css property>] = "value"

Multiple CSS

[ngStyle] = "{font : 'Arial', background-color : bgColor}"

ngClass

Manage the forms :

Specialized Modules

FormsModules

ReactiveFormsModule

Two fundamental Object

FormControl : represents single input field

value, state, error

FormsGroup : represents complete form

(collection of form controls)

FormsModules (template driven directives)

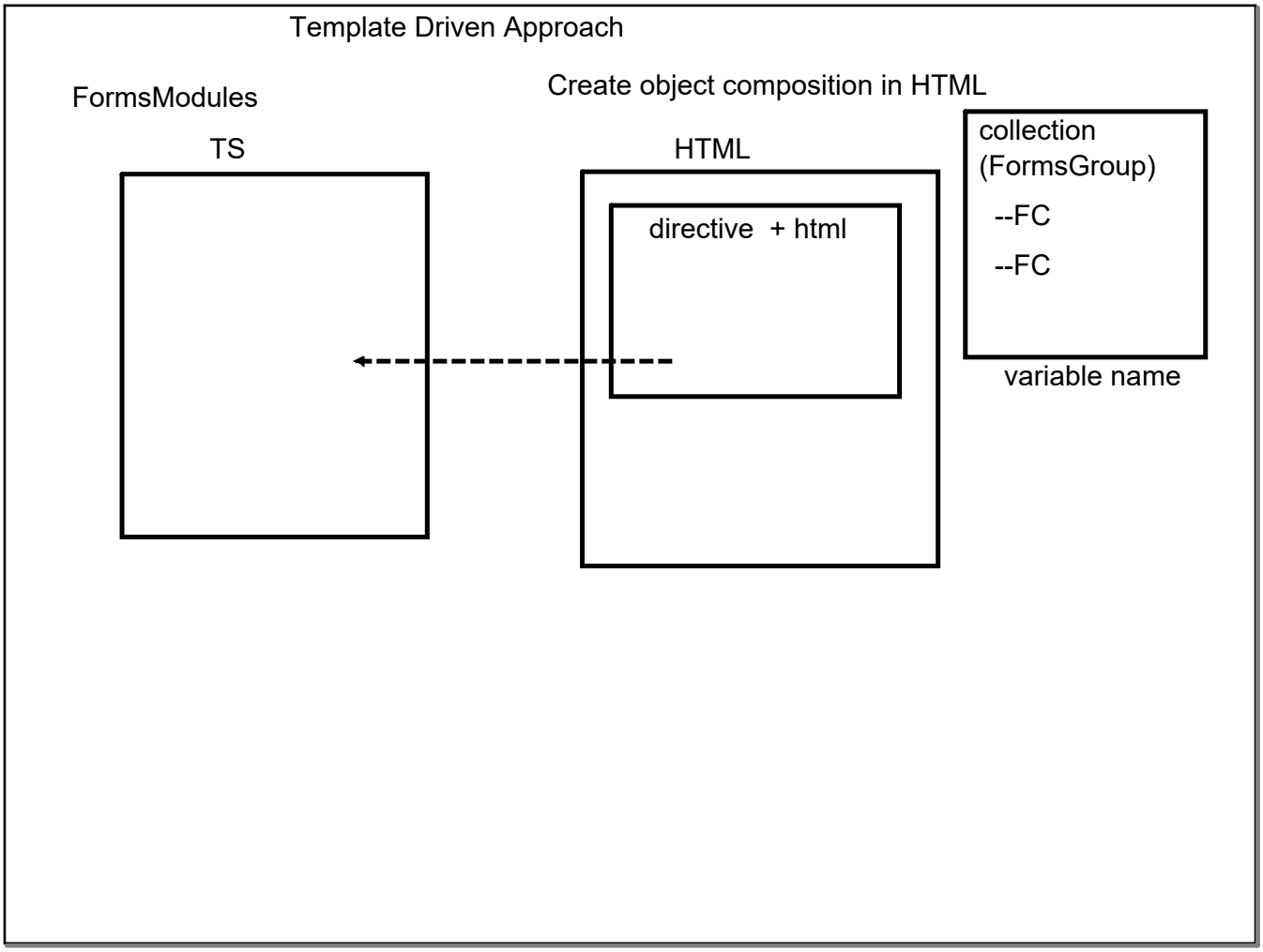
ngModel ~ FormControl

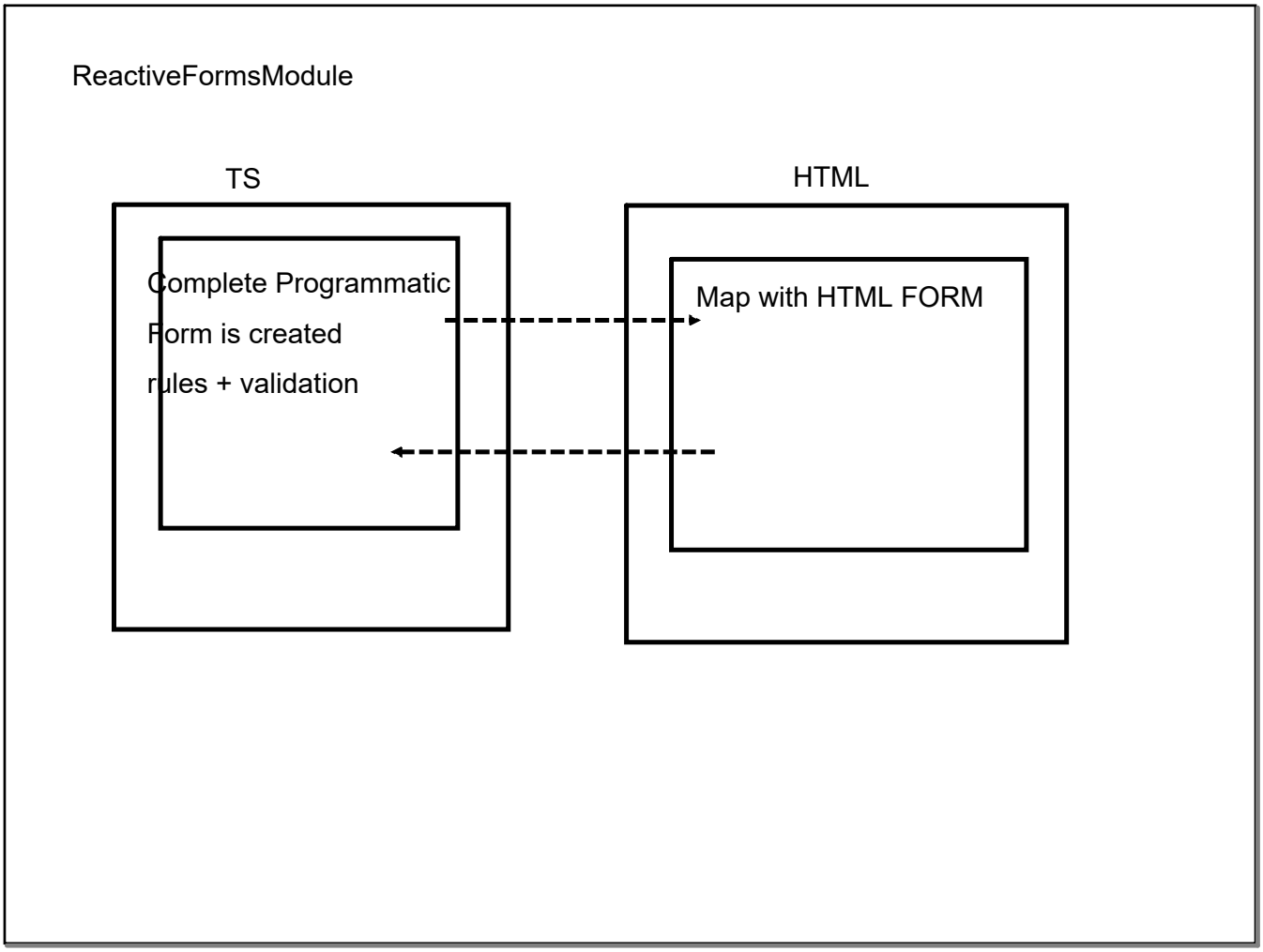
ngForm ~ FormsGroup

ReactiveFormsModule (model driven directive)

formControl ~ FormControl

ngFormGroup ~ FormsGroup


Template Driven Approach
FormsModules
TS
Create object composition in HTML
HTML
directive + html
collection
(FormsGroup)
--FC
--FC
variable name


ReactiveFormsModule
TS
HTML
Complete Programmatic
Form is created
rules + validation
Map with HTML FORM

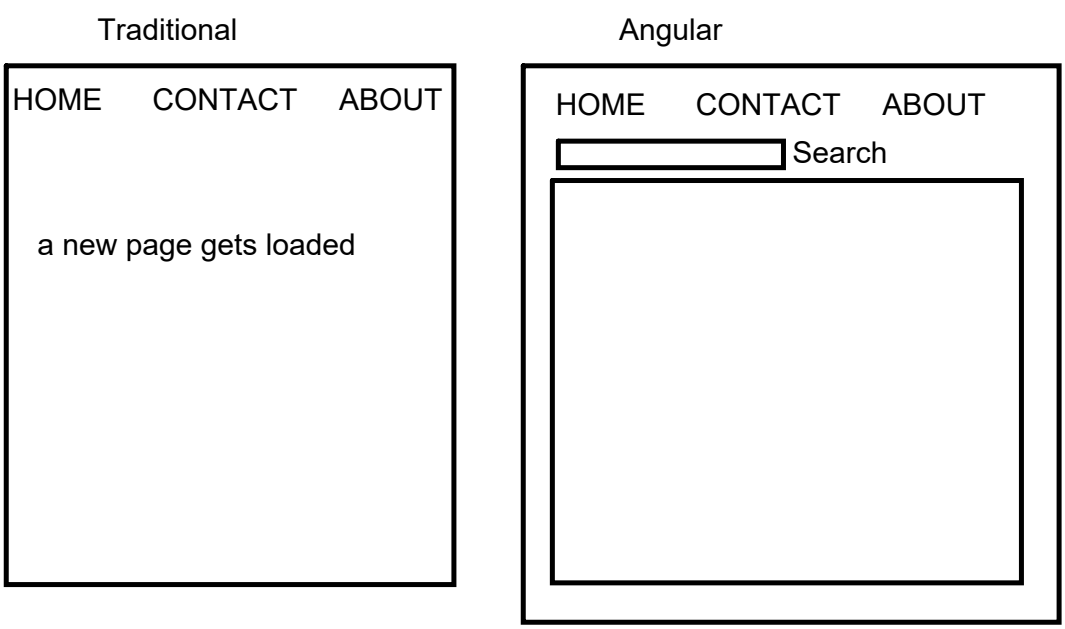
As Soon as Form dependency

1. auto exposed to directive
2. auto exposed to services

Object of these service are already exposed :

Object are AW/injected in constructors

Routing


Traditional
HOME CONTACT ABOUT
a new page gets loaded
Angular
HOME CONTACT ABOUT
Search

Routing programmatically

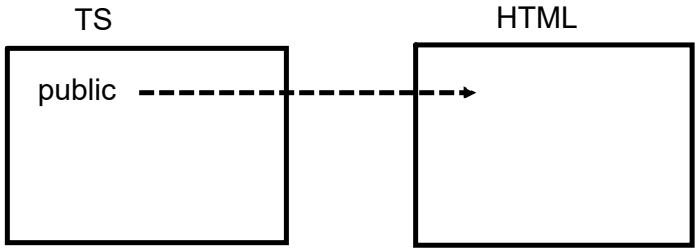
Angular components have life cycle : multiple phases

each phase

=> Interface : method (lifecycle hook method)

OnInit() : as soon as component is loaded

Securing the route: Auth-Guard Service



json-server : dummy backend server

json file

install : npm install -g json-server

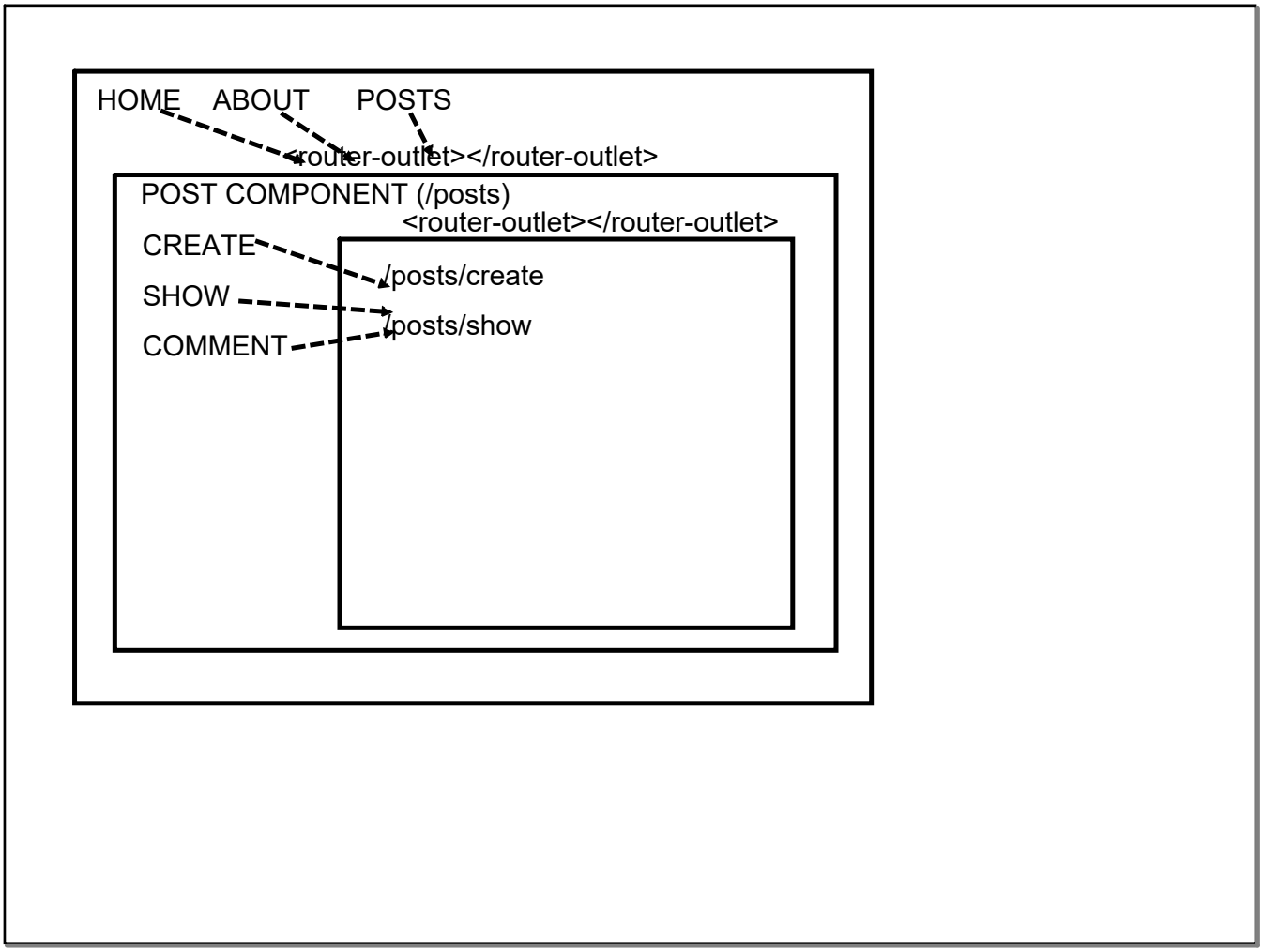
URL : Base url

http://localhost:3000/products

1. GET : http://localhost:3000/products (fetch all records)
2. GET : http://localhost:3000/products/1 (fetch by id)
3. POST : http://localhost:3000/products (add new records)
4. PUT : http://localhost:3000/products/1 (id of record to update)
5. DELETE : http://localhost:3000/products/1 (id of record to delete)

http://localhost:3000/post

http://localhost:3000/comment


HOME
ABOUT
POSTS
<router-outlet></router-outlet>
POST COMPONENT (/posts)
<router-outlet></router-outlet>
CREATE
SHOW
COMMENT
/posts/create
/posts/show

ReactJS : Javascript Lib :

View part : frequently changing data : Modern ES ---> ES5

Component based architecture : syntax approach : HTML + JS (JSX)

: slow rendering

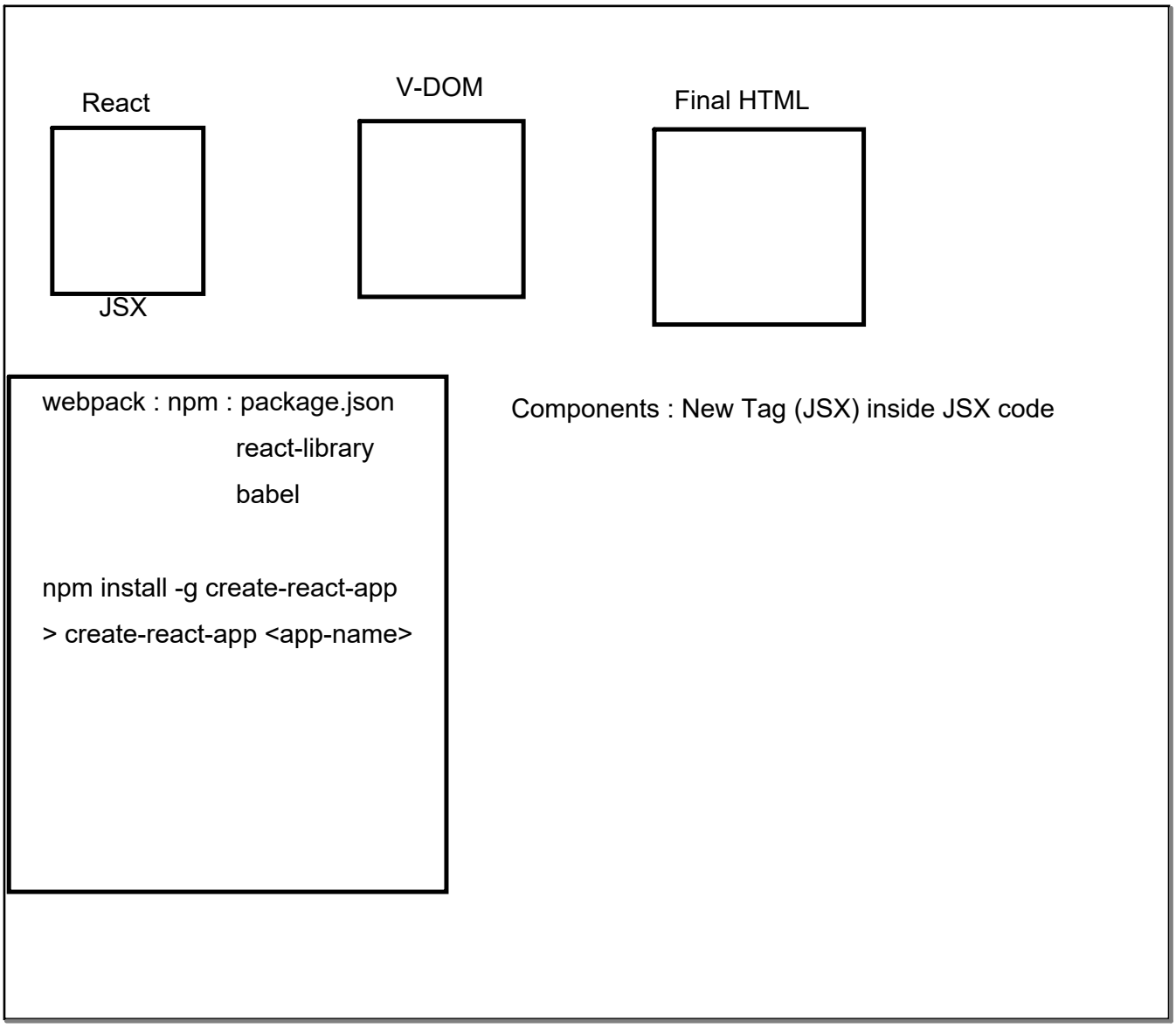
Problem : whenever a new info : DOM heirarchy changes :

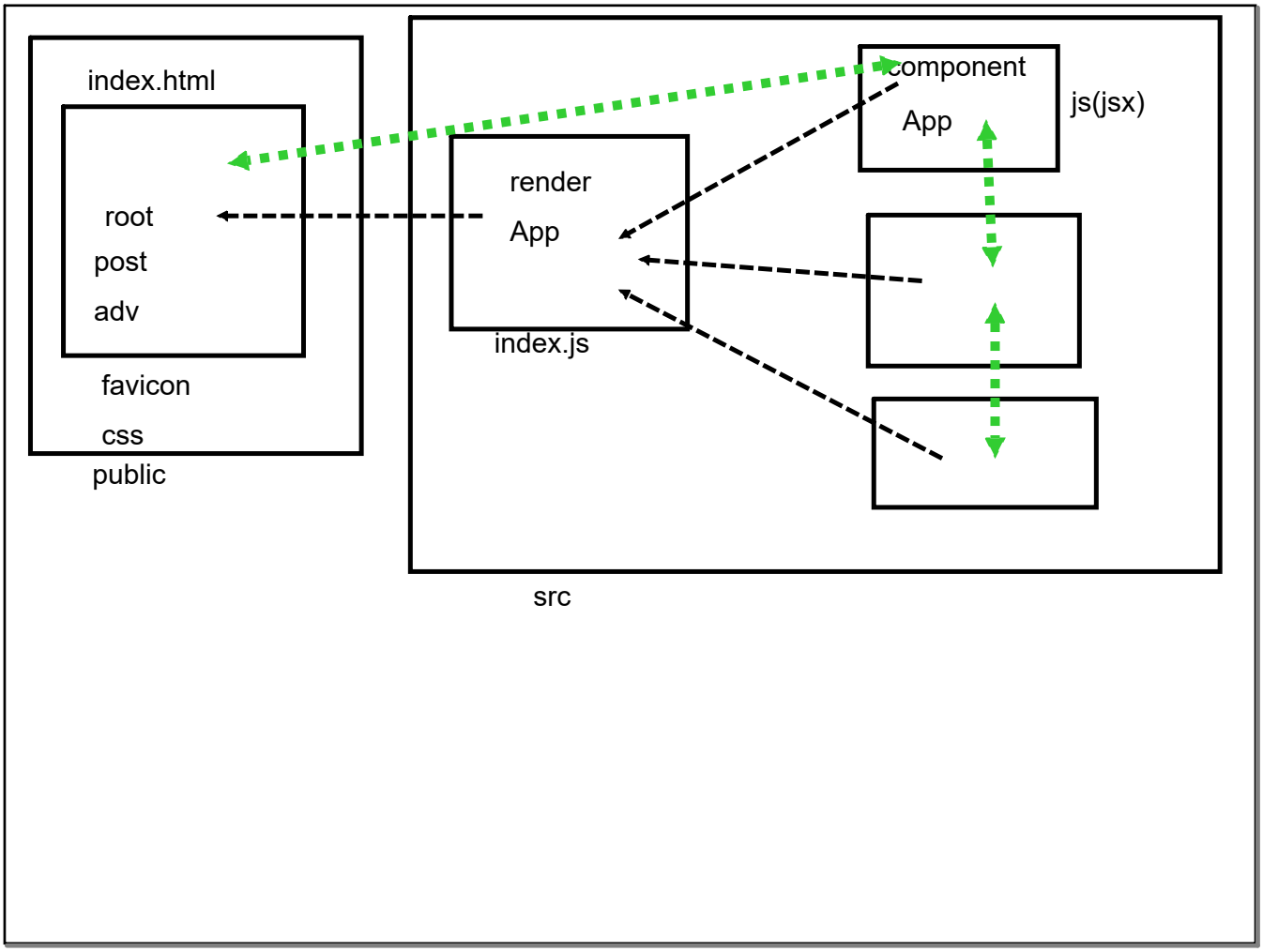
Browser has to re-render the DOM

Solution : Virtual DOM:

js create a in memory DOM Tree,

any changes is done in Virtual DOM : diffing engine

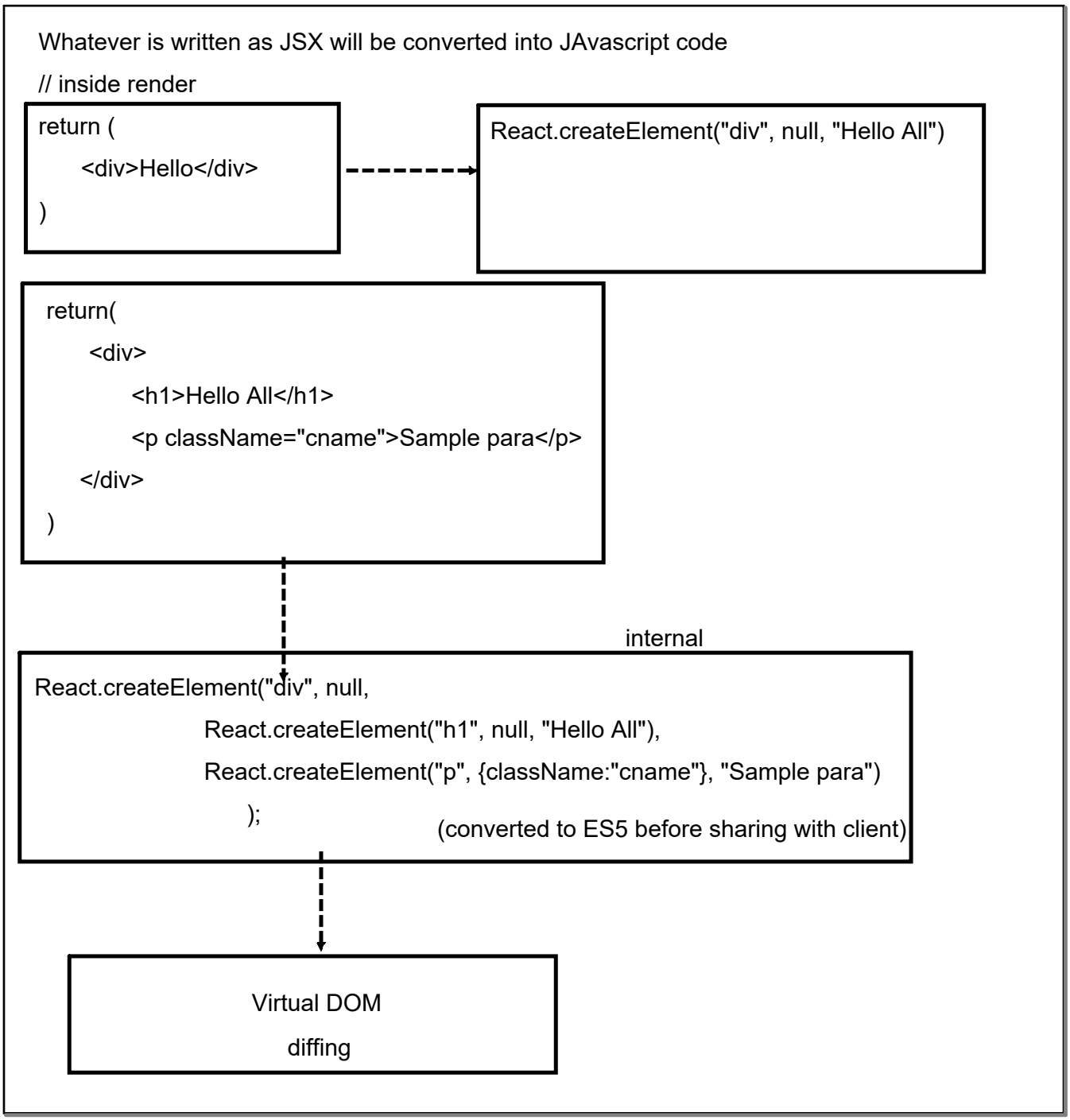

React
V-DOM
Final HTML
JSX
webpack : npm : package.json
react-library
babel
npm install -g create-react-app
> create-react-app <app-name>
Components : New Tag (JSX) inside JSX code


index.html
root
post
adv
favicon
css
public
render
App
index.js
component
App
js(jsx)
src

react : Main ReactJS lib

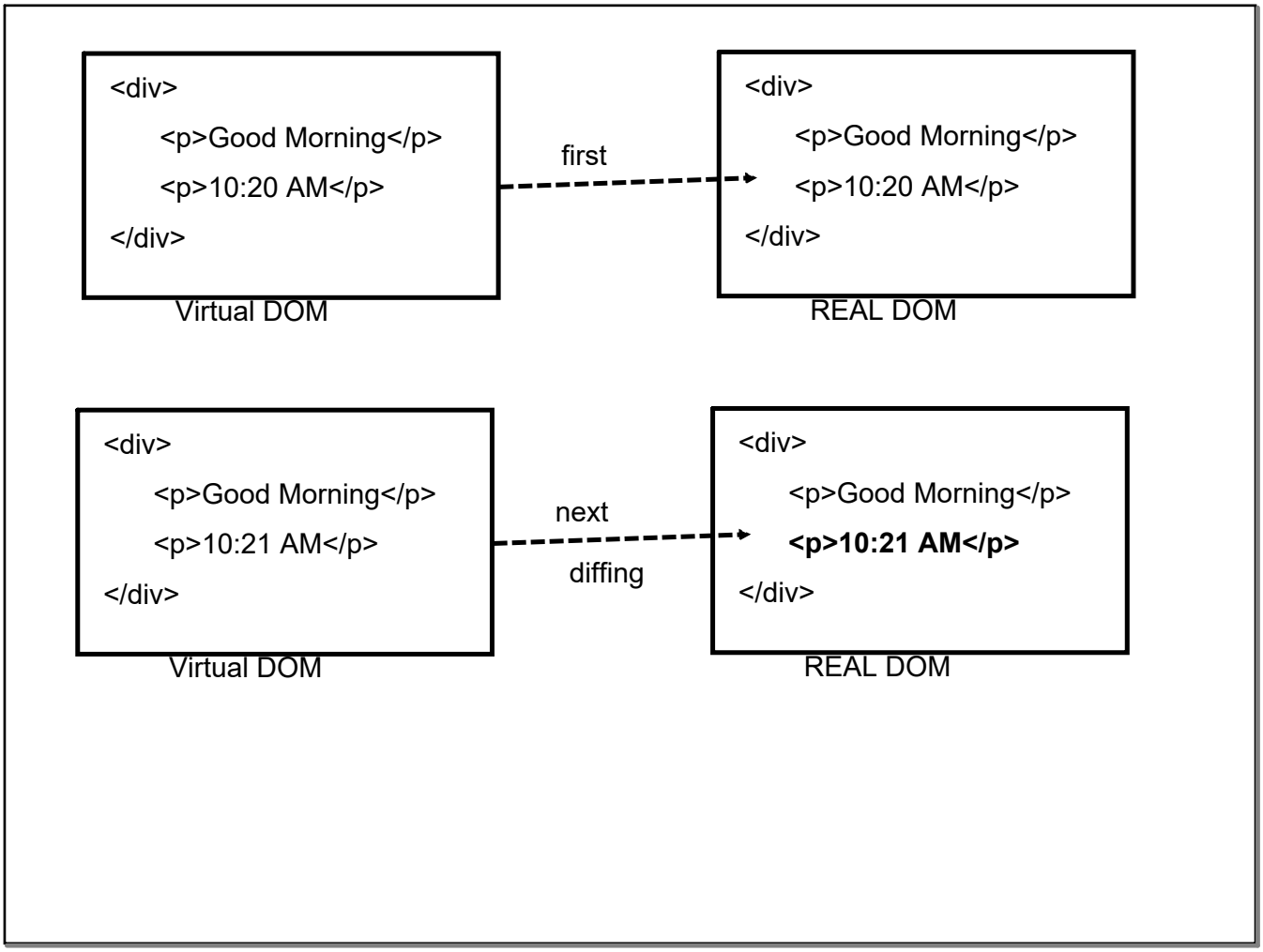
react-dom : Virtual DOM

1. Component (class) : must inherit Component (react)
2. must define (override) render method
3. must return a HTML template (JSX) from render method


Whatever is written as JSX will be converted into JAvascript code
// inside render
return (
Hello
)
React.createElement("div", null, "Hello All")
return(

<h1>Hello All</h1>
Sample para

)
internal
React.createElement("div", null,
React.createElement("h1", null, "Hello All"),
React.createElement("p", {className:"cname"}, "Sample para")
);
(converted to ES5 before sharing with client)
Virtual DOM
diffing



Good Morning
10:20 AM

Virtual DOM
first

Good Morning
10:20 AM

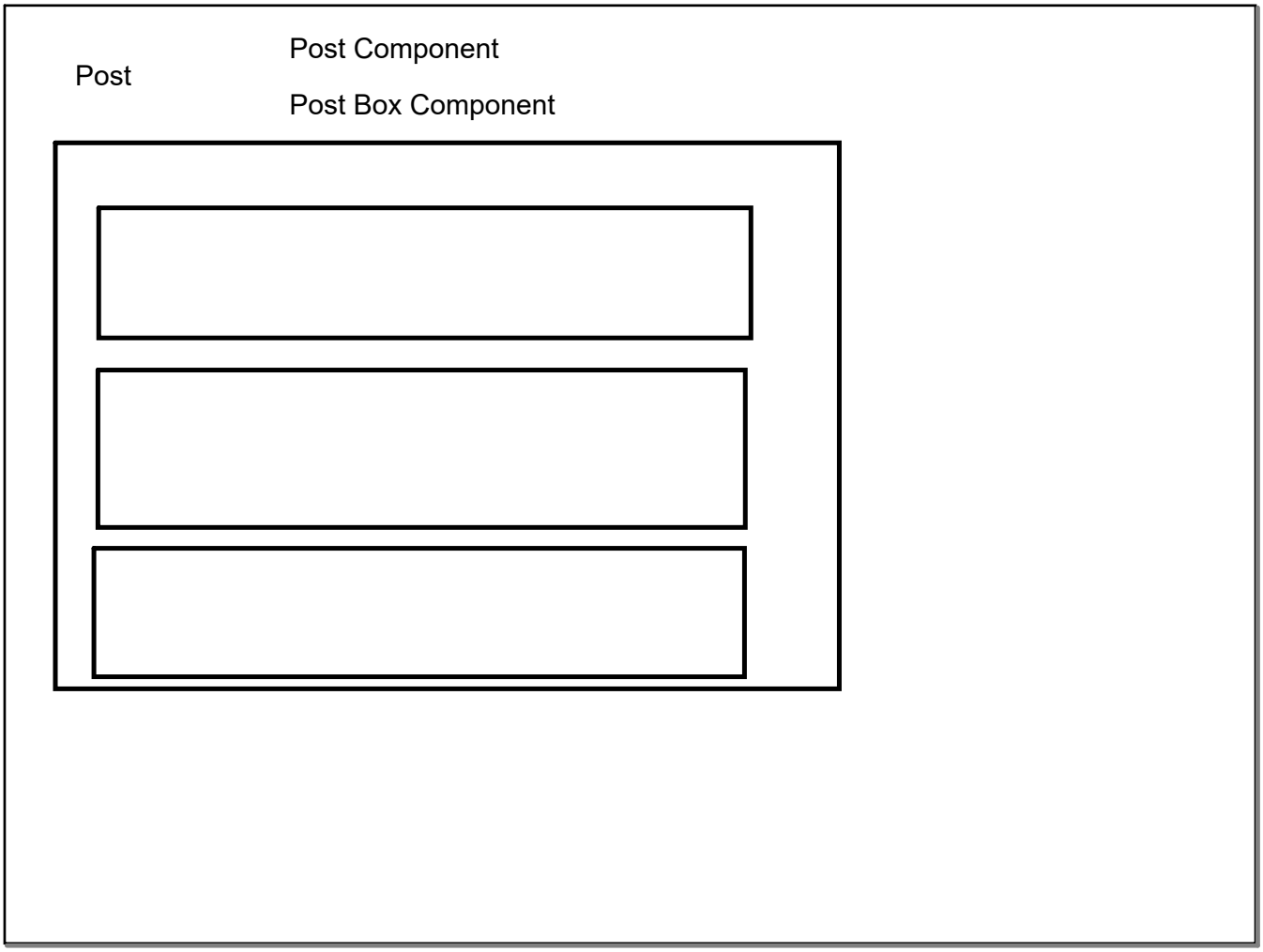
REAL DOM

Good Morning
10:21 AM

Virtual DOM
next
diffing

Good Morning
10:21 AM

REAL DOM

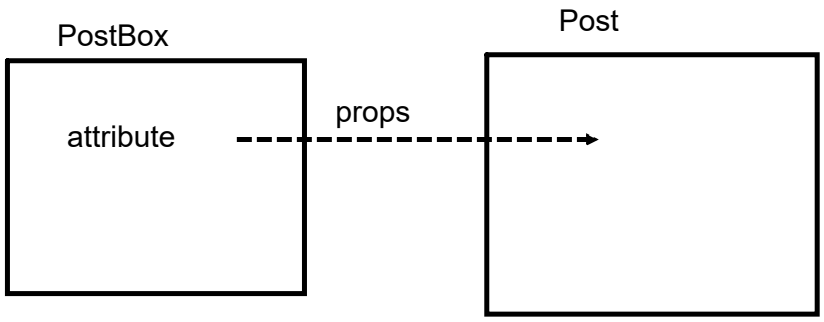

Post
Post Component
Post Box Component

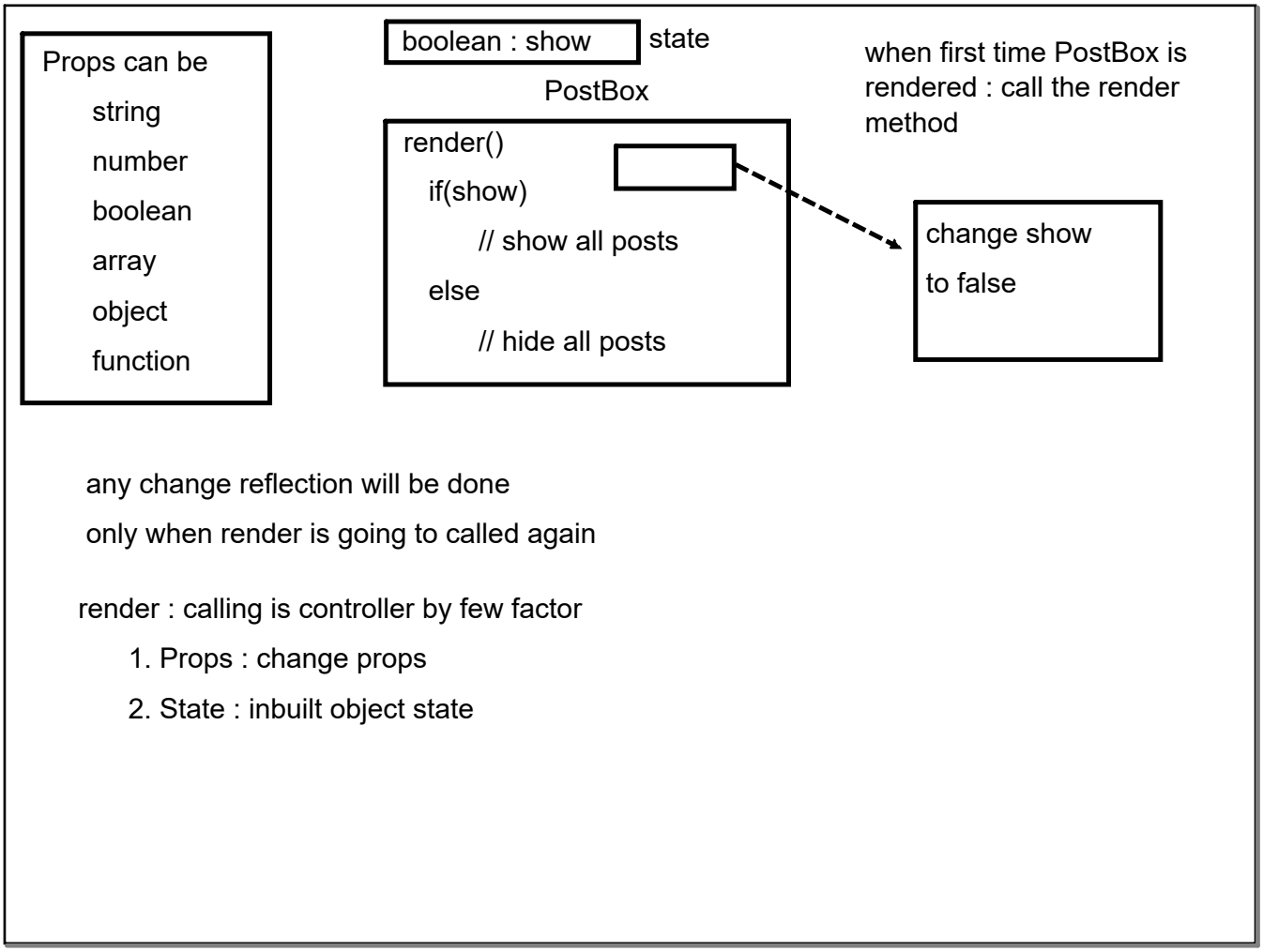
Props : Transfer data one component to another

Created on the fly

all props passed to a component

automatically gets stored into an inbuilt object of component : props



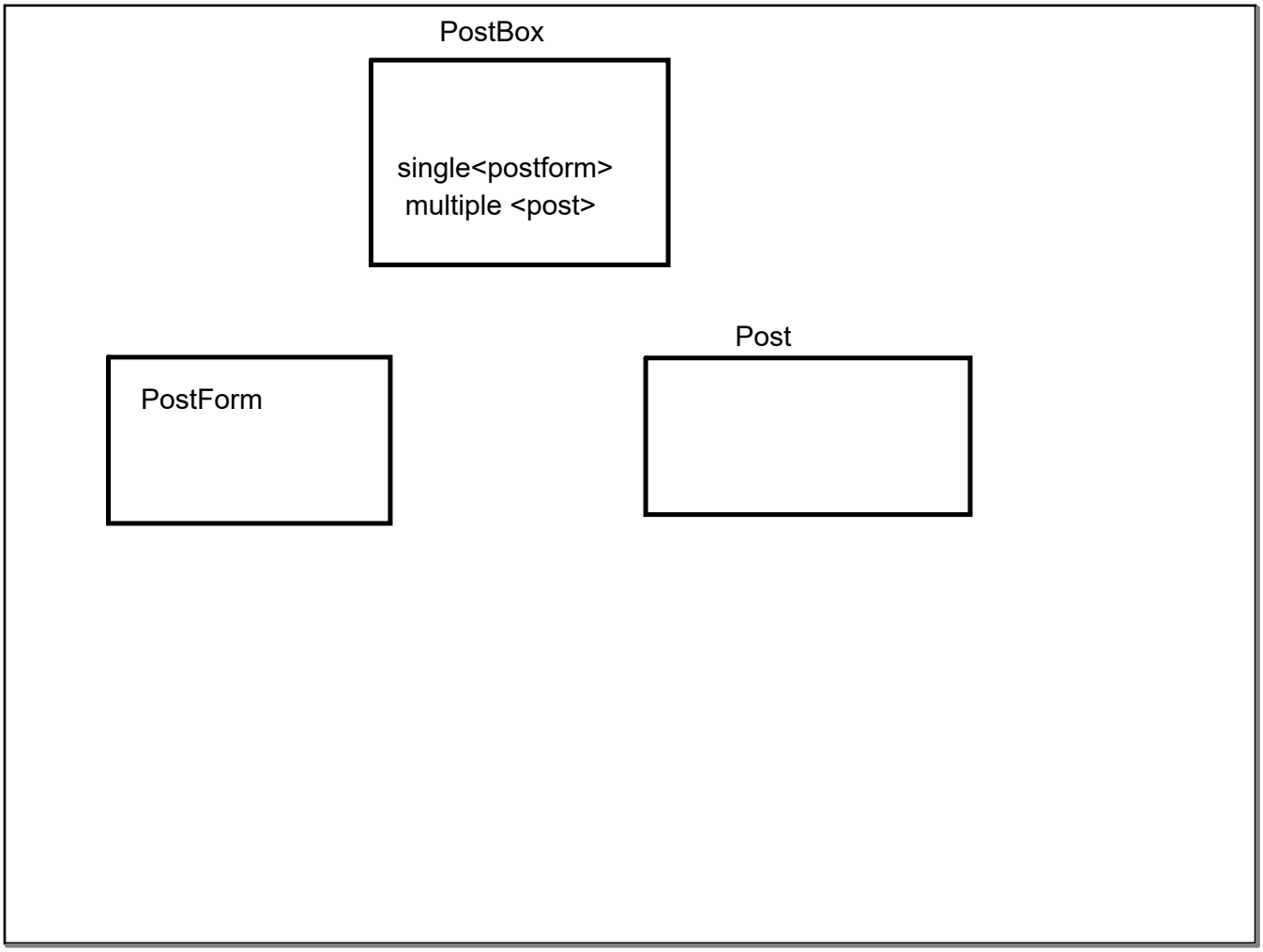


any change reflection will be done

only when render is going to called again

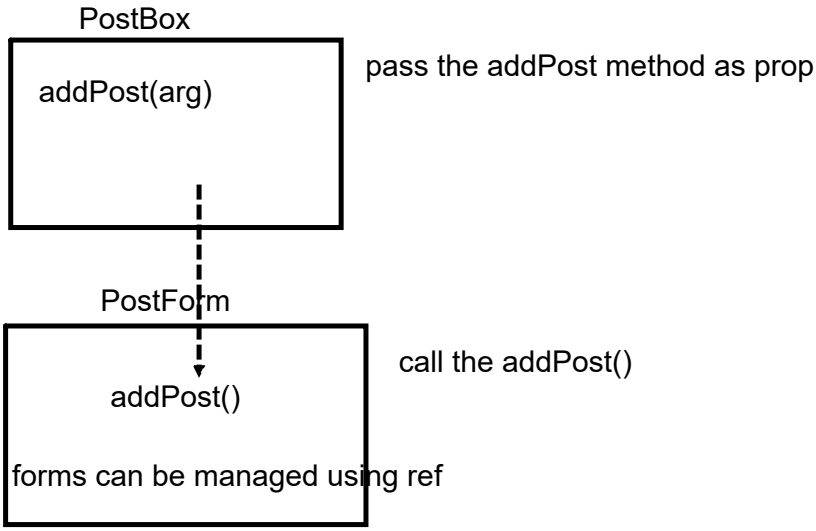
render : calling is controller by few factor

1. Props : change props
2. State : inbuilt object state


PostBox
single<postform>
multiple <post>
Post
PostForm

1. The new post info will req to be added into collection
2. Rerenderring to take place

need to transfer collection into state object



props : expected to controlled from parent

state : component specific controlling of data + effect the re-renderring

class variable : data needs to shared across multiple methods of that class

```
return this.state.postList.map(
(post<x>) => {
                                                    y
    return (<Post author={post.author} tags={post.tags} body={post.body} key={post.id} />);
});
```

transform logic goes inside function

<collect>=map(function())

loops through all elements

x: Post Object 3 Post

y: Post Tag [3 Post tag]

Backend Server : json-server

No service support

plain JS/jquery to be used

SPA : need to talk with server (async)

React lifecycle hook method :
when component is loaded

1. Constructor
2. componentWillMount() : before renderring : if every thing is fine
   (only once : first time when component is loaded : not with every re-renderring)
3. render() method is called
4. componentDidMount() : just after renderring (once : first renderring)
5. componentWillReceiveProps() :
   invoked just before next renderring takes place:
   whenever prop/state changes

props : immutable
state : mutable

6. shouldComponentUpdate() :

this can customized to control the flow
: returns a boolean

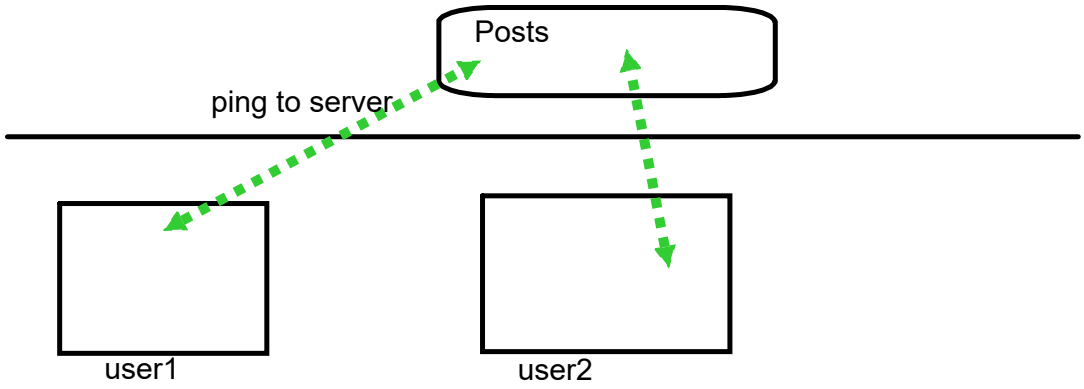
   :true : re-renderring
   :false: no re-renderring

7. componentWillUpdate() : only if true is returned
8: render() : re-renderring
9. componentDidUpdate() : just after re-renderring
10. componentWillUnmount() : component is removed from Virtual DOM

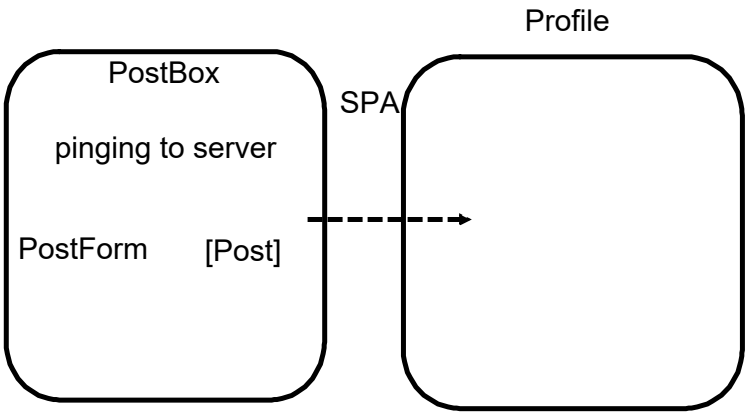
install jquery

need to install jquery and make it as a part of package.json

> npm install --save jquery



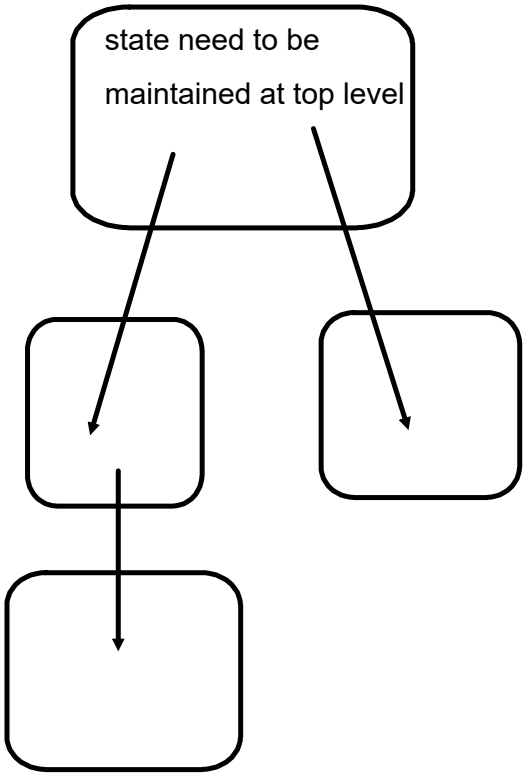
Memory leakage



when component is
unmounted :
need to stop pinging

Redux API : FLUX design pattern

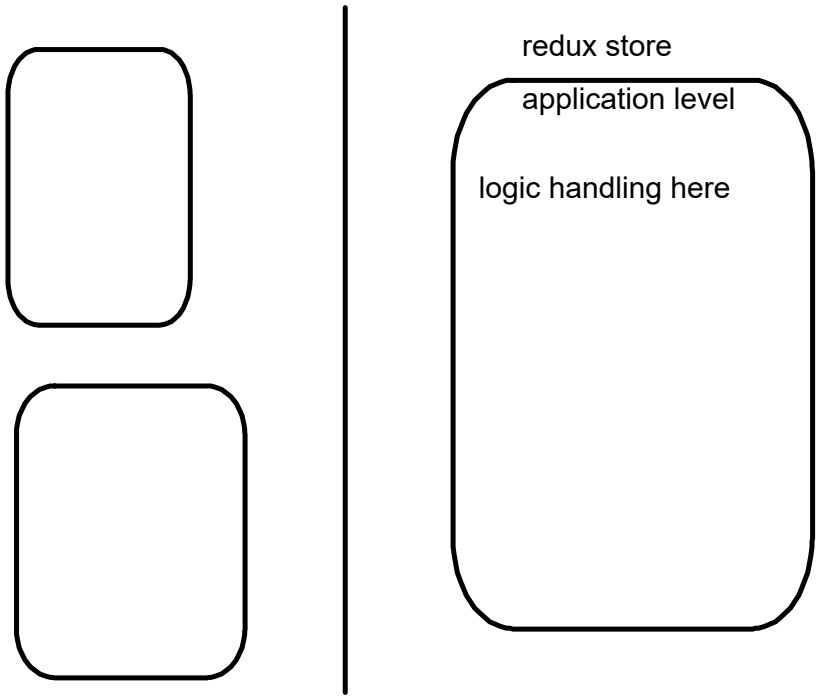
new Ecma Script feature



list of emails:

- click on email(event)
- list --> email view
- fetch data from server
- mark it read
- unread mail counter need to be reduced
- change the url
- all update need to be send to server

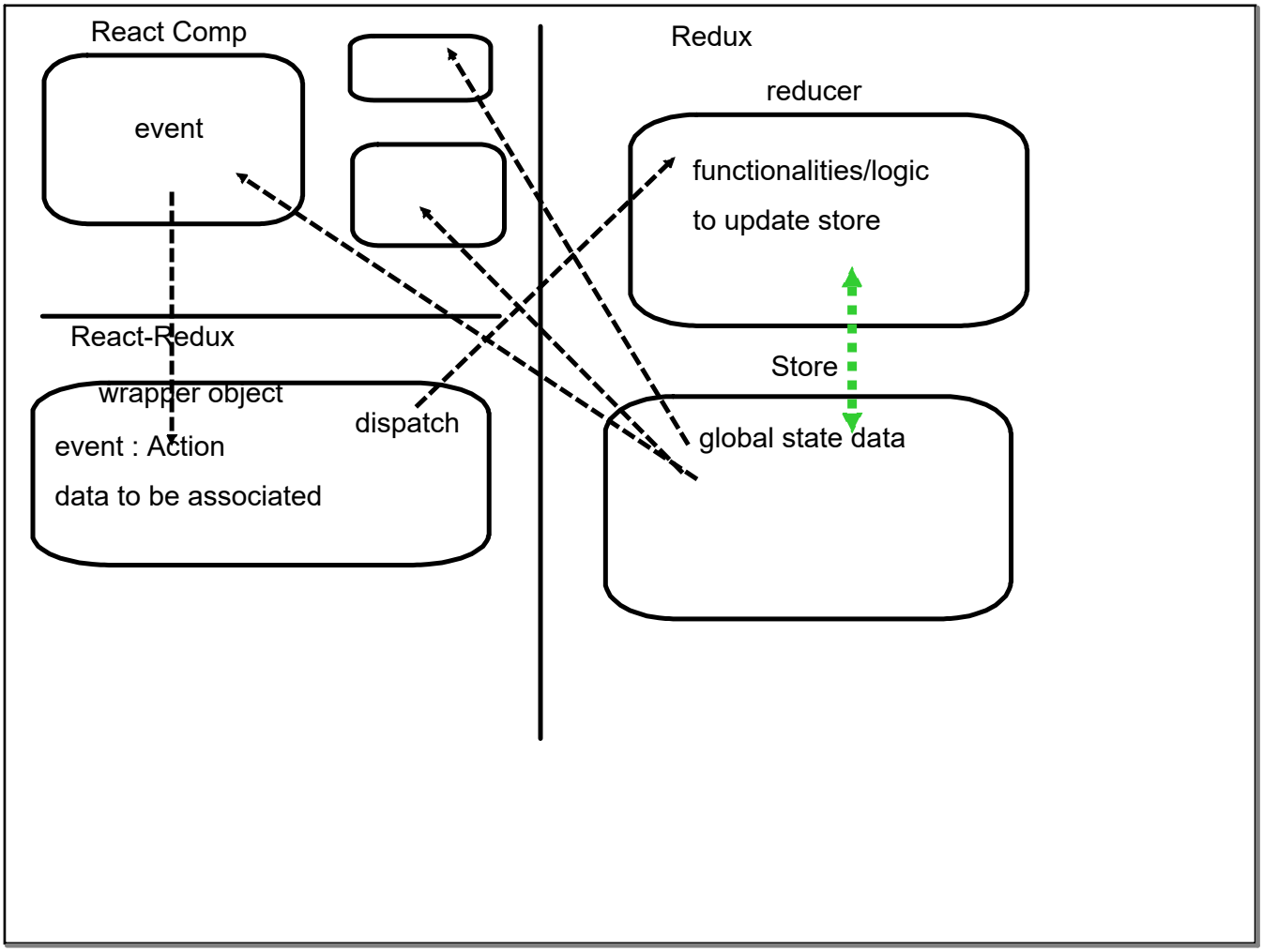
Redux : store (maintaining the global state)

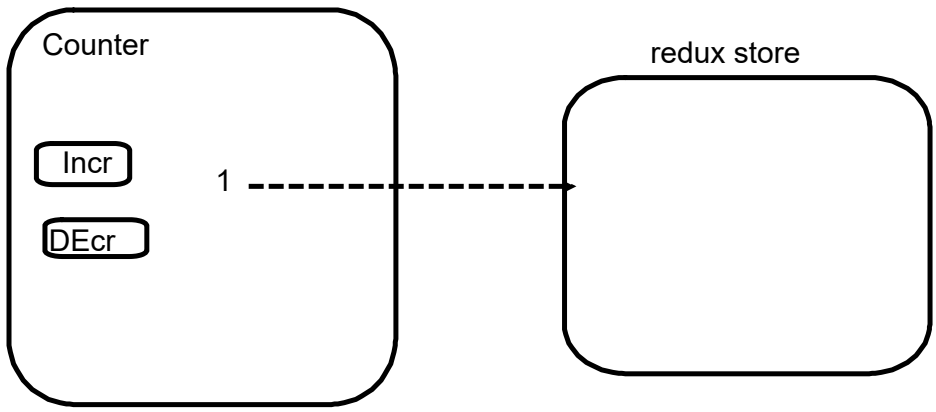


install redux lib

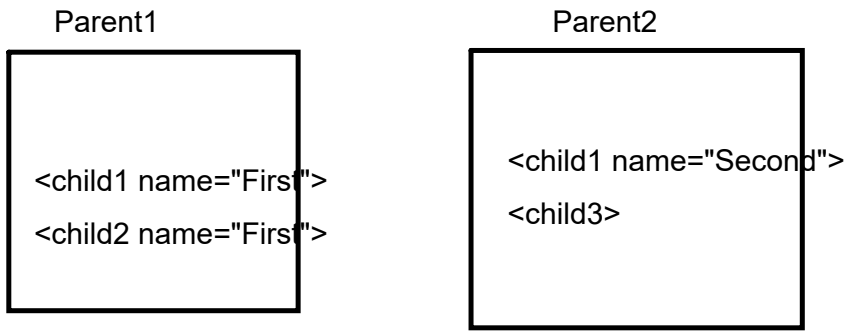
install plumbing (react-redux)

npm install --save redux react-redux


React Comp
event
Redux
reducer
functionalities/logic
to update store
Store
global state data
React-Redux
wrapper object
event : Action
data to be associated
dispatch

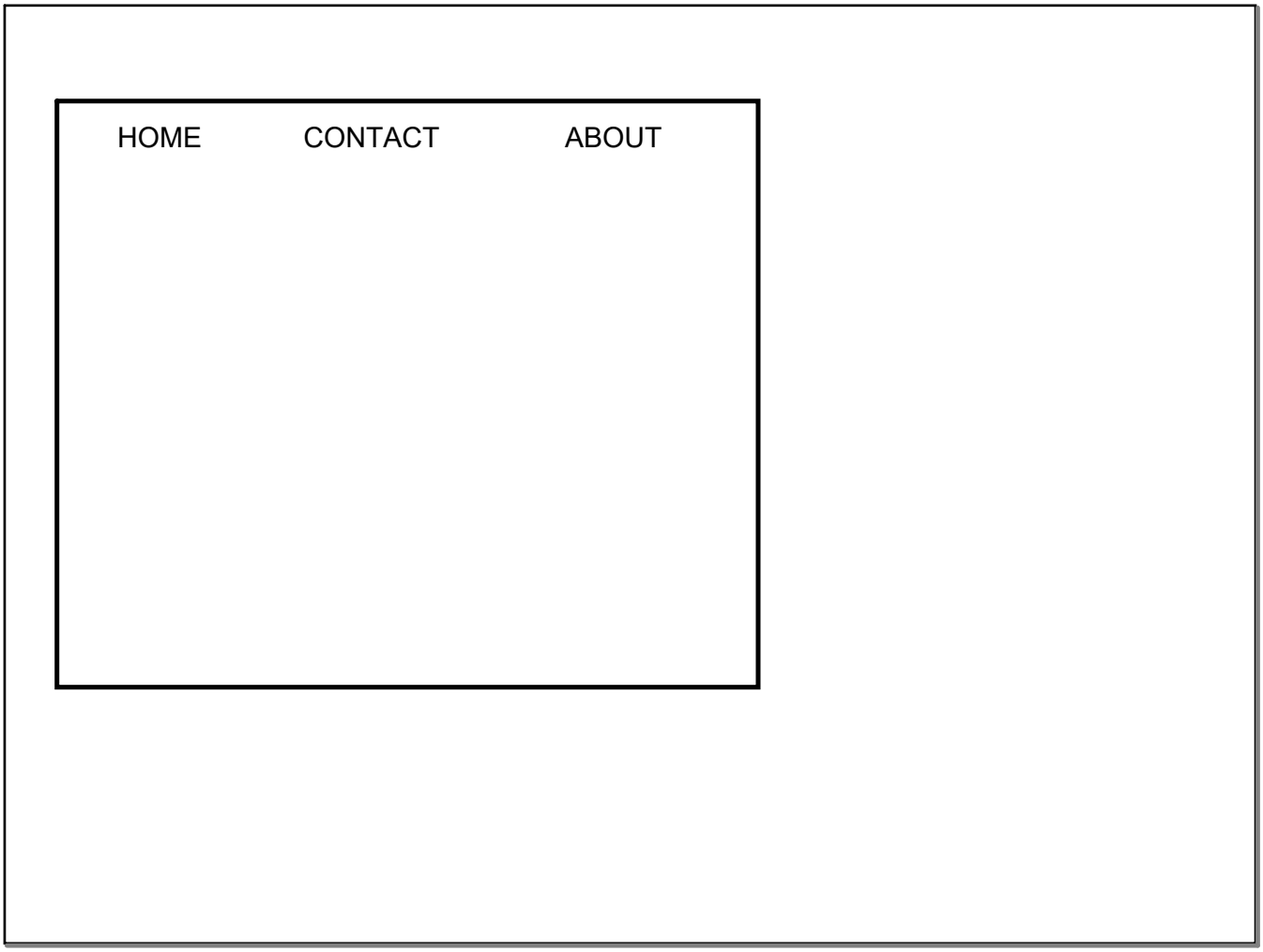


1. set up reducer and store
2. expose the store to app
3. configure components to use data(part) of store



Special Router lib : predefined JSX component

npm install --save react-router-dom


HOME
CONTACT
ABOUT

MongoDB :

=> cross-platform

=> document oriented

specific instance :

embedded

local DB

Cloud Mongo DB

Mongo DB

Database

Collection (collection of multiple record)(Tables)

Document (record) : JSON

schema less

different document in same collection can have different structure : scalable

Mongo DB : Community Server

1. Installed Community Server
2. Define the location : (preferred) c:/data

mongod : connect with repo location : >mongod --dbpath "<db location>" | mongod --dbpath "C:\data"

mongo : launch the mongo db terminal

URI : `spring.data.mongodb.uri=mongodb://[username]:[password]@[ip]:[port]/<dbname>`

java class to configure MongoTemplate

Spring Data :

ALL DB will have common approach

change : Repository

Query syntax

Inherit a repository

all standard CRUD functionality (by default)

method declared with proper naming convention (implementation provided internally)

method declared , associate a query @Query

Custom : if need to add detailed business logic

Custom :

1. Create custom interface
2. declare custom method
3. Create a implementation class (inherting the interface)
4. inherit the custom interface into repository

```
db.<collection>.find({
      "author" : "First",
      "author" : {$in :  ["First","Second"]}
      "likes" : {$gte : 50}
})
```

creating a security credentials for DB

Create a user for DB

Hadoop : DB

=> query based as well

=> programmatic control

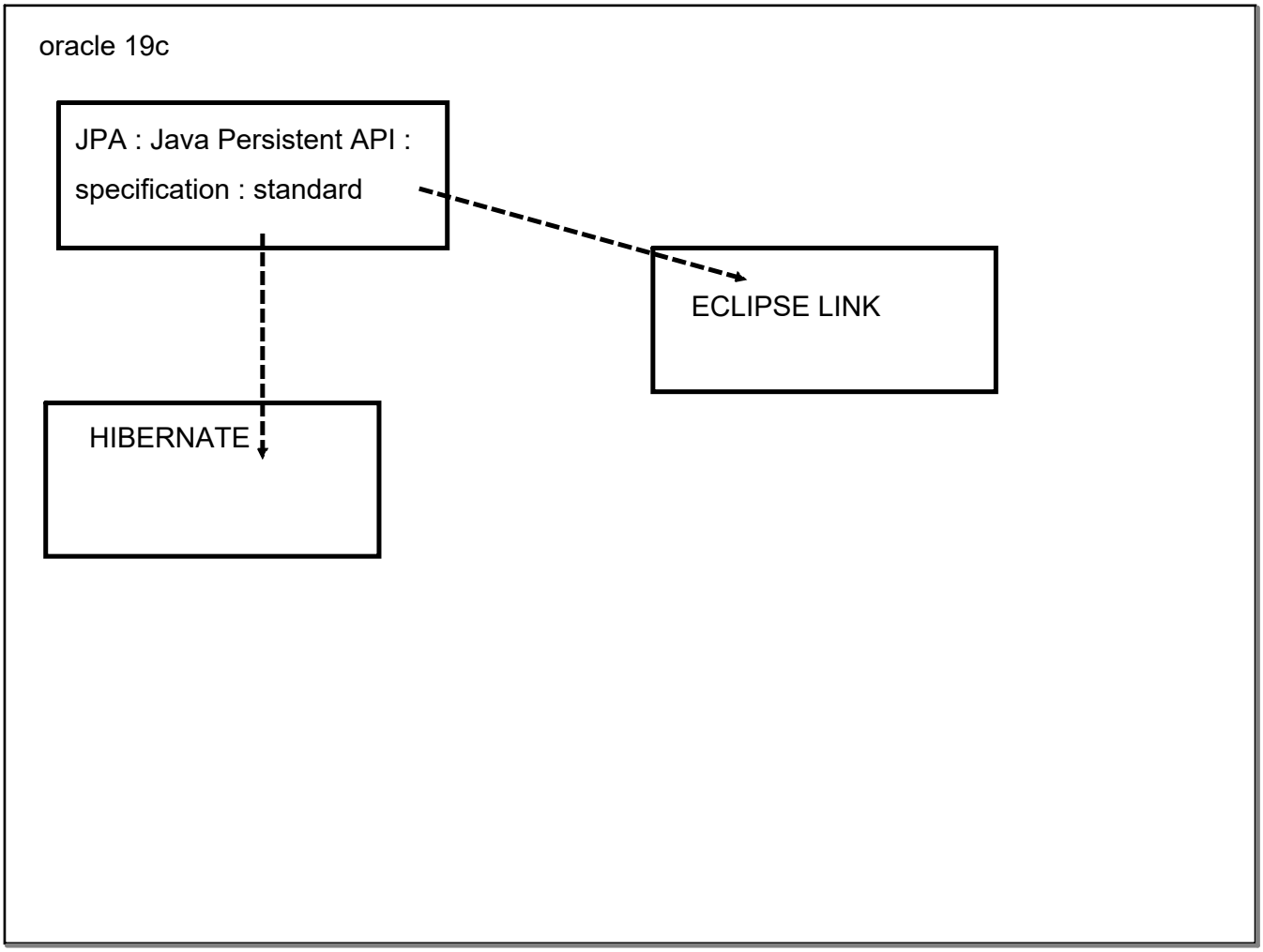
=> document | RDBMS

=> index : normalization

=> complex relationship among tables

=> algorithm (hashing equation)

=> distributed DB


oracle 19c
JPA : Java Persistent API :
specification : standard
ECLIPSE LINK
HIBERNATE

JPQL : ---> ORACLE Dialect

PL/SQL : PAscal based

Reusable programmatic unit (Procedure/Function)

Programmatic construct

Integration with SQL

structural

Structure

Declaration (optional)

Executable Commands (mandatory)

Exception Handling(optional)

Procedure/Function

Procedure : cannot return value explicitly

Function : have to return a value explicitly

Maintained as Objects in Oracle

Procedure

```
CREATE OR REPLACE PROCEDURE <procedure name> ([arguments])
<IS|AS>
    [declaration]
BEGIN
    <execution code/commands>
EXCEPTION
    <exception handling code>
END;
```

Three different types:

- IN : read-only variable
- OUT : write value in it (data out of procedure)
- INOUT : read-write

Procedure

```
CREATE OR REPLACE FUNCTION <function name> ([arguments]) RETURN <return type>
<IS|AS>
    [declaration]
BEGIN
    <execution code/commands>
EXCEPTION
    <exception handling code>
END;
```

Procedure : process, cant use queries, out

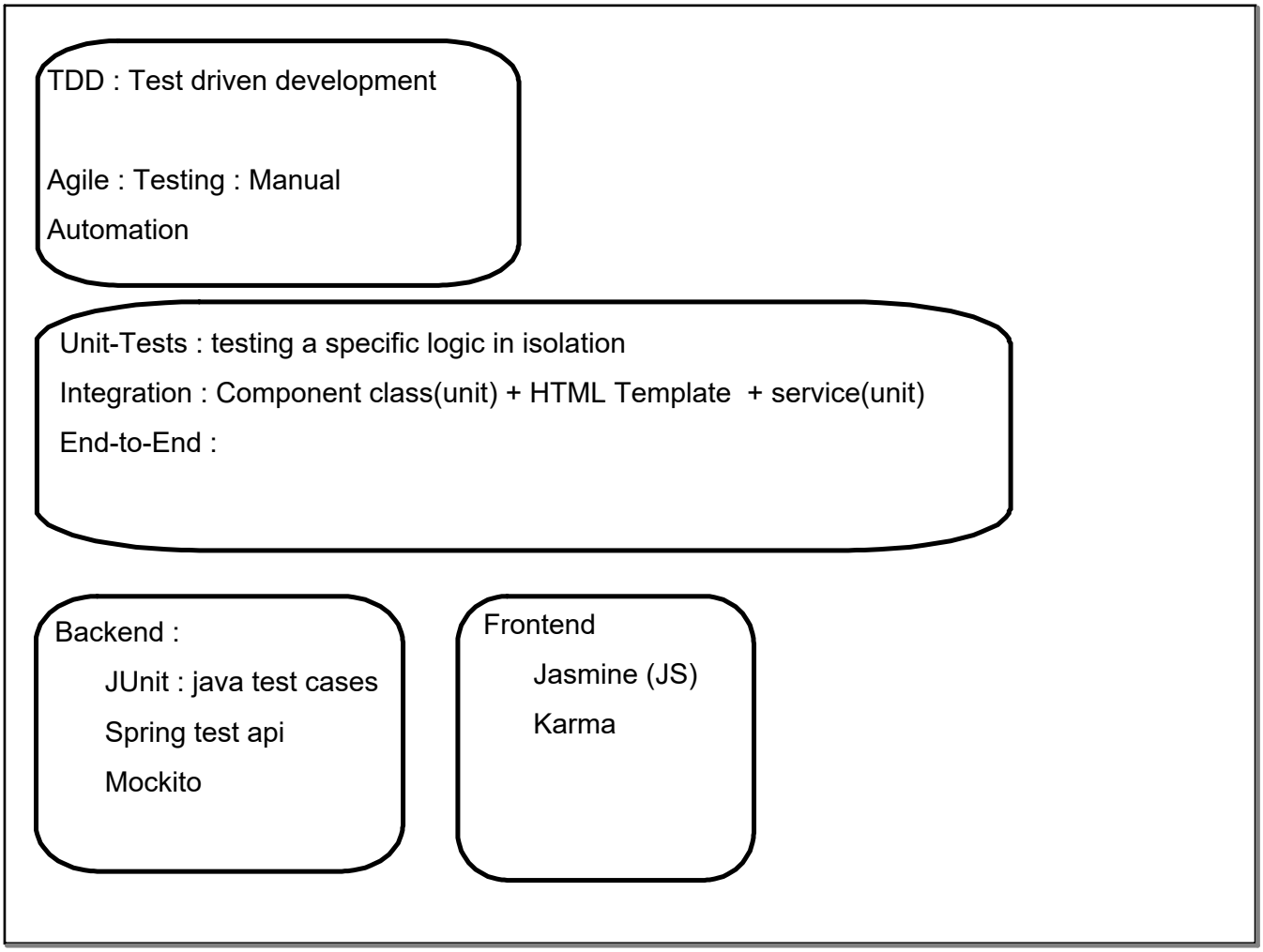
Function : some calculation, queries (no DML stmt), out|RETURN

PL/SQL : inbuilt

Conversion : one type into another type

String

Date


TDD : Test driven development
Agile : Testing : Manual
Automation
Unit-Tests : testing a specific logic in isolation
Integration : Component class(unit) + HTML Template + service(unit)
End-to-End :
Backend :
JUnit : java test cases
Spring test api
Mockito
Frontend
Jasmine (JS)
Karma

JUnit :

Javascript :

Jasmine (independent) : does not require DOM

Karma : test-runner : run test cases over angular app

Jasmine

1. Karma : spec.ts : test files

wrap test case in test suite : describe() function

every test will be defined under : it()

matcher : expect() ~ assert()

beforeAll(<function>) once

beforeEach(<function>) : before each it

afterAll(<function>) : once

afterEach(<function>) : after each it

Fragile

```
spyOn(<service>, <method>).and.callFake(<fake function>);
spyOn(<service>, <method>).and.returnValue(<value>);
```

AWS :

Account

Regions : AWS services are region scoped

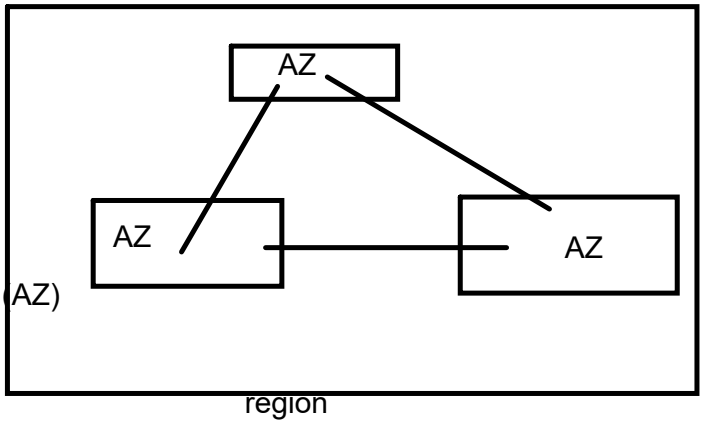
clusters of data centers : Availability Zones (AZ)

3 6(max) (2 min)

us-east-1a

us-east-1b

us-east-1c



EC2 Service : Virtual Server
(Face of AWS)

Servlerless Lambda Service (Modern)

EC2:

Renting a Virtual Machine

store data virtual drive (EBS)

Load distribution

Auto-scaling

SSHing into your EC2 Instance

ssh : Windows 10

putty

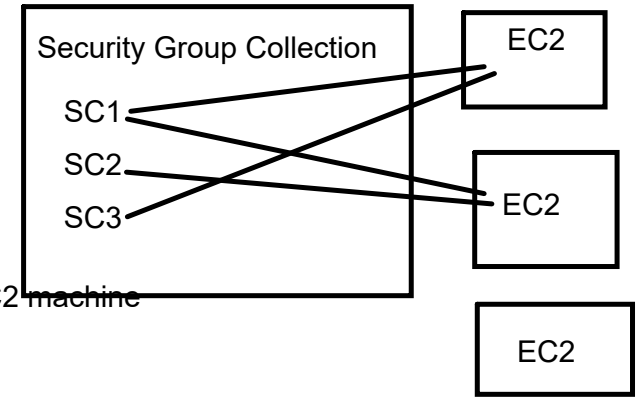
Security Groups :

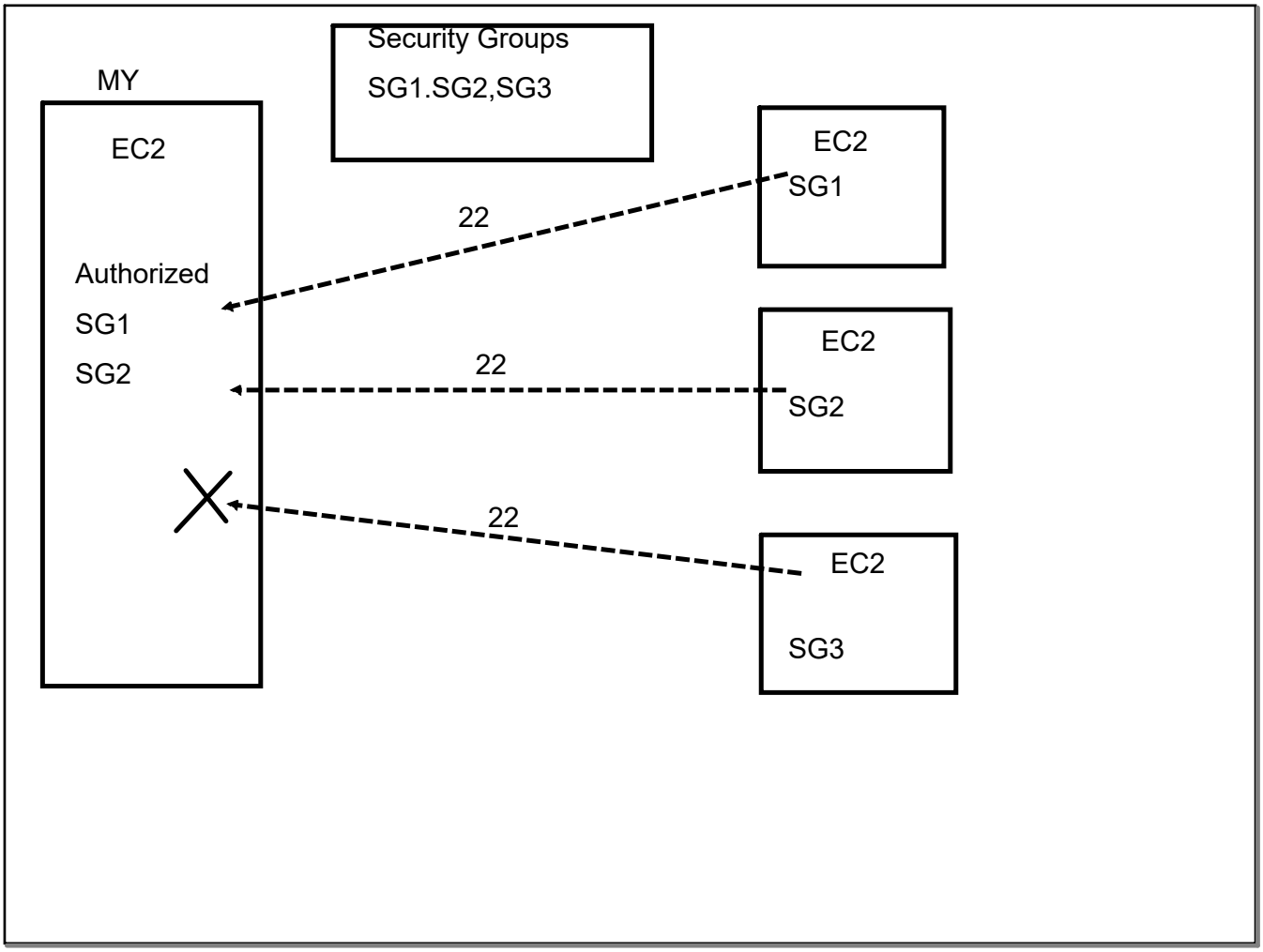
controls how traffic is allowed in/out of EC2 machine

1: port

2. protocol

3. IP ranges (IPv4/IPv6)




Security Groups
SG1.SG2,SG3
MY
EC2
Authorized
SG1
SG2
EC2
SG1
22
EC2
SG2
22
22
EC2
SG3

Multiple SG

Each SG multiple rules (inbound/outbound)

SG bound to regions

live outside EC2 instance

Private IP : remains same on restart of EC2 instance

Public IP : changes with every re-start

Elastic IP : want it to remain same on every restart

On demand Instances :

Reserved (min 1 yr)

Spot Instance : : not reliable

Dedicated Instance : h/w will not be shared

Dedicated Host : entire physical server

Storage:

EBS : S3

EBS : Elastic Block Store

EC2 instance :

root volume (main drive) : lost if EC2 instance is terminated

EBS Volume : network drive attached with EC2 instance

It uses network to communicate

detached and connected to other EC2 instance

Its locked to an AZ

provisioned capacity

SIZE | THROUGHPUT | IOPS (I/O ops per second)

EBS 4 types :

GP2 (SSD) : General Purpose SSD balance price and performance

1 - 16TB,

IOPS

IO I(SSD) : High Performance

ST I (HDD) : Low Cost frequently accessed data

SC I (HDD) : Lowest Cost

S3 : infinitely scaling storage

Buckets(dir);globally unique (region specific)

no uppercase

no underscore

3-63 char

first char can be lowercase alph/ number

: store object(files) : key

key : (path)

s3://<region based instance>/<bucket name>/some.txt (some.txt : key)

s3://<bucket name>/<sub-folder>/some.txt

1 object (1 file) : 5TB (multi-part upload)

AWS Lambda :

Concept of using Cloud service :

Serverless : no more need to manage the server

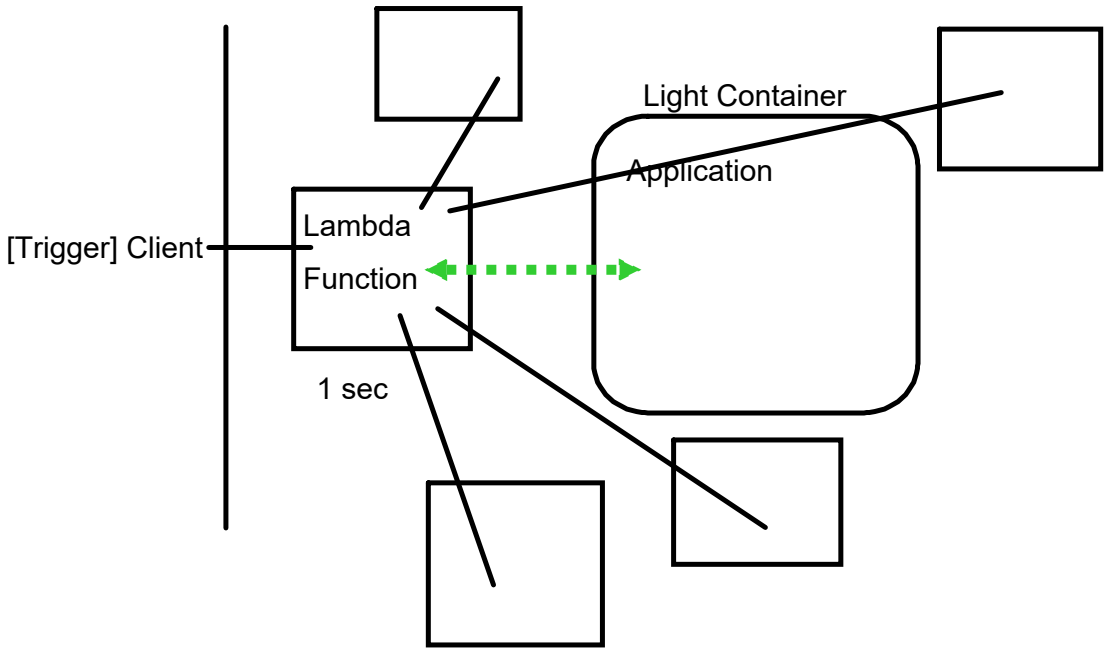
#deploy your code : Lambda function :

Ec2 : setup a server

Serverless : create a function

FaaS : (Function as a Service)

1. Write a code and upload it to Lambda Service
2. Spawn the server(s) on recieving the request - trigger (Automatic scaling)
3. You only pay for the amount of time your code is running



Compute :

EC2

EBS

ELB

Lambda

Node.JS

Python

JAva

C#

Ruby

10 lakh requests

40,000 GB of compute time

Trigger :

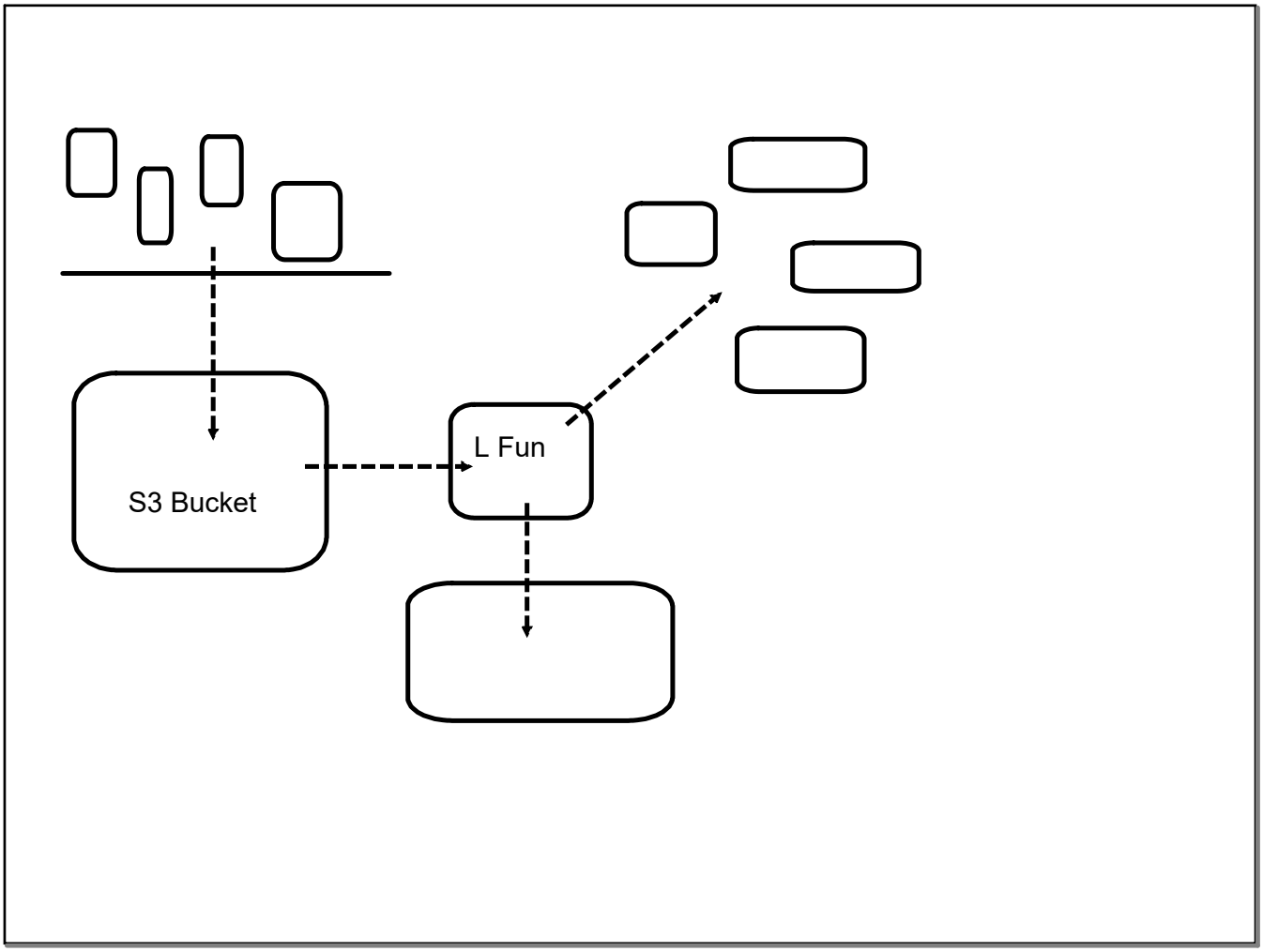
multiple AWS service

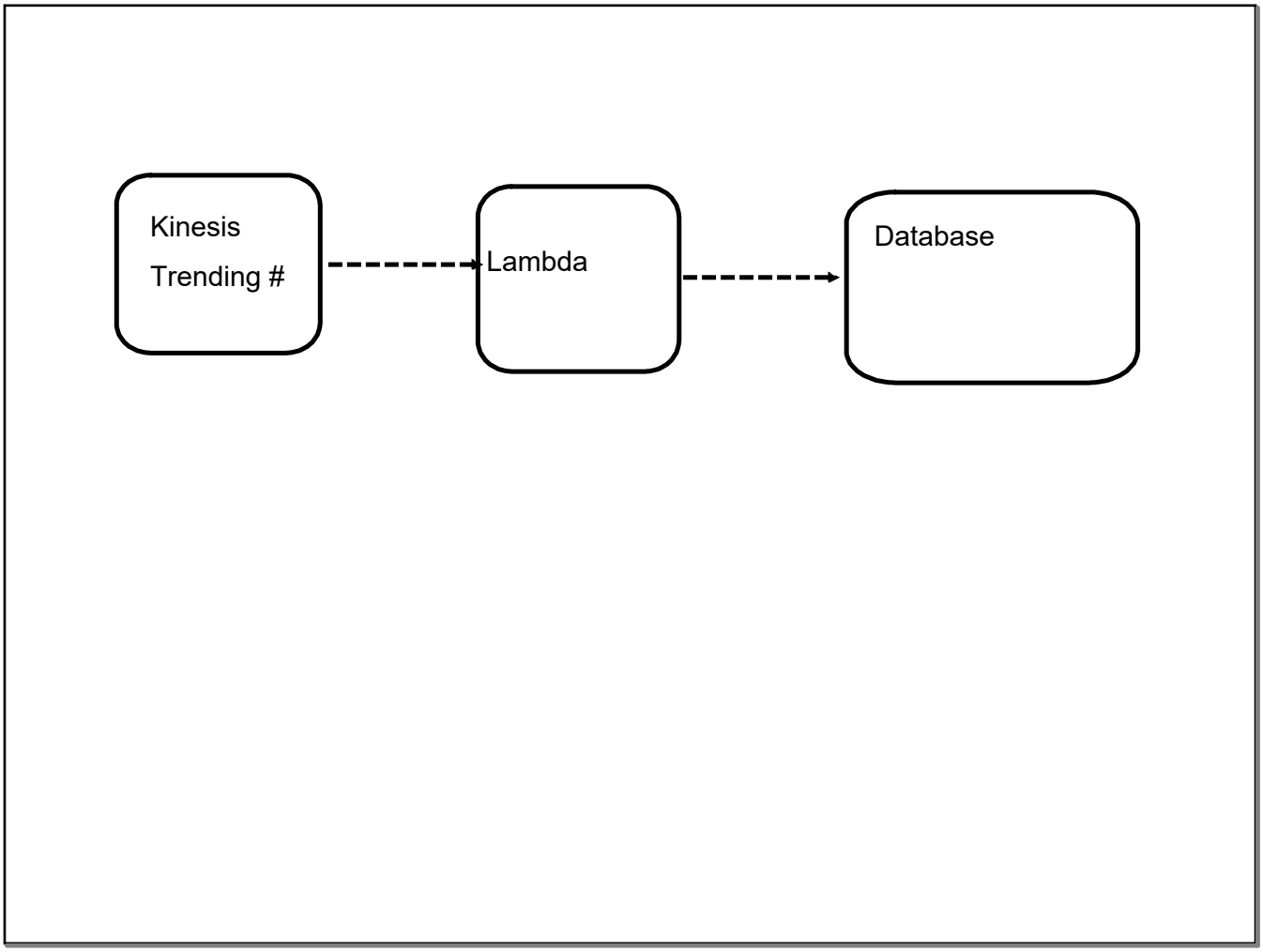
: API GATEWAY (http) :

: S3

: DynamoDB

: Kinesis


S3 Bucket
L Fun

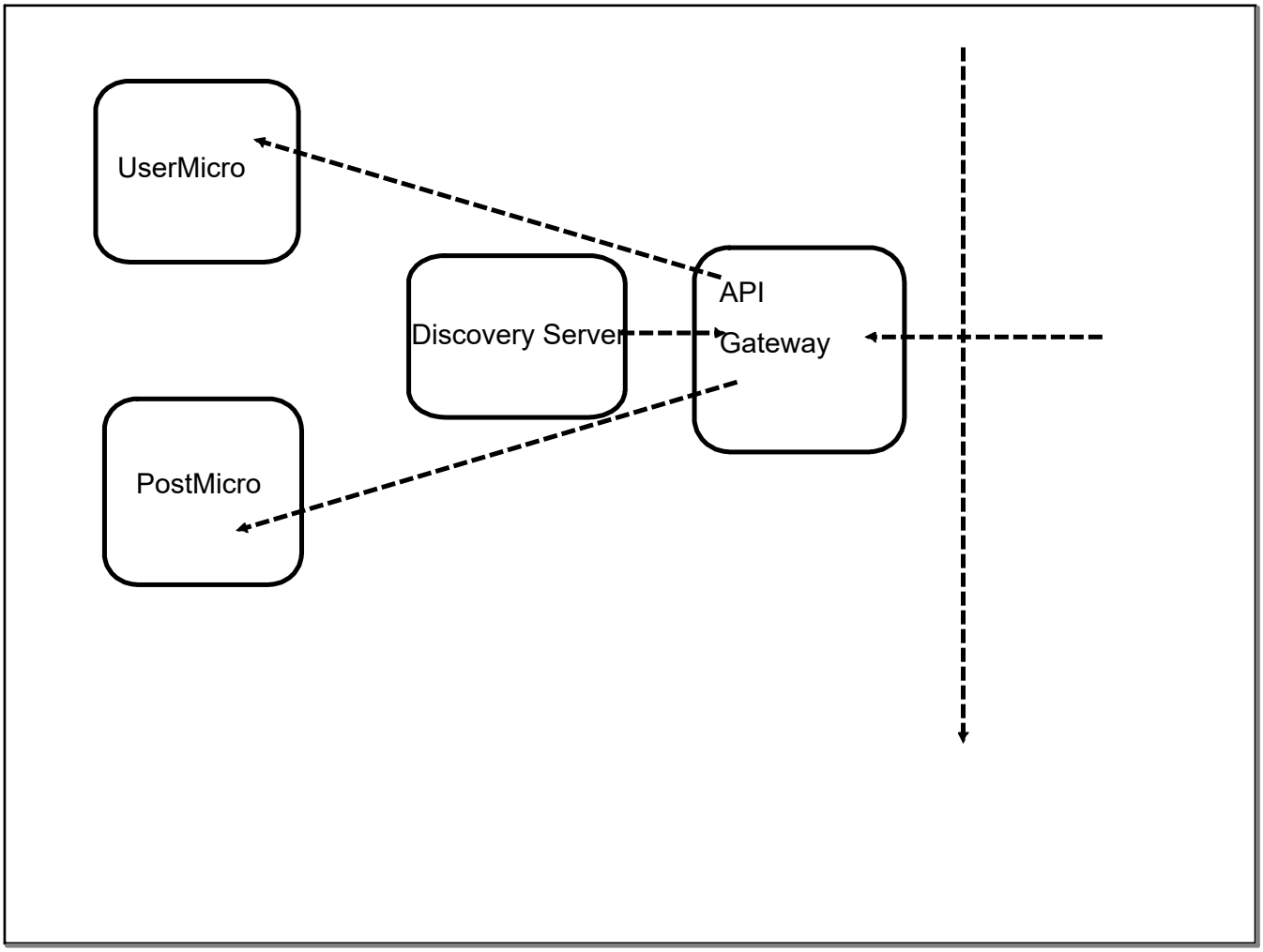

Kinesis
Trending #
Lambda
Database

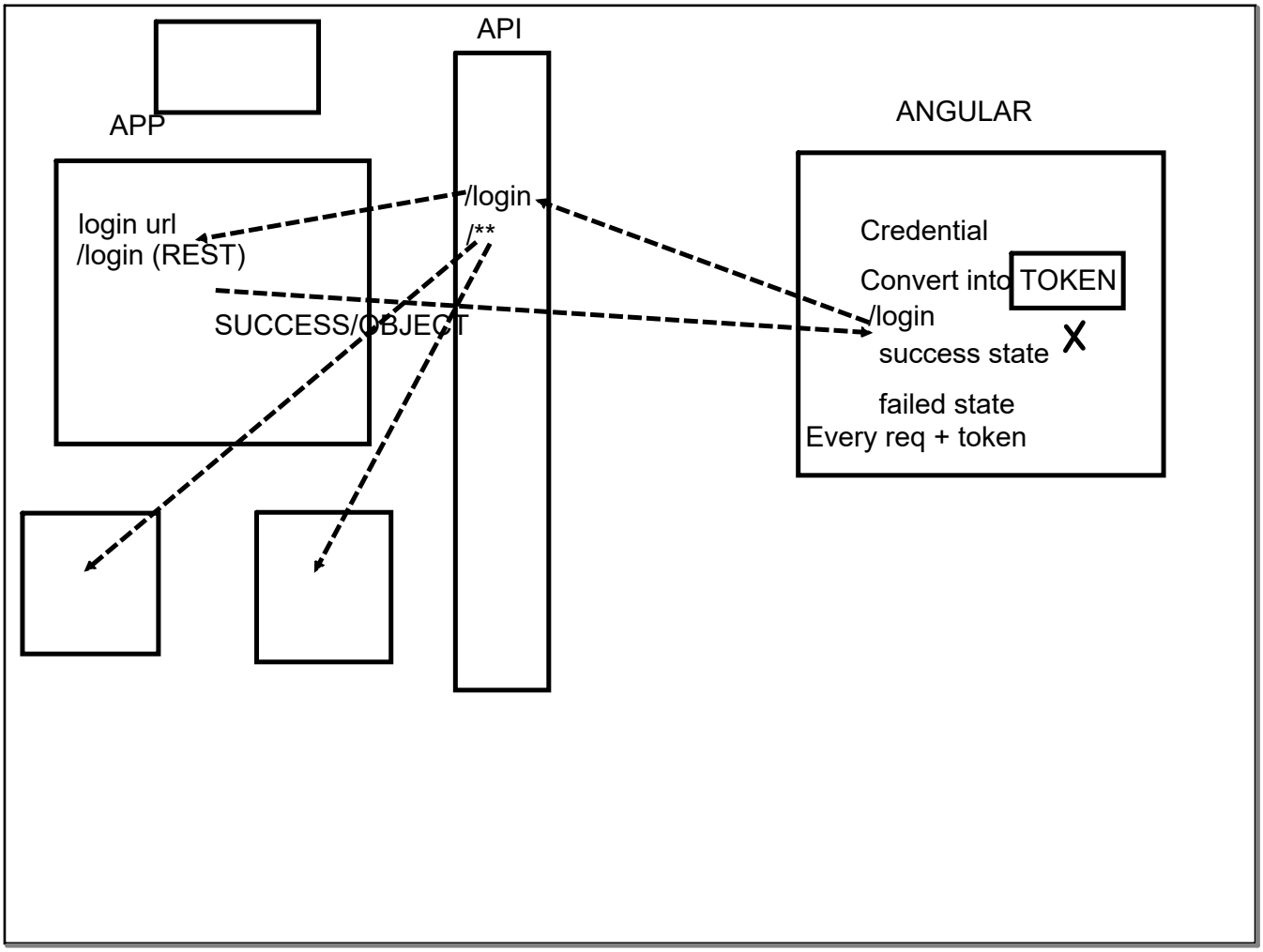
1.. Lambda function defined over AWS Service Console

2. Code designed on dev m/c , have the lambda function created and embedded with code and upload the packages content

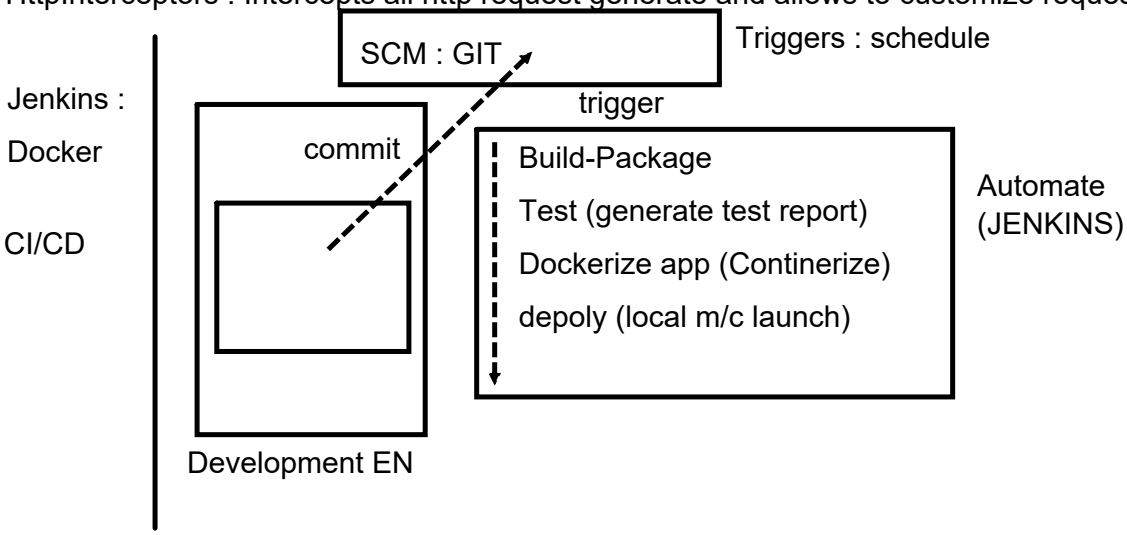
3. aws console installed over local machine :

upload it using CLI


UserMicro
Discovery Server
API
Gateway
PostMicro


API
APP
ANGULAR
/login
/**
login url
/login (REST)
SUCCESS/OBJECT
Credential
Convert into TOKEN
/login
success state
failed state
Every req + token

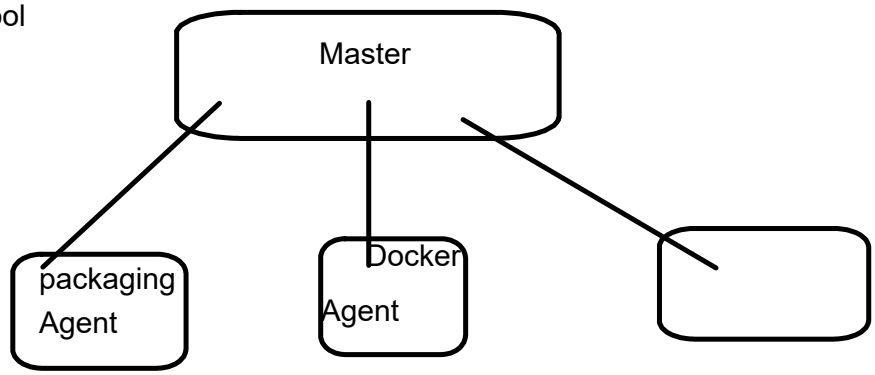
HttpInterceptors : Intercepts all http request generate and allows to customize request



Browser based tool

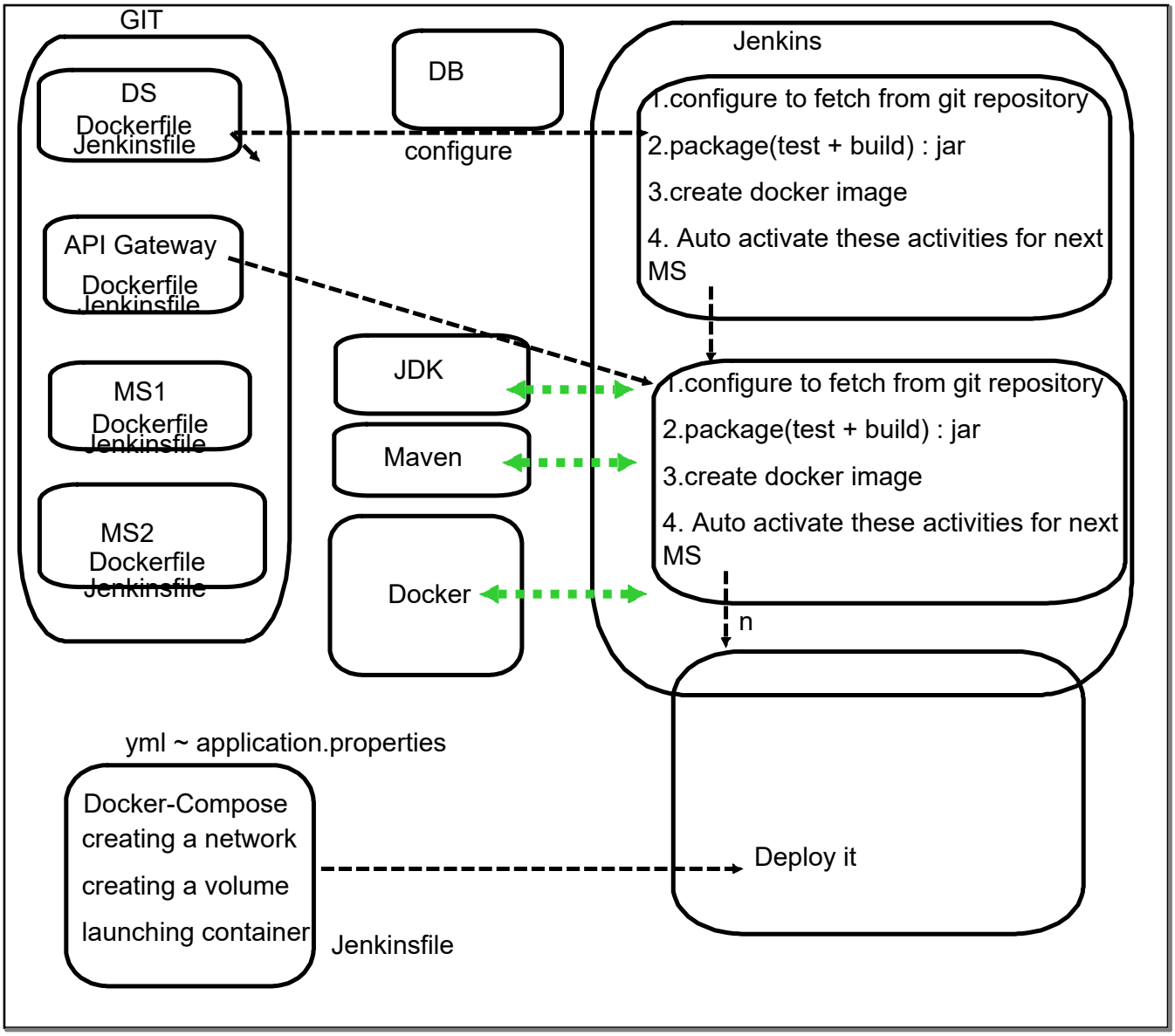
Docker

Pipeline API



jenkins-docker agent image : benhall/dind-jenkins-agent:v2

volume name : /var/run/docker.sock:/var/run/docker.sock


GIT
DS
Dockerfile
Jenkinsfile
API Gateway
Dockerfile
Jenkinsfile
MS1
Dockerfile
Jenkinsfile
MS2
Dockerfile
Jenkinsfile
DB
configure
JDK
Maven
Docker
Jenkins
1.configure to fetch from git repository
2.package(test + build) : jar
3.create docker image
4. Auto activate these activities for next MS
1.configure to fetch from git repository
2.package(test + build) : jar
3.create docker image
4. Auto activate these activities for next MS
n
yml ~ application.properties
Docker-Compose
creating a network
creating a volume
launching container
Jenkinsfile
Deploy it

Key : Value
(heirarchy) : readable (compat)

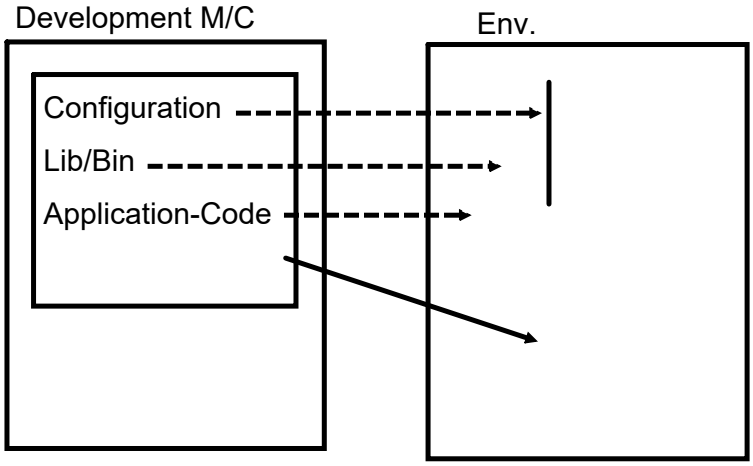
compose-resources :
Jenkinsfile
Docker-Compose.yaml
user-micro

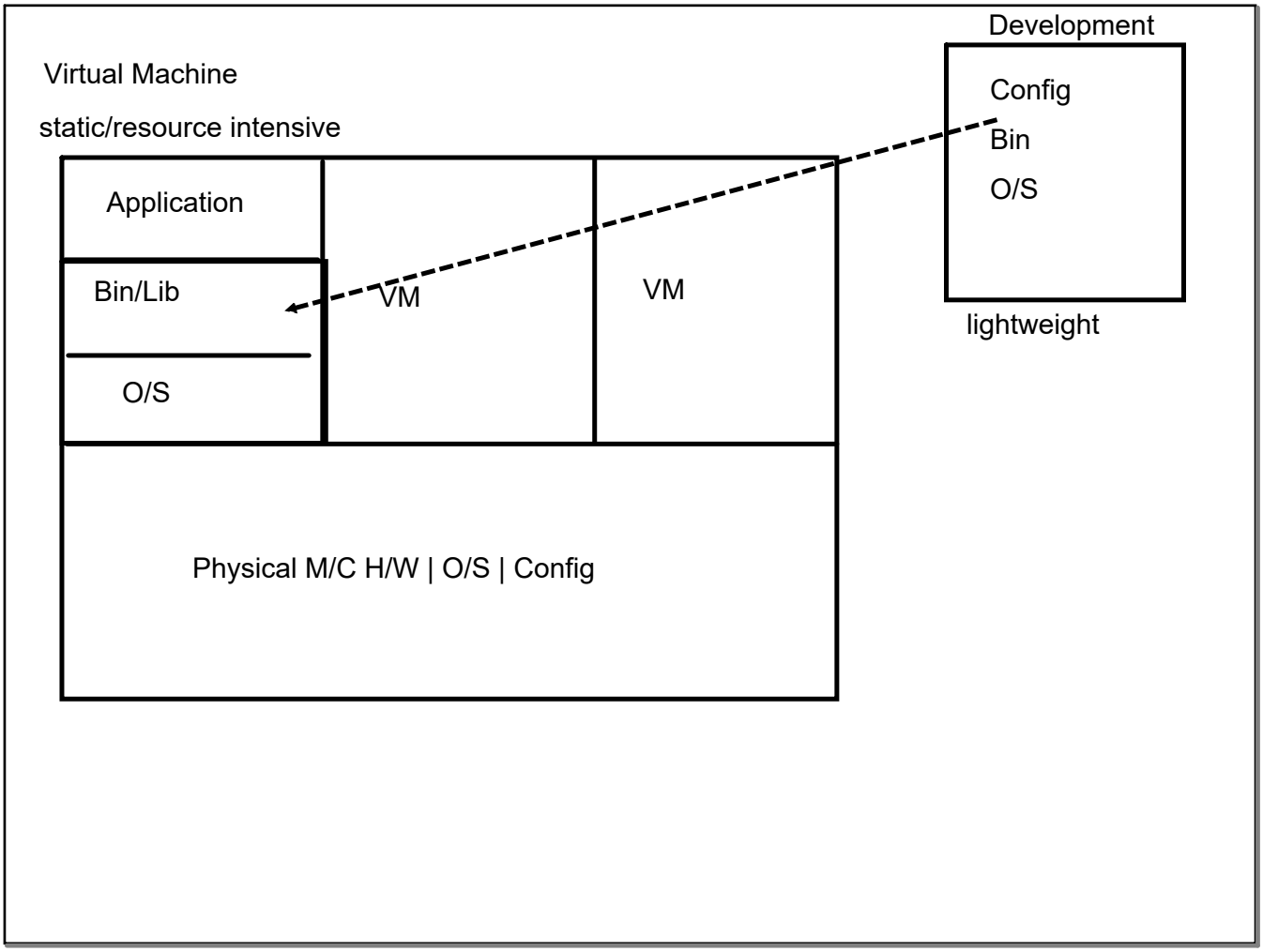
Containerization :

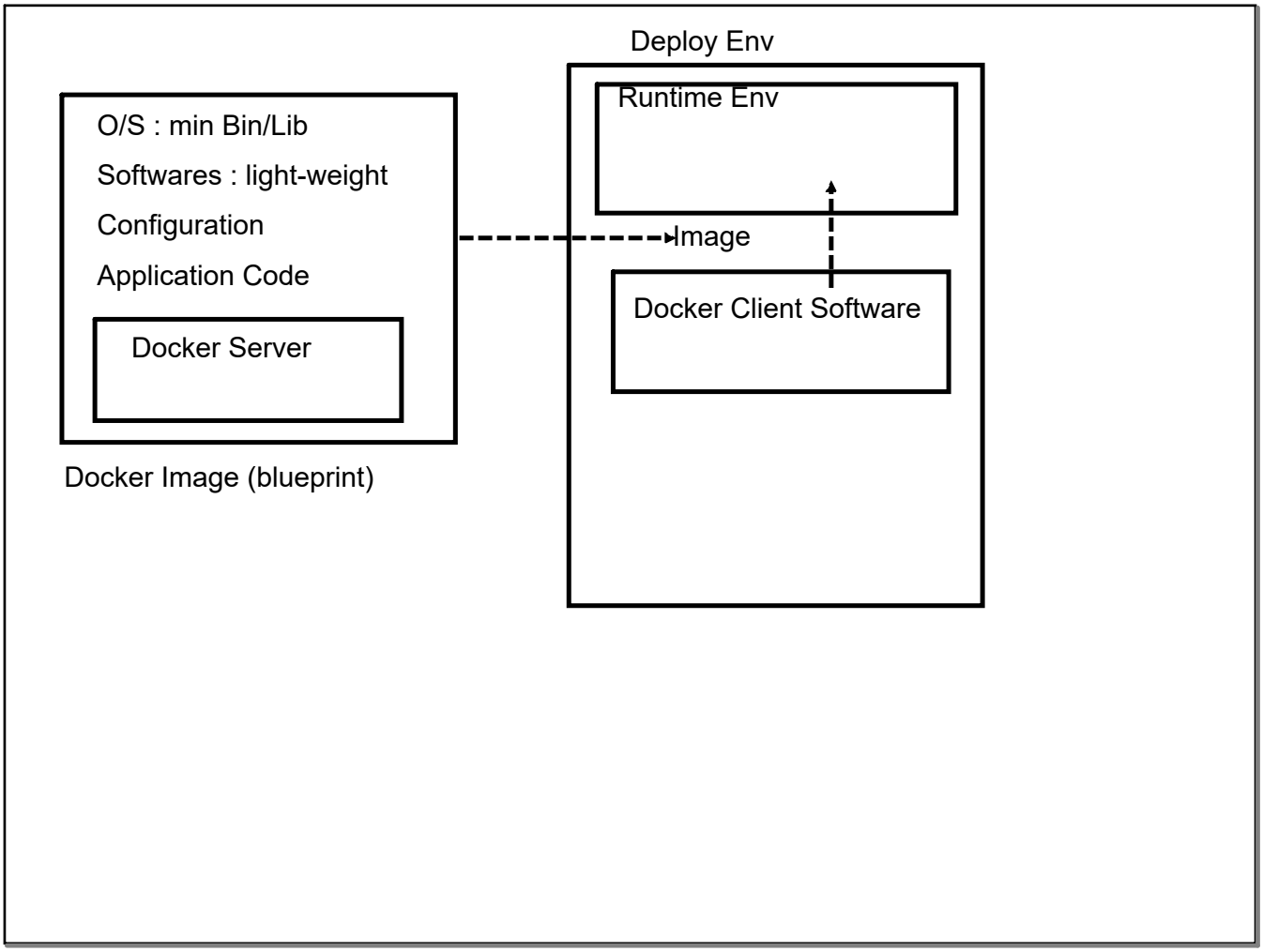
DOCKER : Container management service

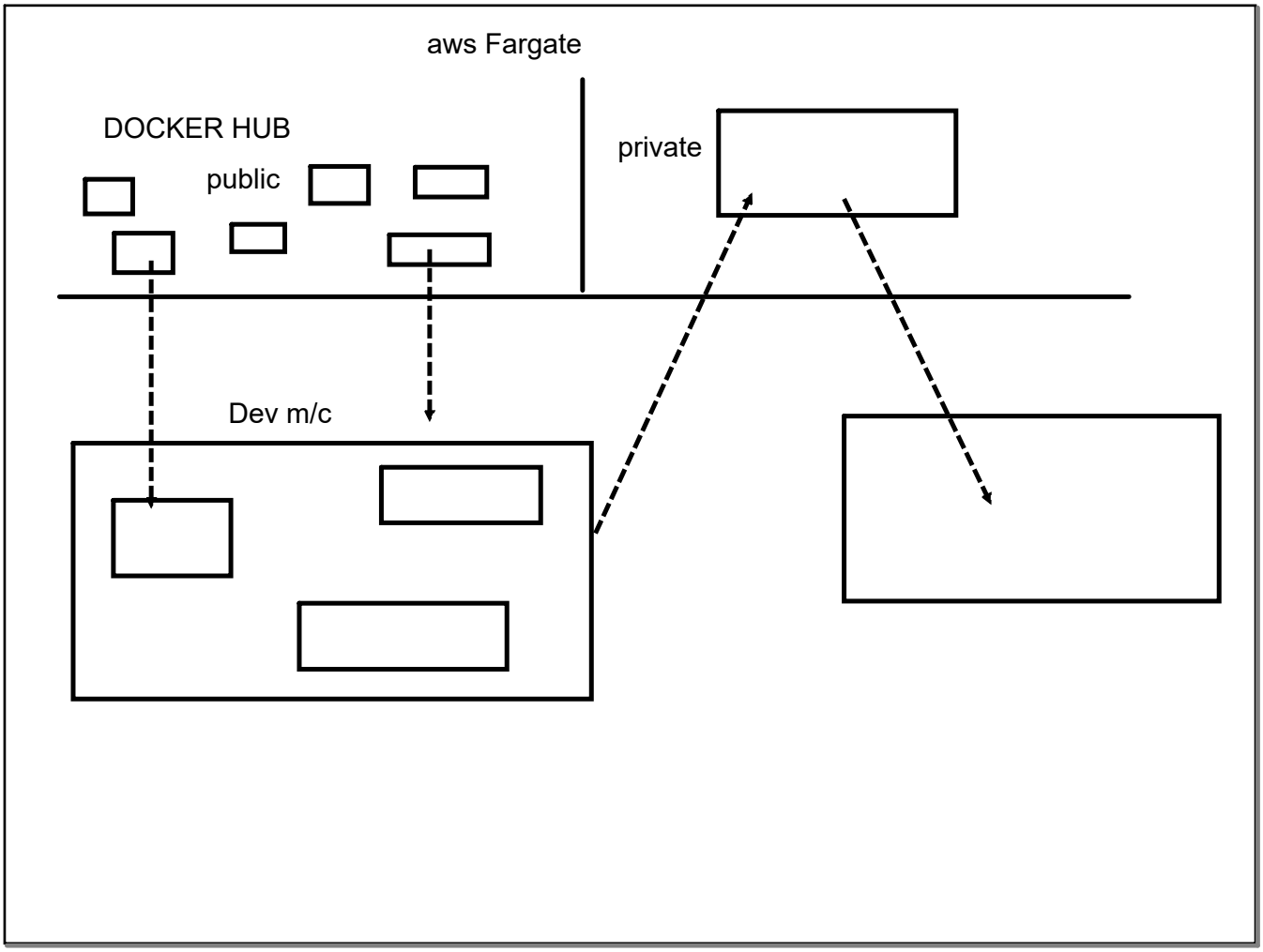
Problem : "Works on my machine"

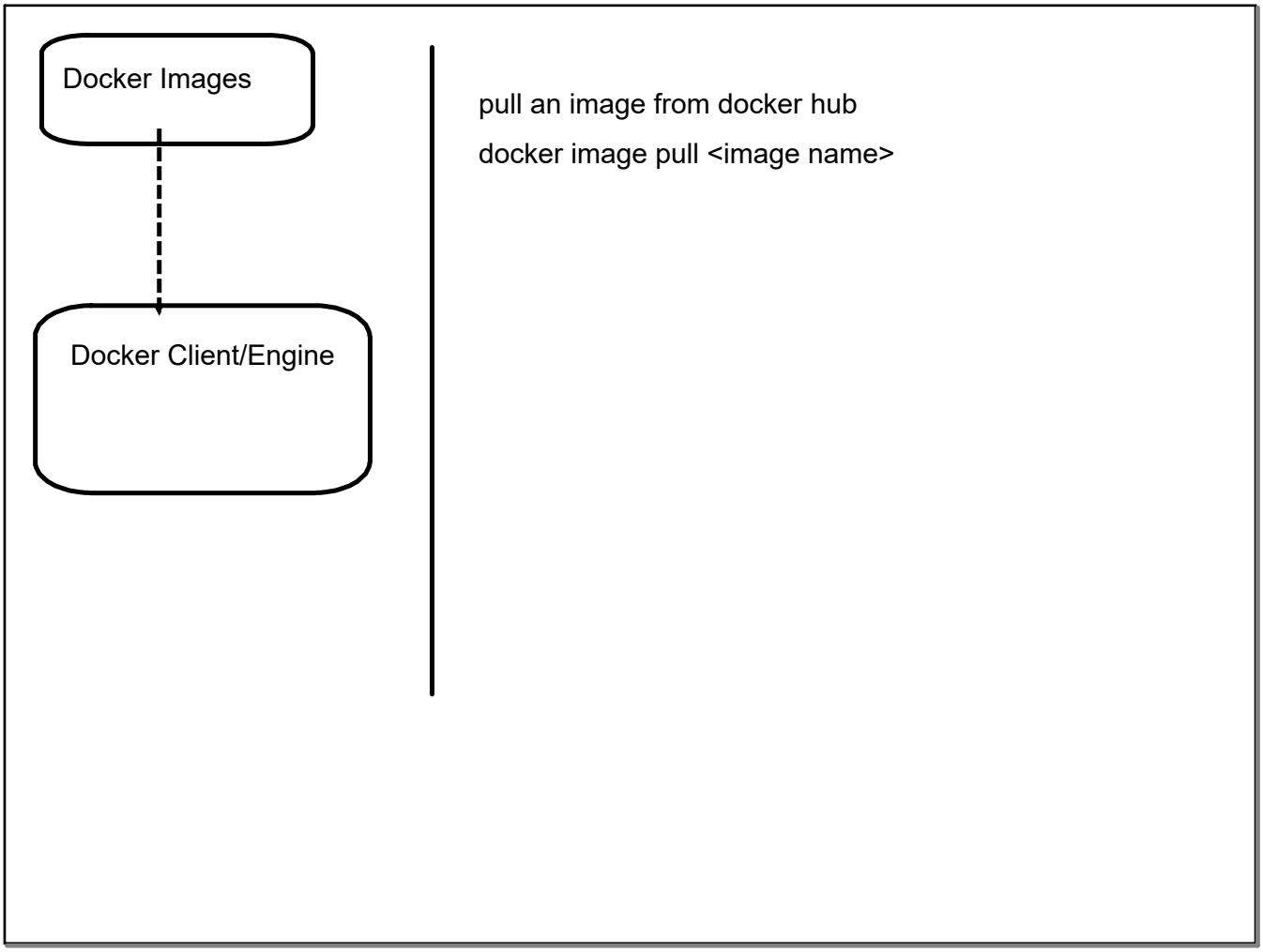
Solution : Develop, ship and run anywhere

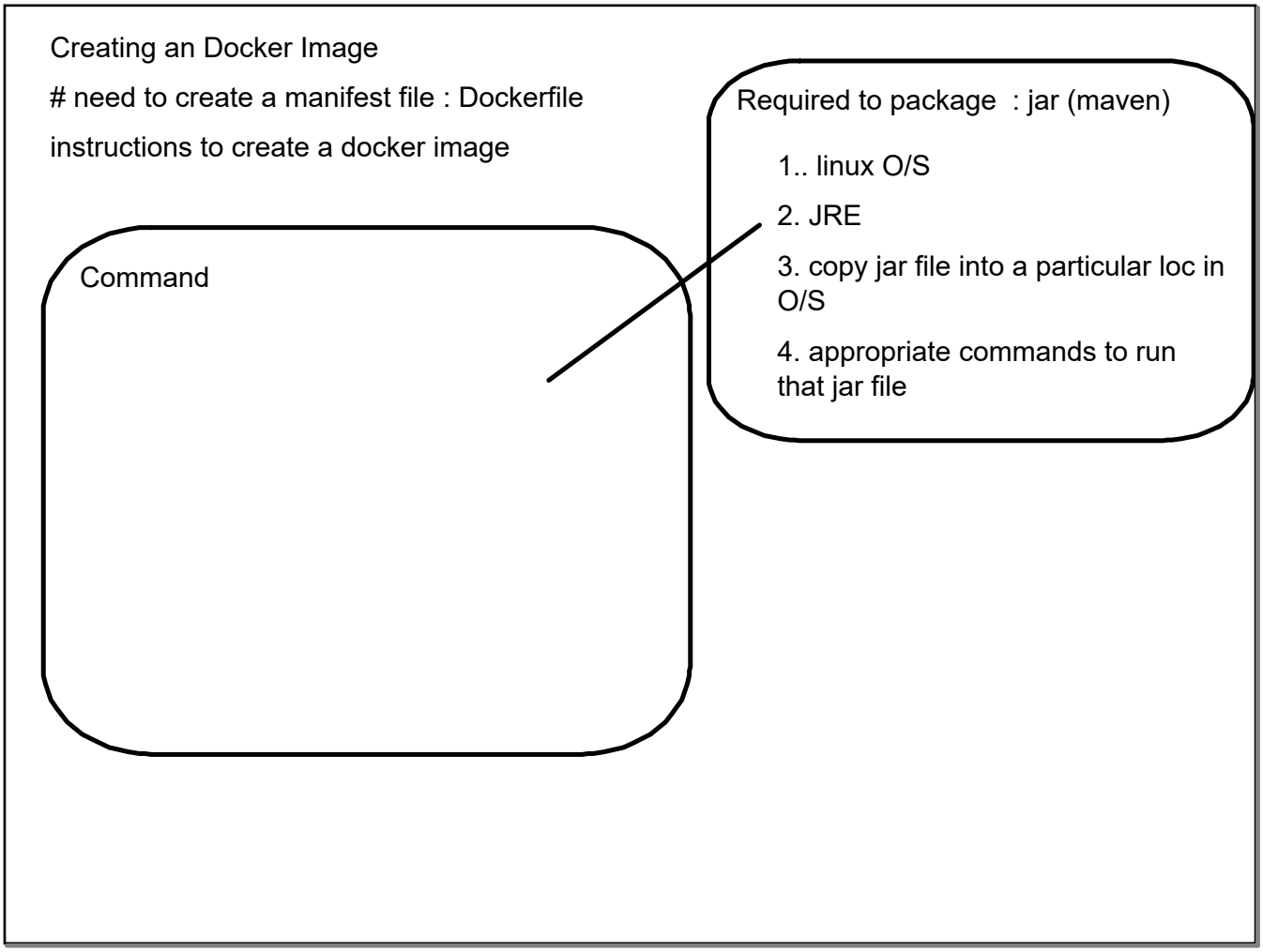


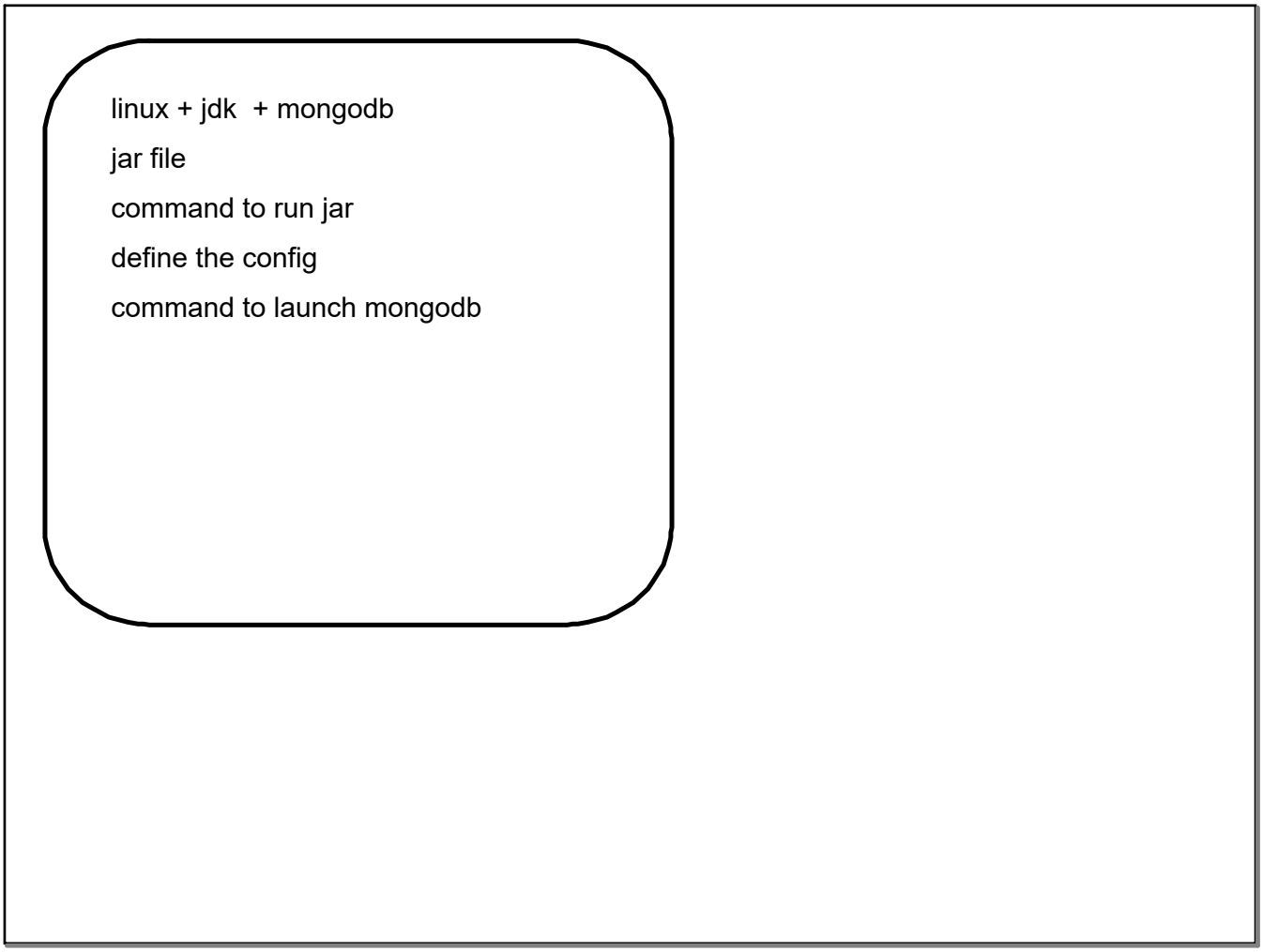

Development
Config
Bin
O/S
Virtual Machine
static/resource intensive
Application
Bin/Lib
O/S
VM
VM
lightweight
Physical M/C H/W | O/S | Config

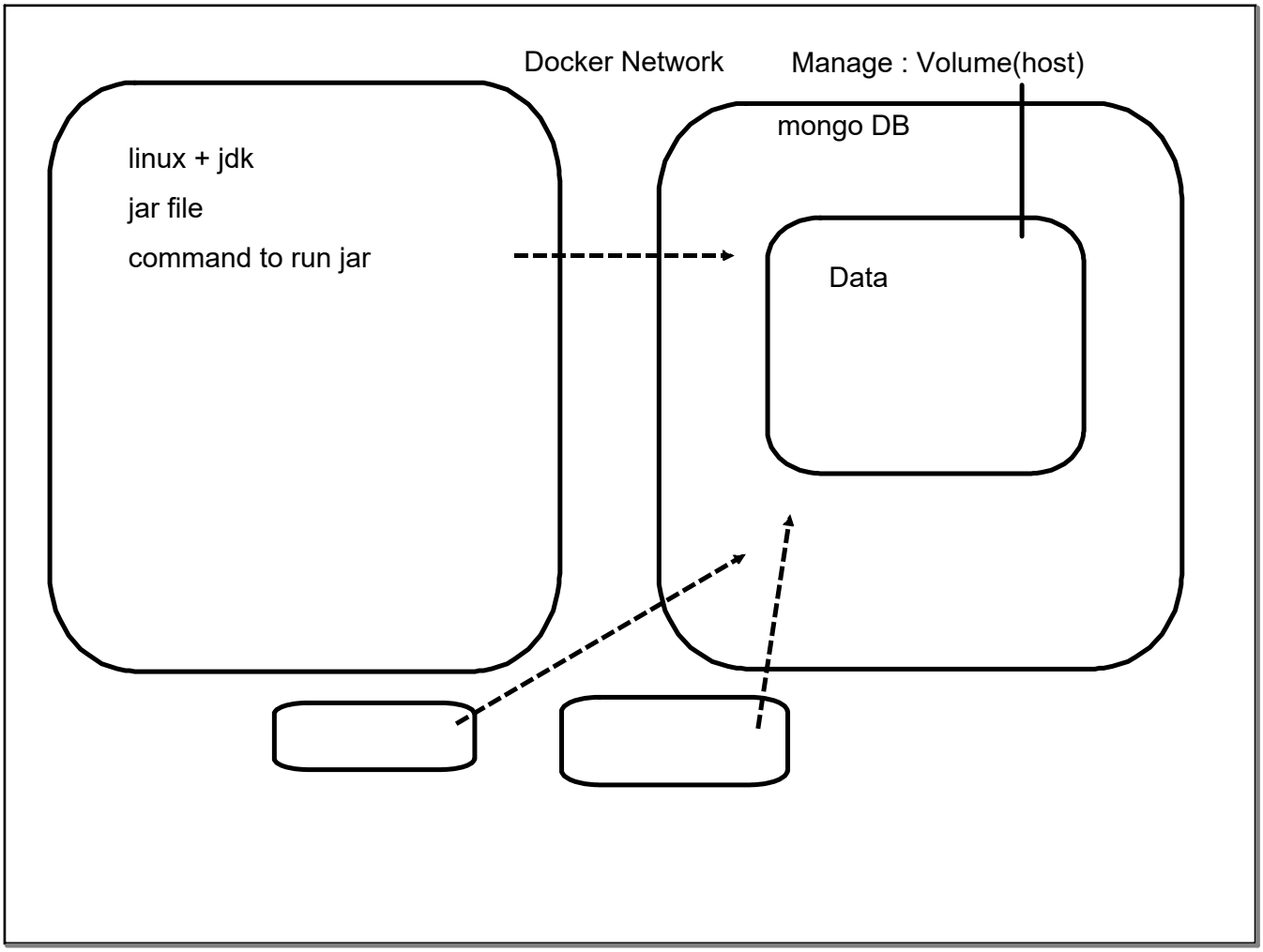

Deploy Env
Runtime Env
O/S : min Bin/Lib
Softwares : light-weight
Configuration
Application Code
Docker Server
Image
Docker Client Software
Docker Image (blueprint)


aws Fargate
DOCKER HUB
public
private
Dev m/c


Docker Images
Docker Client/Engine
pull an image from docker hub
docker image pull <image name>


Creating an Docker Image
need to create a manifest file : Dockerfile
instructions to create a docker image
Command
Required to package : jar (maven)
1.. linux O/S
2. JRE
3. copy jar file into a particular loc in O/S
4. appropriate commands to run that jar file


linux + jdk + mongodb
jar file
command to run jar
define the config
command to launch mongodb


Docker Network
Manage : Volume(host)
mongo DB
linux + jdk
jar file
command to run jar
Data

creating a docker image

> docker build -t <nameofimage> <location Dockerfile>

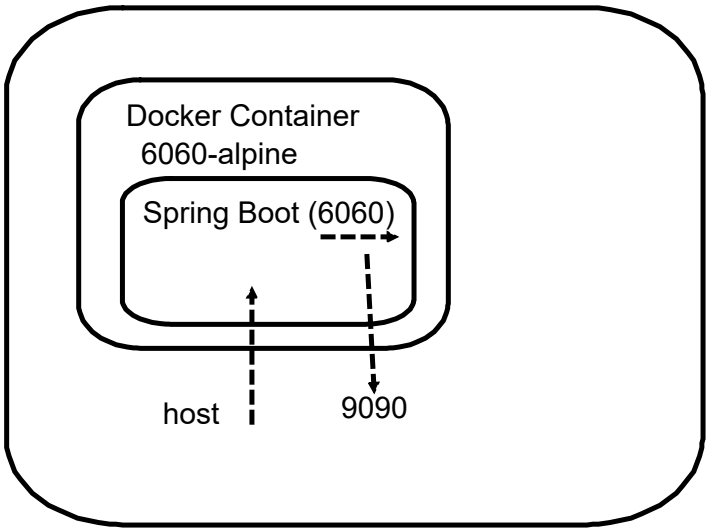
launching the container

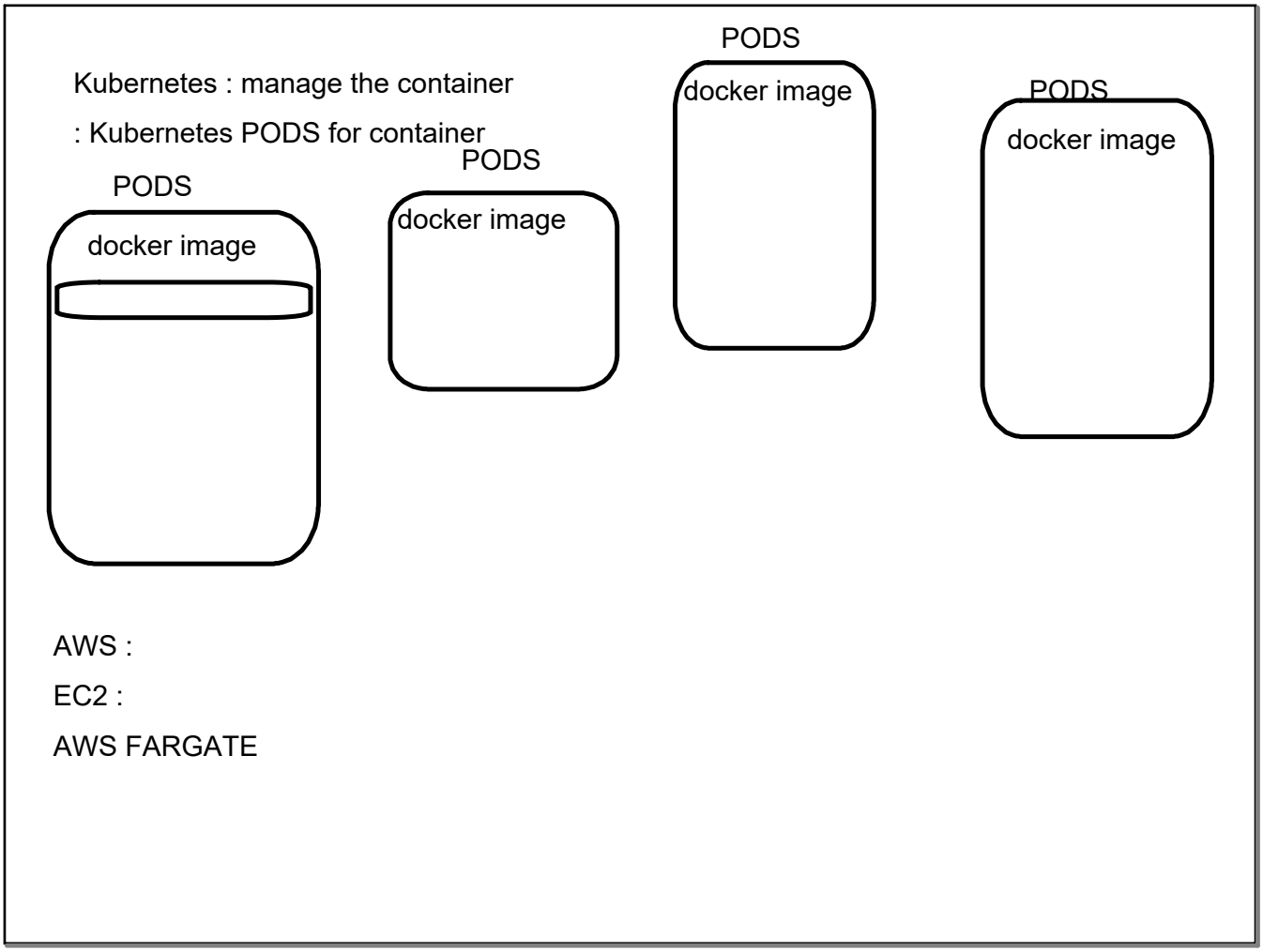
>docker conatainer run

>docker run <image-name>

>docker run -p <host>:<container>

CI/CD




Kubernetes : manage the container
: Kubernetes PODS for container
PODS
docker image
PODS
docker image
PODS
docker image
PODS
docker image
AWS :
EC2 :
AWS FARGATE

Thread :

Traditional approach :

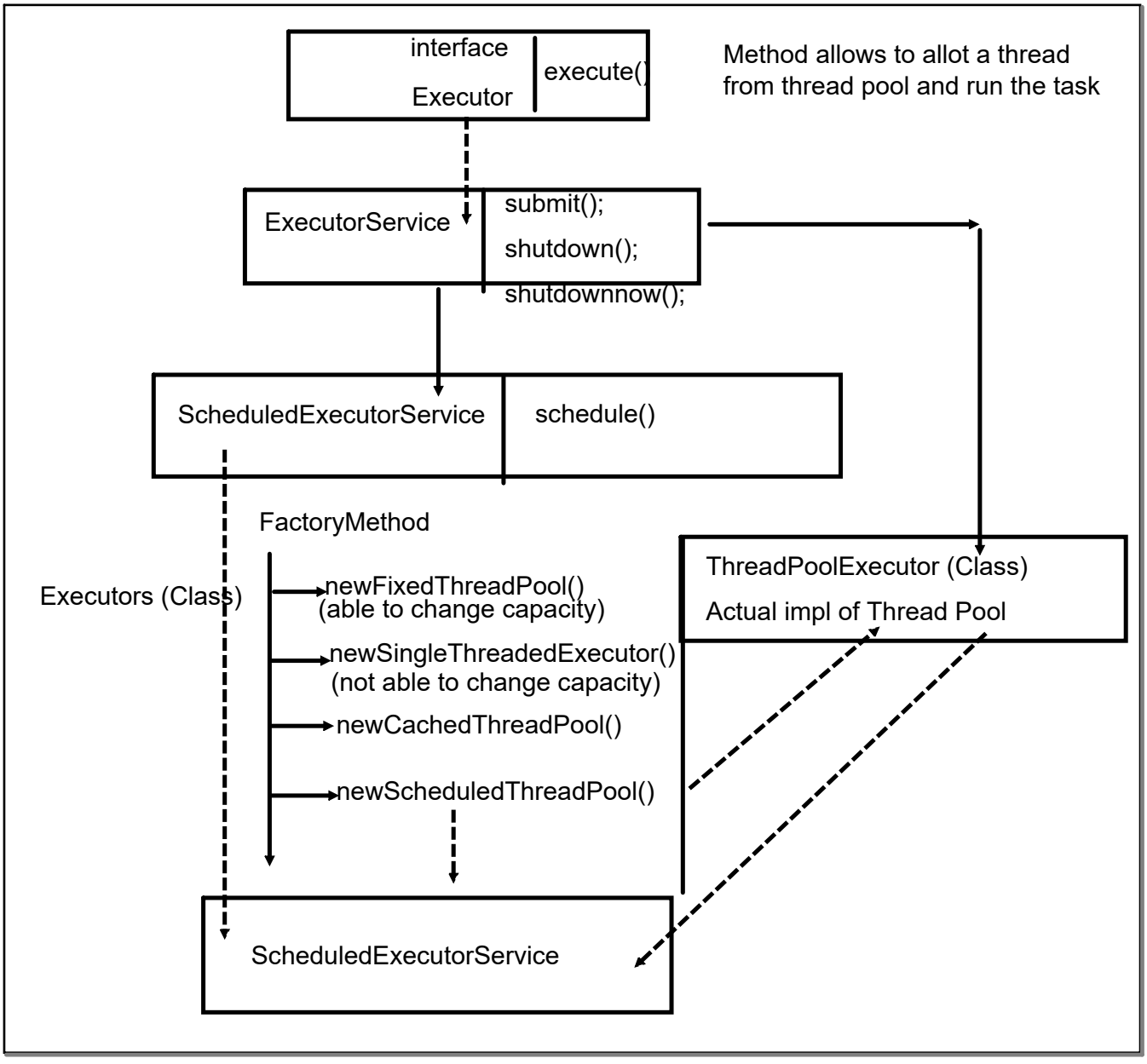
create, execute, manage

Executor Framework :

improve the performance

Thread per Task :

THREAD POOL


interface
Executor
execute()
Method allows to allot a thread
from thread pool and run the task
ExecutorService
submit();
shutdown();
shutdownnow();
ScheduledExecutorService
schedule()
FactoryMethod
Executors (Class)
newFixedThreadPool()
(able to change capacity)
newSingleThreadedExecutor()
(not able to change capacity)
newCachedThreadPool()
newScheduledThreadPool()
ThreadPoolExecutor (Class)
Actual impl of Thread Pool
ScheduledExecutorService

To have more control/customization : need to create instance of ThreadPoolExecutor explicilty

```
new ThreadPoolExecutor(
    <corePoolSize>,  // number of thread to always keep even if they are idle
    <maxPoolSize>, // max no of thread
10  <keepAliveTime>, // time to wait before idle thread gets removed
SECONDS <TimeUnit>,
    <queue capacity>, // capacity of queue
    <ThreadFactory>,
    <RejectedHAndler> //
);
```

Scheduling

Thread : returns value back

Thread : implementation Callable

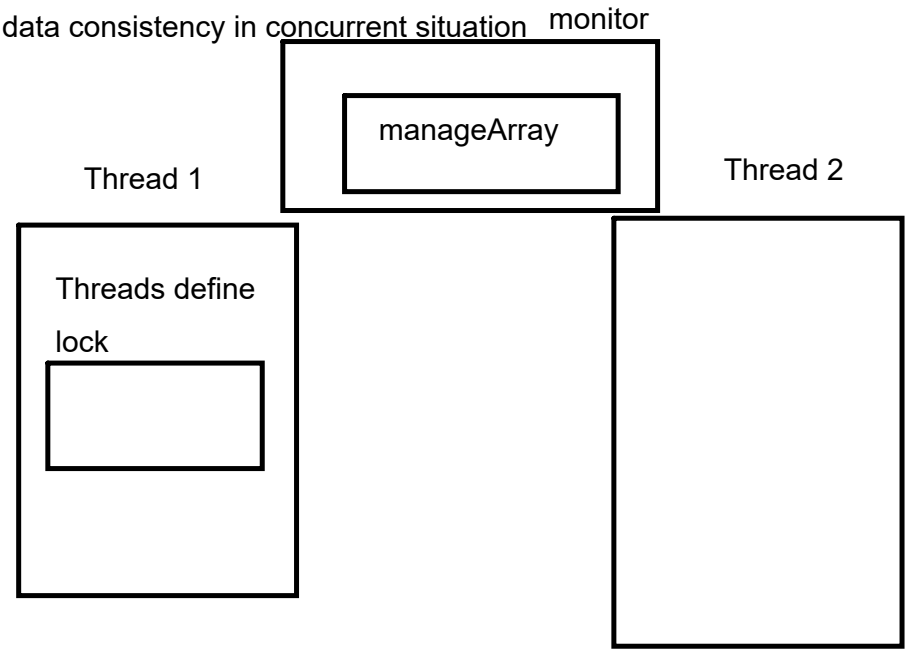
=>ExecutionCompletion : n thread (returns result as and when thread terminates)

=>CompletableFuture :

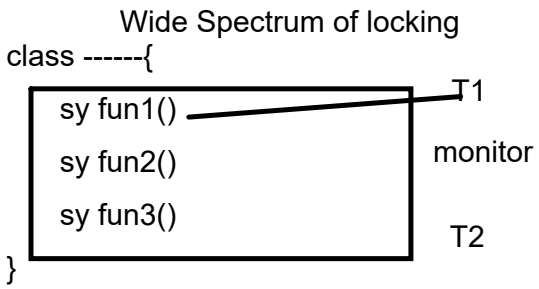
callback function would get invoked when results are ready

data sharing :

data consistency in concurrent situation



Wide Spectrum of locking



Atomic level of locking

Eliminates the advantage of concurrency

fine control concurrency

Concurrent Collection Classes

Where we need to apply a lock : Non-Atomic instruction

i=10; // Atomic operation (single unit of work)

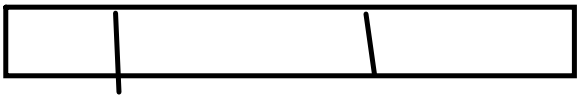
long/double : non-atomic

i++; // Non atomic

get i

increment

set i



4 bytes

8 bytes (4+4)

AtomicInteger : wrapper :

operations will be done in atomic

get i
increment
set i

lock

Concurrent Collection :

Converting Non-Atomic activities into atomic

Collection : Max of Collection classes are not thread safe

ConcurrentModification Exception

Vector/Stack : HashTable

Collections.concurrentList();

Collections.concurrentSet();

Thread Safe/ variant of those classes

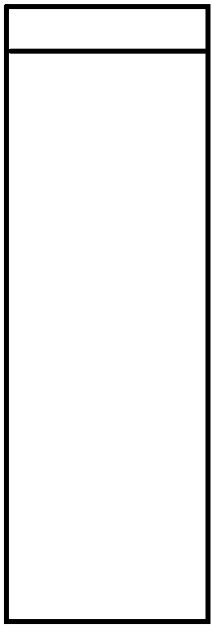
Wide Spectrum

Thread Safe

Concurrent Collection

Atomic level

16 Segments : 1 lock ~ 16 Thread can go apply write on hasmap



Hash Table (Segment[0]) : 5 elements

(on any one element of first segment) :

Optimized for high concurrent reading

less write

CopyOnWriteArrayList()

copy of reference()

write : create a private copy for that thread (changes in private copy)

reading thread (stale instance)

Design Patterns for Micro-services

Criteria

1. Decomposition Patterns

a) Decompose by business capabilities

business req rather that technical

b) Decomposition based on domain/sub-domain

techinical challenge : Parent| God model/classes

(DDD) Domain Driven Design : bounded context

microservice (sub-domain) : model class (in boundation with Parent class)

Greenfield :

80% : brownfield

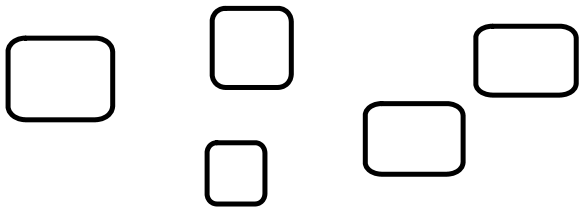
c) Strangler Pattern

divide running large monolith app into MS arch.

url by url creation of MS

Integration Criteria:

a)API Gateway



abstracting producer from consumer

routing

customizing the response

b)Aggregator Patterns

aggregate data from different service and respond back

#Composite : Atomic (exclusive)

add it to API Gateway

c) Client Side UI Composition

UI/UX logic

Database Patterns

a) Ideally : Database per service

loosly MS architecture

b) Shared DB

No ideal , but good to begin on brownfield situations

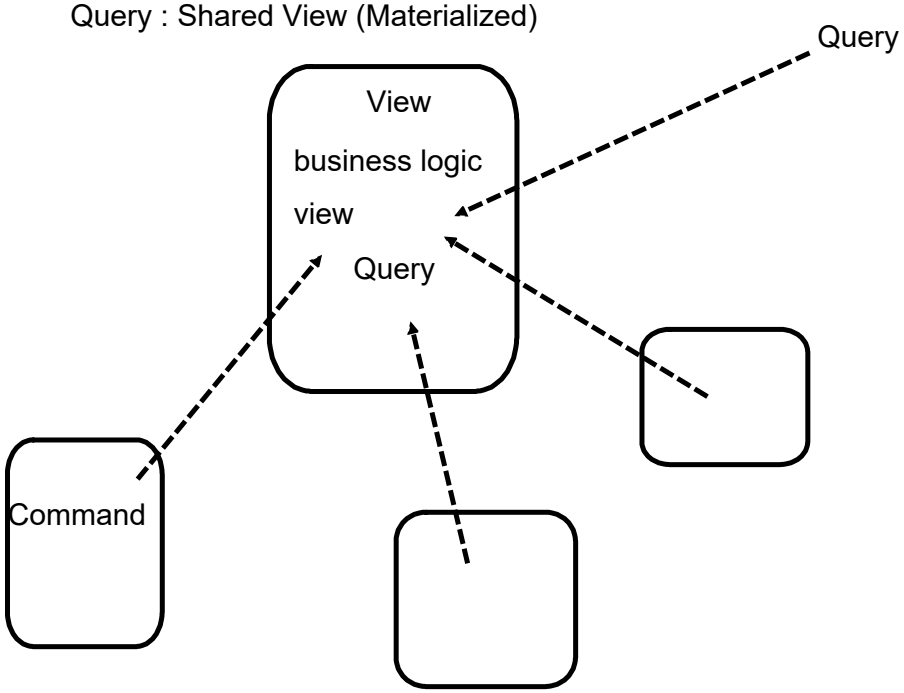
2-3 MS sharing a DB

c) CQRS : Command Query Responsibilty Segreggation

Split app in two parts:

Command : Create, Update, Delete (isolated)

Query : Shared View (Materialized)



event sourcing patterns

Transaction based Requirement

d) Saga patterns:

sequence of local transaction

the service performing transaction publishes a event , triggers the subsequent transaction

event bus :

rollback the pre transaction (failure)

1. Choreography : each service decided what to do when recieve event
2. Orchestration : initiate an object : tell all praticipants what to do

Observability Pattern

a) Log Aggregation :

Centralized logging system will get log infos from all instances

analysis

alerts

PCF (Pivotal Cloud Foundry)

AWS Cloud Watch

b) Performance Metrics

gather the statistics : NewRElics, Promethus

c) Distributed Tracing

keeping a track/tracing end-to end

Spring Cloud Slueth/ Zipkin Server

d) Health Check:

Load Balancer : need to look for failed instances

actuator REST Endpoints

Cross-Cutting Concerns

1. Externalizing Configuration

Spring Cloud Config Server

2. Service Discovery

3. Circuit Breaker Pattern

Hystrix

Agile development process:

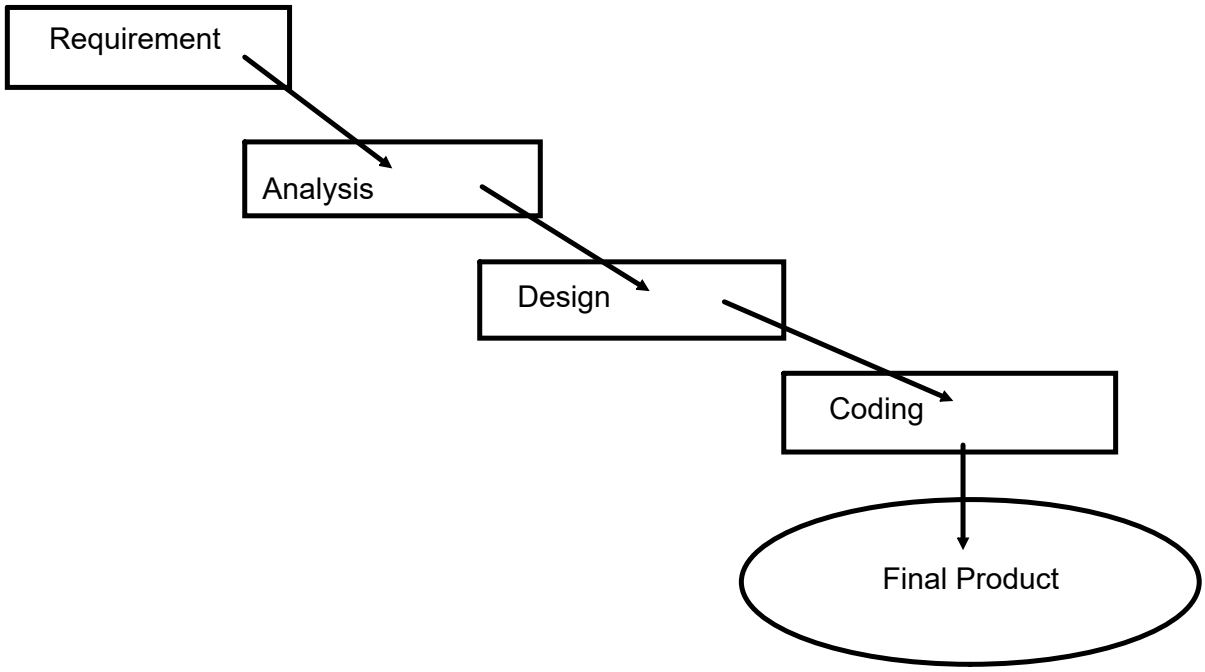
Different way of executing software development teams and project

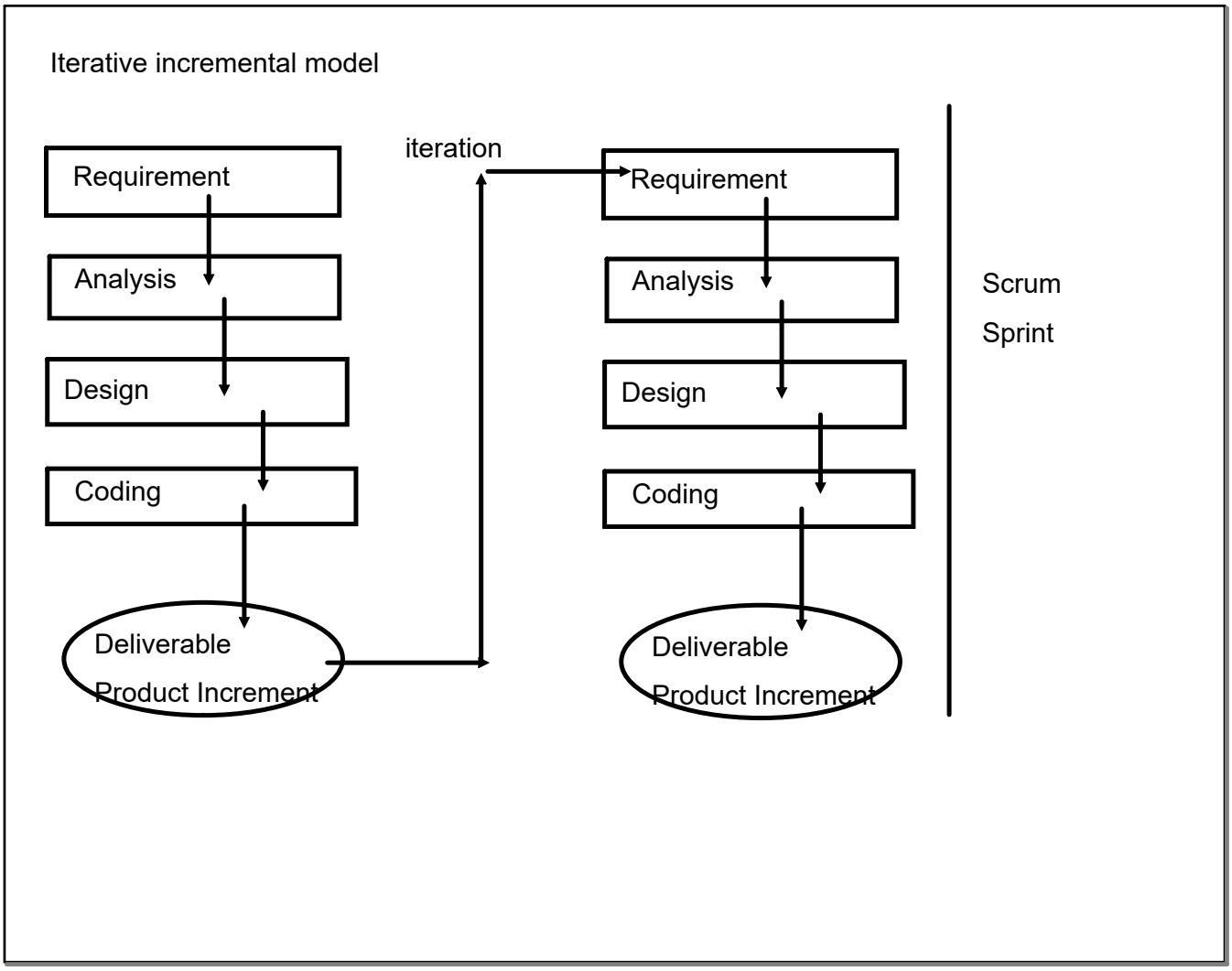
Traditional Approach:

Waterfall model:

not structured to accommodate continuous changes

client will not have clarity till product is available in entirety




Iterative incremental model
Requirement
Analysis
Design
Coding
Deliverable
Product Increment
iteration
Requirement
Analysis
Design
Coding
Deliverable
Product Increment
Scrum
Sprint

Agile Development:

based on iterative incremental model

only a guideline not a particular practice

#Team collaboration

#Time boxed approach

Agile Manifesto:

putting importance over

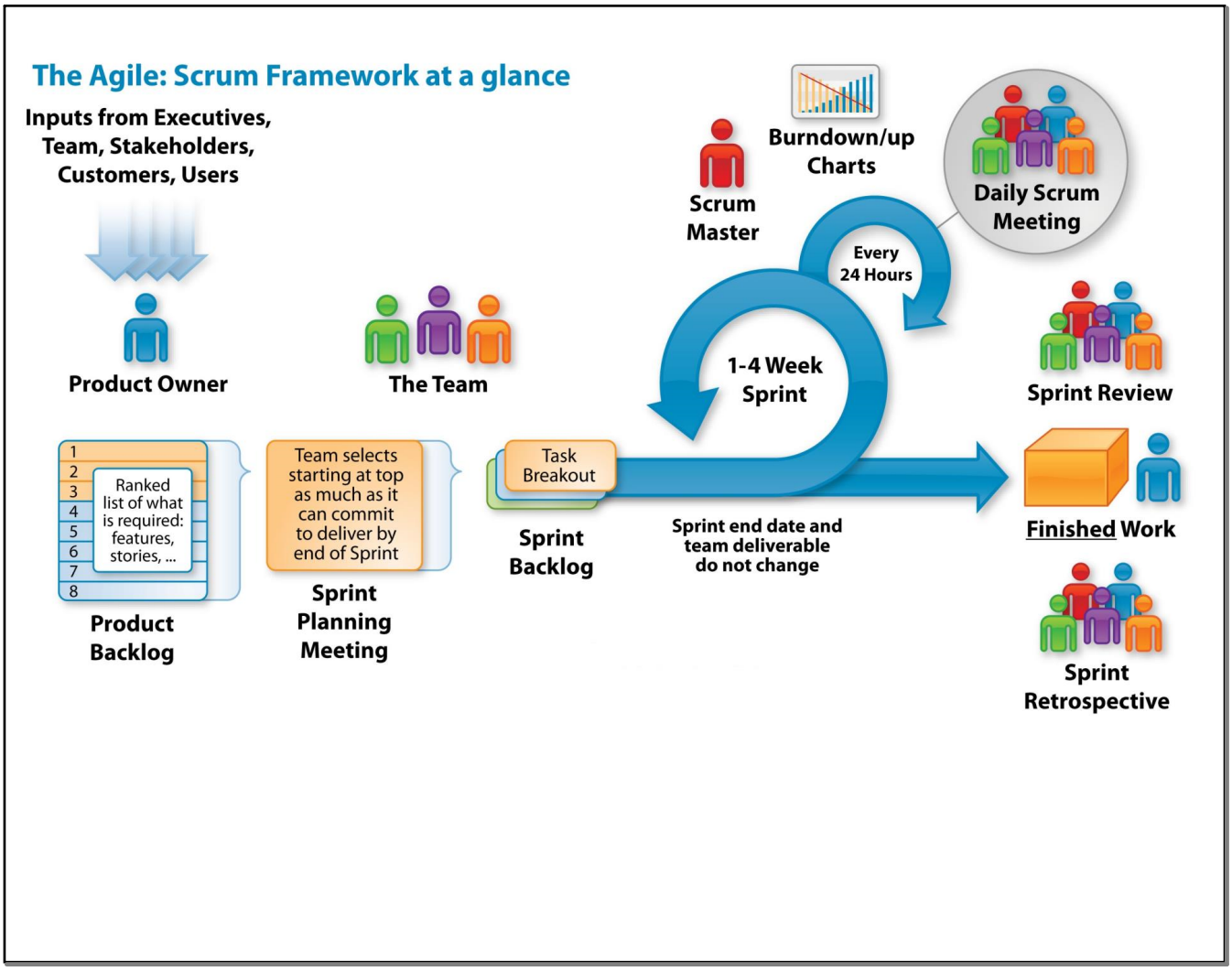
1. Individuals and interaction (over process and tool)
2. Working software (over comprehensive doc)
3 Customer Collaboration (over contract negotiation)
4. Responding to change (over sticking to a fixed plan)

Agile methodologies :

Rational Unified Process

Dynamic Systems Development Method(DSDM)

Scrum (Popular)


The Agile: Scrum Framework at a glance
Inputs from Executives, Team, Stakeholders, Customers, Users
Product Owner
The Team
Scrum Master
Burndown/up Charts
Daily Scrum Meeting
Every 24 Hours
1-4 Week Sprint
Sprint Review
1
2
3
4
5
6
7
8
Ranked list of what is required: features, stories, ...
Product Backlog
Team selects starting at top as much as it can commit to deliver by end of Sprint
Sprint Planning Meeting
Task Breakout
Sprint Backlog
Sprint end date and team deliverable do not change
Finished Work
Sprint Retrospective

Sprint:

(iteration : time-boxed)

1-4 weeks :

Sprint Planning

Daily Scrum meeting

Sprint Review

Sprint Retrospective

Roles /Teams

1. Scrum Master
2 Product Owner
3. Implementation team

Product Backlog:

Ordered/priortized list of features that are needed as part of end product

#Single Source of all improvement changes needed to be made

Implementation Team Size : 5-9

Sprint Planning Meeting :

=>What needs to be and can be delivered in the Spring Increment

=>how will the work needed for the execution of Sprint be achieved

Input:

1. The Product Backlog
2. the latest product increment
3. Projected structure and capacity of the Team
4. Past Performance of team

Output:

Sprint Goal

Sprint Backlog : Selected items from Product Backlog + plan to achieve to

Daily Scrum Meeting : 15-20 min

focus on Team Member:

#Team member explanation:

What person did yesterday

What is planned for today

if any issues to achieve todays goal

=>Improve Communication

=>Identify obstacle

=>promote quick decision making

=>Improving Teams level of knowledge

Sprint Review Meeting:

#held after sprint

#presentation of increment is reviewed

#collaborative meeting of scrum team , customer reps

#object a collective feedback and progress scenario

=>1 hr / week

outcome :

improved/updated product backlog

Sprint Retrospective

Combines the learning from prev sprint

#Identify major area of improvement

#Creating a plan to increase product quality (making next sprint more effective)

Artifact / Documents :

- Product Backlog
- Sprint Backlog
- Burn-down chart
- Increment

All requirement shall be mentioned as User Stories

Increment : sum of all Product Backlog items completed during a sprint combined with the increments of all the previous sprint

Burn-down Chart: total work remaining int sprint backlog (reviewed updated in every daily scrum meeting)

user -Stories:

Tool / approach to describe any requirements (Product and Sprint Backlog)

is described from user perspective

#structured user point of view req

Eg Structure

As a - <Type of User>

I want - <to perform some task>

So that - < I can achieve some goal>

eg:

Req: cash withdrawal from ATM

As a - Bank Customer

I want - to withdraw cash from ATM

So that- I don;t have to wait in bank queue

USer story Acceptance criteria

Given - account is valid

#and card is valid

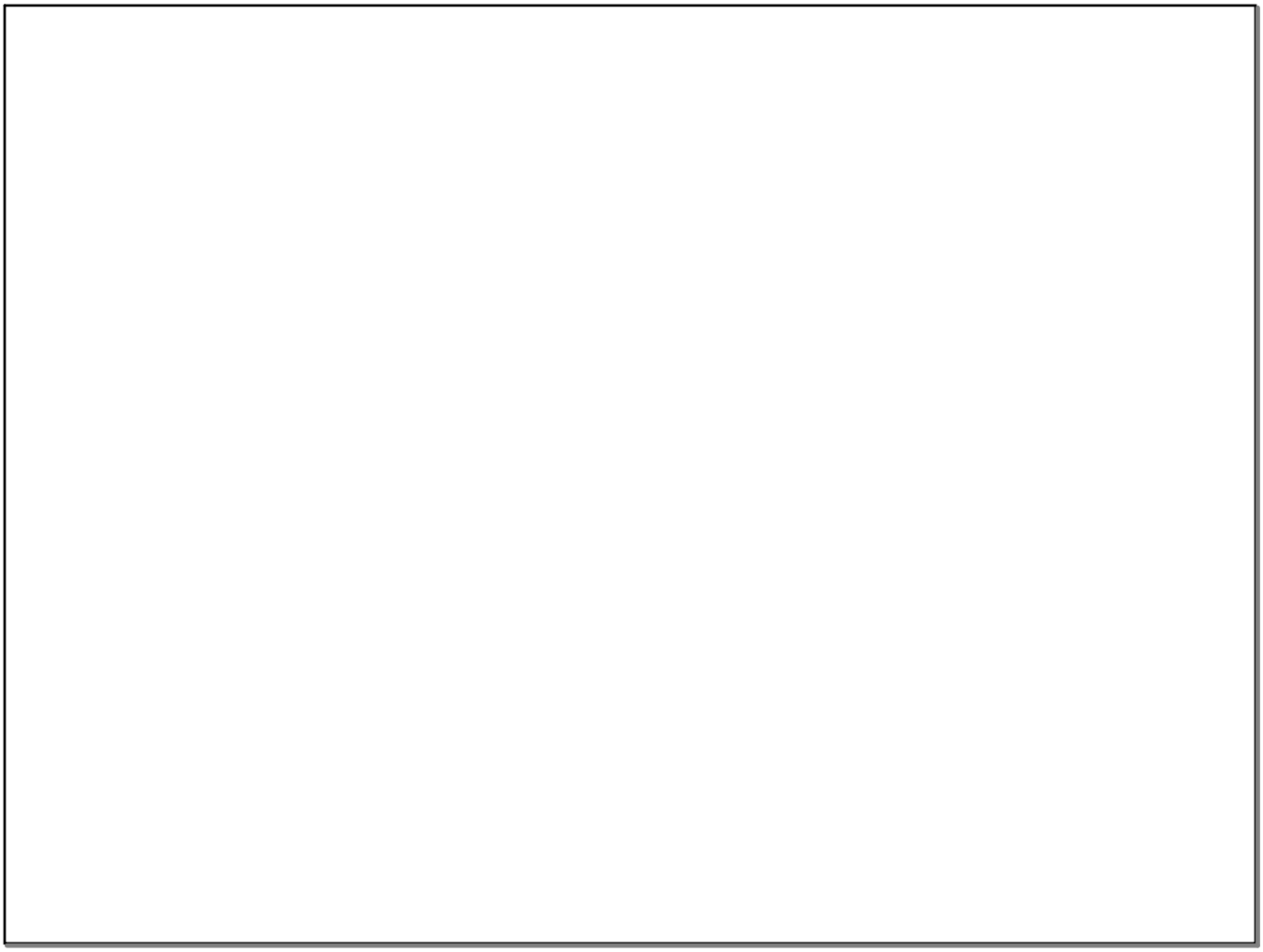
#and dispenser contains cash

When - the customer request the cash

Then- ensure that account is debited

#ensure cash is dispensed

#ensure card is returned



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