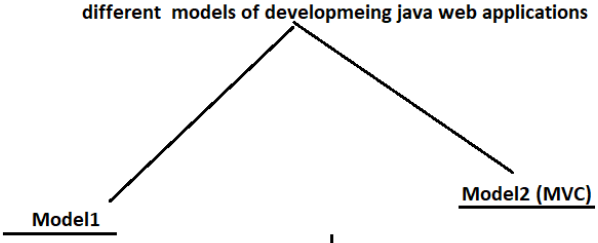
# 1 NTSPBMS615- spring Boot MVC Intro -- Feb 22nd- 2022

Spring MVC /spring boot MVC
==========

different models of developmeing java web applications



Model1

=> Here all logics will be placed either in servlet comp or in jsp comp

=> In this model of application development if servlet comps are used as main comps then the jsp comps will not used and vice-versa.

=> Every main web comp like servlet /jsp comp contains mix of multiple logics .. So we can say there is no clean seperate b/w logics.

=> This model1 architecture is suitable only for small scale web application.

Model2 (MVC)

=> Here the multiple logics of web application will be developed using multiple technologies by placing them in multiple layers.

=> Since multiple layers are there we can say there is clean seperate b/w logics

=>M for Model Layer -->contains b.logic + persistence data [Service class] [DAO class]
(Basically represents data)

=>V for View Layer --> contains presentation logic
(UI logics)

=>C for Controller layer ---> contains Monitoring Logics
(tracing the activies)

note: Prefer this architecture to develop medium scale and large projects..
beans

=>suitable technologies for Model layer :: java classes or spring Beans or spring with ORM code or EJB comps
=> suitable technologies for Controller Layer :: Servlet or Servlet Filter
=> Suitable technologies for View layer :: jsp , html , thymeleaf , angular, react js and etc...

=>Instead of developing controller comp as normal servlet comp or servlet filter comp ..it is recomanded to develop FrontController Servlet (servlet comp based FrontController DP)

=> All MVC projects of current thread are MVC with FrontController.

=>MVC is not design Pattern .. It is an architecture to devleop Layered Applications in Java .. while developing various layers and comps in that archicture we use multiple design patterns as best practies
=> Generally in the impl of MVC architecture based web application we can see the following Desing Patterns implementation
DAO , SErvice /BusinessDelegate , Factory , FrontController , View Helper , CompositeView and etc..
(required in Model layer) (required in controller layer) (Required in view layer)

==========
FrontController
==========

=>The special web comp of web application that acts as entry and exit point for all or multiple http requests is called FrontController web comp.
=> Generally one web application contains only one FrontController Web comp ..
=> we can take either Servlet comp or servlet filter comp or jsp comp as FrontContrlller comp .. but Servlet comp is recomanded.
=> A Front Controller Web comp traps either all requests or multiple requests ---> applies common system services ---> performs navigation managment, Data Management , View Management and lastly sends the response to browser (Client)

System services:: The Minimum services that should be applied after trapping requests are called System services .
eg: security , logging, auditing and etc..

navigation managent:: taking the requests by trapping the requests and delegating/passing appropriate uri/url requests to appropriate Handler comps/classes is called Navigation managmeent . (In simple front controller right request to right handler class)

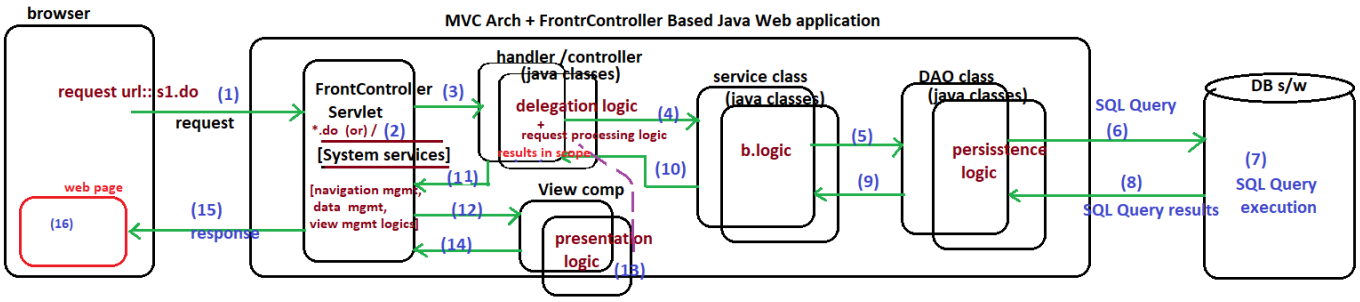
(Model Management)

Data Management :: Passing the data(inputs) that is coming along with request to appropriate handler class and passing data(results) to appropriate view comp from handler class by keeping required scope (generally request scope or session scope) is called Data Management/ Model Management

View Managent :: sending the results/outputs generated by Handler class by selecting appropriate view comp having loose coupling is called View comp

note1:: System services, Data Management, View Management, Navigation management logics will be placed in FrontController i.e entire flow of the Application request to response will be under control and monitoring of FrontController Servlet comp.

note2:: Handler class is java class and also called as controller class either can process the recieved request directly or can take the support of Service, DAO cclasses for the same (taking service,DAO classes is good pratice)




=>Since Front Controller servlet comp should trap and either all or multiple requests , so we need to configure FrontController Servlet comp having extension match url pattern (eg: *.do ) or directory match url pattern(/x/y/*) or with "/" ( for All requests)

(for multiple requets) (for multiple requests)

=> with respect to each MVC archicture web application

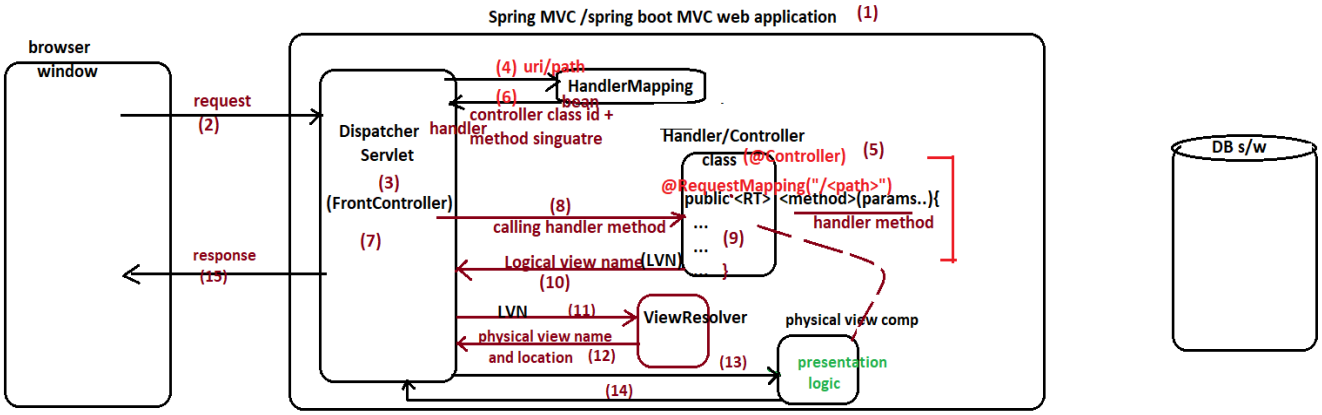
Frontcontroller servlet :: 1
Controller/Handler classes :: 1 per module
Service classes :: 1 per module
DAO classes :: 1 per db table

## Spring MVC /spring Boot MVC flow (Diagramatic Flow)

=>Spring mvc or spring boot mvc are designed around the front controller DispatcherServlet comp

=> The comps of spring mvc/spring boot mvc app are

a) DispatcherSevlet (Front Controller)
b) View comps (can be from any view technology like html ,jsp , thymeleaf, volocity, freemaker and etc..)
c) HandlerMapping comp ( To map incoming request urls with Handler/controller clases)
d) Handler /Controller classes ( To delegat the request to service, DAO classes)
e) ViewResolver (To resolve/identity View comps name and location)
and etc..




(1) Programmer deploy spring mvc /spring boot mvc application in web server or application server ... In the process DispatcherServlet is pre-instantiated (DS class obj is created) --> init() method DS executes performing IOC containe creattion which leads to singletom scope spring beans pre-instantations , completing dependency injections and keeping spring bean class objs in in the internal cache of IOC container

Here singleton scope spring beans are :: HandlerMaping, controller classes, View resolver , serivce classes , DAO clases and etc..

(2) enduser gives request to Spring MVC /spring boot mvc web application
(3) As FrontController , the DispatcherServlet comp traps takes the request and applies common system services.

(4) DS (DispatcherServlet) handovers the request to HandlerMapping component

(5) HandlerMapping comp uses Reflection api support to search and get @Controller class and handler method whose request path of @RequestMapping matches with incoming request uri

(6) Handler mapping component gives @Controller class spring bean id and handler method signature to DS

(7) DS takes @Controller class bean id and gets its spring bean class object from the internal cache of IOC container

(8) DS prepares the required arguments that required to call the handler method of @Controller class and calls the handler method having those arguments.

(9) Handler method of @Controller class either process the request by executing b.logic or delegates the request to service,DAO classes to process the requests. Generates results keeps in request scope

(10) Handler method of @Controller class returns LVN back to DispatcherServlet

11) DS gives the recieved LVN to View Resolver comp

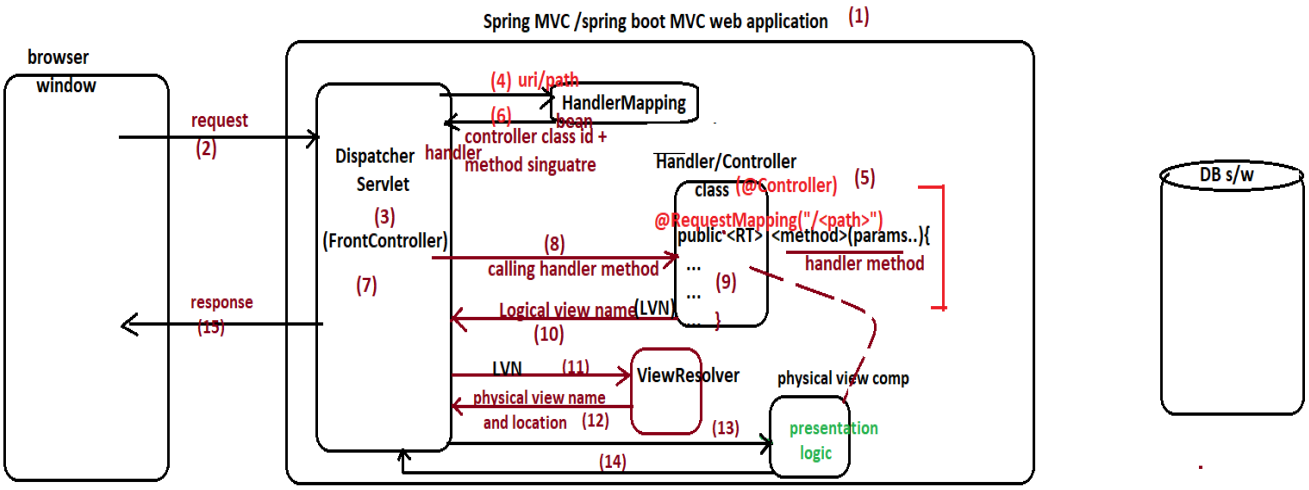
12) View Resolver comp resolves/identifies the name and location of physical view comp based on the recieved logic view name (LVN)

13) DS passes the control flow to the recieved physical view comp

from

14) The physical view comp collectes results request scope , formats the results using presentation logics and sends the formatted results back to DS

15) DS gives the formatted results to browser window as response.




=>3 types of registerting servlet comp with Servlet container

a) Declarative approach (using web.xml)

b) Annotation approach(using @WebServlet)

c) Progamatic approach ( using ServletContext.addServlet(-,-) method)

Spring Boot MVC in the following operations takes place automatically

a) DispatcherServlet registration enabling load-on startup
(this uses programatic registration of Servlet comp techinue)

b) DispatcherServlet created IOC container
(This takes place from the init() of DispatchServlet comp)

c) HandlerMApping component configuration
(RequestMappingHandlerMapping class becomes spring bean through AutoConfiguration)

d) ViewResolver Configuration
(InternalResourceViewResolver class becomes spring bean through AutoConfiguration)

e) DispatcherServlet created IOC container performs pre-instatiation of singleto scope spring beans (service classes, controller classes, view resolver , HandlerMapping, DAO clases/Repository Impl classes and etc..)

and etc..

=>spring-web-<ver>.jar ,spring-webmvc-<ver>.jar files represent spring web mvc framework

=>spring -starter-web represents spring boot statter in spring boot MVC

## Controller class /Handler class

=> It is java class annotated with @Controller
=> we generally take this calss on 1 per module basis
=> This class can contain multiple hander methods annotation with
@RequestMapping having request path ( it is /<path>)

=> The sample methods can have flexible signature i.e method name , retruns type , param types ,params count is completely our choice.

```
//sample controller class
=====================
@Controller
public class MyController{
                                request path must start with "/"
  @RequestMapping("/home")                                  parameters
   public String  showHome(HttpServletRequest req){
      ....                                                  method name
      ... // logic for request processing or
      ....    logic for request delegation
return type   }
  }
```

## Allowed return types are

=>nearly 20+ return types are allowed for handler method .. but most of them are given by keeping spring rest(required for Restfull webservices) in mind.. In spring MVC we use very little number of return types.

| Controller method return value | Description |
|---|---|
| `@ResponseBody` | The return value is converted through `HttpMessageConverter` implementations and written to the response. See `@ResponseBody`. |
| `HttpEntity<B>`, `ResponseEntity<B>` | The return value that specifies the full response (including HTTP headers and body) is to be converted through `HttpMessageConverter` implementations and written to the response. See ResponseEntity. |
| `HttpHeaders` | For returning a response with headers and no body. |
| `String` [ The best in spring mvc ] | A view name to be resolved with `ViewResolver` implementations and used together with the implicit model — determined through command objects and `@ModelAttribute` methods. The handler method can also programmatically enrich the model by declaring a `Model` argument (see Explicit Registrations). |
| `View` | A `View` instance to use for rendering together with the implicit model — determined through command objects and `@ModelAttribute` methods. The handler method can also programmatically enrich the model by declaring a `Model` argument (see Explicit Registrations). |
| `java.util.Map`, `org.springframework.ui.Model` | Attributes to be added to the implicit model, with the view name implicitly determined through a `RequestToViewNameTranslator`. |
| `@ModelAttribute` | An attribute to be added to the model, with the view name implicitly determined through a `RequestToViewNameTranslator`.<br><br>Note that `@ModelAttribute` is optional. See "Any other return value" at the end of this table. |
| `ModelAndView` object | The view and model attributes to use and, optionally, a response status. |
| `void` | A method with a `void` return type (or `null` return value) is considered to have fully handled the response if it also has a `ServletResponse`, an `OutputStream` argument, or an `@ResponseStatus` annotation. The same is also true if the controller has made a positive `ETag` or `lastModified` timestamp check (see Controllers for details).<br><br>If none of the above is true, a `void` return type can also indicate "no response body" for REST controllers or a default view name selection for HTML controllers. |

| | |
|---|---|
| `DeferredResult<V>` | Produce any of the preceding return values asynchronously from any thread — for example, as a result of some event or callback. See Asynchronous Requests and `DeferredResult`. |
| `Callable<V>` | Produce any of the above return values asynchronously in a Spring MVC-managed thread. See Asynchronous Requests and `Callable`. |
| `ListenableFuture<V>`, `java.util.concurrent.CompletionStage<V>`, `java.util.concurrent.CompletableFuture<V>` | Alternative to `DeferredResult`, as a convenience (for example, when an underlying service returns one of those). |
| `ResponseBodyEmitter`, `SseEmitter` | Emit a stream of objects asynchronously to be written to the response with `HttpMessageConverter` implementations. Also supported as the body of a `ResponseEntity`. See Asynchronous Requests and HTTP Streaming. |
| `StreamingResponseBody` | Write to the response `OutputStream` asynchronously. Also supported as the body of a `ResponseEntity`. See Asynchronous Requests and HTTP Streaming. |
| Reactive types — Reactor, RxJava, or others through `ReactiveAdapterRegistry` | Alternative to `DeferredResult` with multi-value streams (for example, `Flux`, `Observable`) collected to a `List`.<br><br>For streaming scenarios (for example, `text/event-stream`, `application/json+stream`), `SseEmitter` and `ResponseBodyEmitter` are used instead, where `ServletOutputStream` blocking I/O is performed on a Spring MVC-managed thread and back pressure is applied against the completion of each write.<br><br>See Asynchronous Requests and Reactive Types. |
| Any other return value | Any return value that does not match any of the earlier values in this table and that is a `String` or `void` is treated as a view name (default view name selection through `RequestToViewNameTranslator` applies), provided it is not a simple type, as determined by BeanUtils#isSimpleProperty. Values that are simple types remain unresolved. |

**The possible parameter types are**

==========

| Controller method argument | Description |
|---|---|
| `WebRequest`, `NativeWebRequest` | Generic access to request parameters and request and session attributes, without direct use of the Servlet API. |
| `javax.servlet.ServletRequest`, `javax.servlet.ServletResponse` | Choose any specific request or response type — for example, `ServletRequest`, `HttpServletRequest`, or Spring's `MultipartRequest`, `MultipartHttpServletRequest`. |
| `javax.servlet.http.HttpSession` | Enforces the presence of a session. As a consequence, such an argument is never `null`. Note that session access is not thread-safe. Consider setting the `RequestMappingHandlerAdapter` instance's `synchronizeOnSession` flag to `true` if multiple requests are allowed to concurrently access a session. |
| `javax.servlet.http.PushBuilder` | Servlet 4.0 push builder API for programmatic HTTP/2 resource pushes. Note that, per the Servlet specification, the injected `PushBuilder` instance can be null if the client does not support that HTTP/2 feature. |
| `java.security.Principal` | Currently authenticated user — possibly a specific `Principal` implementation class if known.<br><br>Note that this argument is not resolved eagerly, if it is annotated in order to allow a custom resolver to resolve it before falling back on default resolution via `HttpServletRequest#getUserPrincipal`. For example, the Spring Security `Authentication` implements `Principal` and would be injected as such via `HttpServletRequest#getUserPrincipal`, unless it is also annotated with `@AuthenticationPrincipal` in which case it is resolved by a custom Spring Security resolver through `Authentication#getPrincipal`. |
| `HttpMethod` | The HTTP method of the request. |
| `java.util.Locale` | The current request locale, determined by the most specific `LocaleResolver` available (in effect, the configured `LocaleResolver` or `LocaleContextResolver`). |
| `java.util.TimeZone` + `java.time.ZoneId` | The time zone associated with the current request, as determined by a `LocaleContextResolver`. |

| | |
|---|---|
| `java.io.InputStream` , `java.io.Reader` | For access to the raw request body as exposed by the Servlet API. |
| `java.io.OutputStream` , `java.io.Writer` | For access to the raw response body as exposed by the Servlet API. |
| `@PathVariable` | For access to URI template variables. See URI patterns. |
| `@MatrixVariable` | For access to name-value pairs in URI path segments. See Matrix Variables. |
| `@RequestParam` | For access to the Servlet request parameters, including multipart files. Parameter values are converted to the declared method argument type. See `@RequestParam` as well as Multipart.<br><br>Note that use of `@RequestParam` is optional for simple parameter values. See "Any other argument", at the end of this table. |
| `@RequestHeader` | For access to request headers. Header values are converted to the declared method argument type. See `@RequestHeader` . |
| `@CookieValue` | For access to cookies. Cookies values are converted to the declared method argument type. See `@CookieValue` . |
| `@RequestBody` | For access to the HTTP request body. Body content is converted to the declared method argument type by using `HttpMessageConverter` implementations. See `@RequestBody` . |
| `HttpEntity<B>` | For access to request headers and body. The body is converted with an `HttpMessageConverter` . See HttpEntity. |
| `@RequestPart` | For access to a part in a `multipart/form-data` request, converting the part's body with an `HttpMessageConverter` . See Multipart. |
| `java.util.Map` , `org.springframework.ui.Model` , `org.springframework.ui.ModelMap` (Best) | For access to the model that is used in HTML controllers and exposed to templates as part of view rendering. |
| `RedirectAttributes` | Specify attributes to use in case of a redirect (that is, to be appended to the query string) and flash attributes to be stored temporarily until the request after redirect. See Redirect Attributes and Flash Attributes. |
| `@ModelAttribute` | For access to an existing attribute in the model (instantiated if not present) with data binding and validation applied. See `@ModelAttribute` as well as Model and `DataBinder` .<br><br>Note that use of `@ModelAttribute` is optional (for example, to set its attributes). |
| `Errors` , `BindingResult` | For access to errors from validation and data binding for a command object (that is, a `@ModelAttribute` argument) or errors from the validation of a `@RequestBody` or `@RequestPart` arguments. You must declare an `Errors` , or `BindingResult` argument immediately after the validated method argument. |
| `SessionStatus` + class-level `@SessionAttributes` | For marking form processing complete, which triggers cleanup of session attributes declared through a class-level `@SessionAttributes` annotation. See `@SessionAttributes` for more details. |
| `UriComponentsBuilder` | For preparing a URL relative to the current request's host, port, scheme, context path, and the literal part of the servlet mapping. See URI Links. |
| `@SessionAttribute` | For access to any session attribute, in contrast to model attributes stored in the session as a result of a class-level `@SessionAttributes` declaration. See `@SessionAttribute` for more details. |
| `@RequestAttribute` | For access to request attributes. See `@RequestAttribute` for more details. |
| Any other argument | If a method argument is not matched to any of the earlier values in this table and it is a simple type (as determined by BeanUtils#isSimpleProperty, it is resolved as a `@RequestParam` . Otherwise, it is resolved as a `@ModelAttribute` . |

=>Spring Boot MVC web application , if we place controller class under root pkg where @SpringBootApplication class is placed then the @Controller classes will be scanned automatically.

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HandlerMapping component
==========

=>It is the component with whom DispatcherServlet handovers the request .. This component uses the reflection api support interally to search for handler method in all @Controller classes finding the matched handler method and gives that @Controller class bean id and handler method signature back to DispagcherServlet to make Dispatcher calling hanlder method on @Controller class object.

=> All HandlerMapping clases ready made classes implementing org.springframework.web.servlet.HandlerMapping(I) directly or indirectly..

=> spring MVC api gives lots of pre-defined HandlerMapping classes for different situations.. Mostly there will not any need of developing custom Handler Mapping classes.

=>BeanNameUrlHandlerMapping
=>ControllerClassNameHandlerMapping
=>SimpleUrlHandlerMapping
=>useful in xml driven cfgs

=>DefaultAnnotationHandlerMapping
(Defult in annotation driven cfg upto 4.x)
Useful annotaion driven cfgs

=>RequestMappingHandlerMapping
(Default in annotation driven cfgs from spring 5.x)

=>In Spring boot MVC application , the RequestMappingHandlerMapping classes comes automatically through autoconfiguration.. and will be pre-instantiation automatically using becoz the DispatcherServlet created IOC container.

ViewResolver
==========

=>This comp takes LVN (Logical view name) given by Controller throuhg DS maps/links physical view comp name and location returns the View object (View Interface impl class obj) having that physical view comp name and location ..

=> ViewResolver does not execute View comp .. ViewResolver indentifies the name and location of physical view comp gives those details to DispatcherServlet comp.

=> All ViewResolver comps are the classes implementing org.springframework.web.servlet.ViewResolver(I) directly or indirectly..

=> Most of the times we work with ready made ViewResolvers i.e there is no need of developing user-defined ViewResolvers..

=>InternalResourceViewResolver (default in spring MVC application)
=>UrlBasedViewResolver
=>ResouceBundlerViewResolver
=>XmlViewResolver
=>TileViewResolver
=>BeanNameViewReoslver

and etc..

=> InternalResourceViewResolver will become spring bean automatically through auto configuration ..To suply inputs to this ViewResolver take the support application.properties or yml file.

In application.properties
---

spring.mvc.view.prefix=/WEB-INF/pages/ (This location of physical view comp)
spring.mvc.view.suffix=.jsp (This extension or type of view comp)

if the controller supplied LVN view name is "home" then the physical view comp name will be
"/WEB-INF/pages/home.jsp" ( prefix + lvn + suffix)

prefix [Location ]
suffix [extension]
LVN :: Logical View name

=>This physical view name and location goes to DS from ViewResolver in the form of View obj (View (I) impl class obj)
=> DS gathers physical view name and location from the View object uses rd.foward(-) or some other technique internally to execute physical view comp.

if u want to configure other ViewResolver classes as additional classes then we need to use @Bean methods support in @Configuration class or @SpringBootApplication class.

## 2 NTSPBMS615- Running first App as standalone app-- March2nd- 2022

**Running first spring boot MVC App as standalone App using embedded Tomcat server**

==========

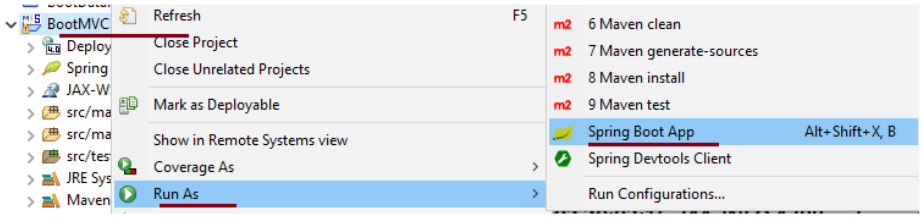
**step1) add Tomcat embedded jasper dependency in pom.xml file**

```
<!-- https://mvnrepository.com/artifact/org.apache.tomcat.embed/tomcat-embed-jasper -->
<dependency>
  <groupId>org.apache.tomcat.embed</groupId>
  <artifactId>tomcat-embed-jasper</artifactId>
</dependency>
```

collect from mvnrepository.com

=>Some how Embeded Tomcat server does not come with built -in jsp container (jasper) .. So we need to add it explicity..

**step2) Run web application as the spring boot application**




**step3) Test the application by giving url**

**http ://localhost:4041/home**

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**=> When we run the spring boot mvc web application as the standalone app there will not be any context path for it by default .. To provide that add following entry in application.properties file**

**In application.properties**

**---**

**server.servlet.context-path=/FirstBootMVCApp**

**request url after this change :: http://localhost:4041/FirstBootMVCApp/home**

---

**=>if we are running spring boot MVC App as the normal deployable web application in Tomcat server then there is no need of placing main(-) in the @SpringBootApplication class i.e DispatcherServlet registration is happening by using the automatically generated ServletInitializer class.**

**war file deployment ----> ServletInitializer is very important**

**=>if we are running spring boot MVC App as the standalone web application .. then there is no need of ServletInitializer class becoz the SpringApplication.run(-) placed in main class will take care of creating IOC container , Embedded Tomcat server ,DispatcherServlet registation and etc..**

**jar file deployment ----> main(-) of main class is very important**

**DispatcherServlet Registration internals**

==========

**=> In spring Boot MVC DispatcherServlet comp is automatically registered with Servlet container having "/" url pattern and the enabled Load on startup .That internally uses Programatic approach nothig but sc.addServlet(-,-) method.**

**A servlet comp can be registered with ServletCotnainer in 3 ways**

**a) using declarative approach (web.xml entries)**

**[For pre-defined servlet comp where xml cfgs are allowed]**

**b) using annotation driven approach (@WebServlet)**

**[For user-defined servlet comp where xml cfgs are not allowed]**

**c) Programatic approach / Dynamic registration of servlet**

**[For pre-defined servlet comp where xml cfgs are not allowed]**

**note:: In spring Boot MVC apps DispatcherServlet is pre-defined servlet comp and xml cfgs are not allowed**

## 3 NTSPBMS615- DispatcherServletRegistration-- March3rd- 2022

To make Spring Boot MVC Application working as standalone we bapplication , deployable web application we need to place the following tags pom.xml as dependency representing tocmat jasper.

```
<dependency>
    <groupId>org.apache.tomcat.embed</groupId>
    <artifactId>tomcat-embed-jasper</artifactId>
    <scope>provided</scope>
</dependency>
```

mandatory

Indicates the underlying Runtime env.. or server or container provides the jar file no need of collecting from repository.

### Scopes in Maven dependency

==========

compile :: Dependency is avaiable only during the compilation of source code

provided :: refer above

runtime :: dependency is avaiable only during the execution of the compiled code

system :: collect the dependency from the specified location of the system

test :: dependency is avaiable during the test cases compilation and execution

if no scope is spcified the dependency is avaiable during compilation , execution of source code and test cases code.

### DispatcherServlet Registration internals

==========

=> In spring Boot MVC DispatcherServlet comp is automatically registered with Servlet container having "/" url pattern and the enabled Load on startup .That internally uses Programatic approach nothig but sc.addServlet(-,-) method.

A servlet comp can be registered with ServletCotnainer in 3 ways

a) using declarative approach (web.xml entries)
[For pre-defined servlet comp where xml cfgs are allowed]

b) using annotation driven approach (@WebServlet)
[For user-defined servlet comp where xml cfgs are not allowed]

c) Programatic approach / Dynamic registration of servlet
[For pre-defined servlet comp where xml cfgs are not allowed]

note:: In spring Boot MVC apps DispatcherServlet is pre-defined servlet comp and xml cfgs are not allowed

## Dynamic registration of DispatcherServlet comp in programatic approach with respect to spring web MVC App running in external server

spring-web-<ver>.jar
|--->META-INF
|-->services
|----->javax.servlet.ServletInitializer (file)
Container
org.springframework.web.SpringServletContainerInitializer

javax.servlet.ServletContainerInitializer(I)
↑ implements
org.springframework.web.SpringServletContainerInitializer (c)

org.springframework.web.WebApplicationInitializer (I)
↑ implements
org.springframework.boot.web.servlet.support.SpringBootServletInitializer (AC)
↑ extends
com.nt.ServletInitializer(c)
[IDE generated class having support
logics for ondeployment configurations]

=>Deployment of spring boot mvc web application in external server like tomcat

=> Servletcontainer verifies the deployment directory structure and notices that there is no web.xml file in the web application

=>Servletcontainer creates SerlvetContext obj

=> Since the ServletContaienr is 3.0+ it looks for javax.servlet.ServletContainerInitializer file in all the jar files that are kept in WEB-INF\lib folder ..but finds in spring-web-<ver>.jar file ---> loads that file file and collects that file content org.springframework.web.SpringServletContainerInitializer class,

=> SErvletContainer loads org.springframework.web.SpringServletContainerInitializer class , creates the obj and calls onStartup(-,-) on that object having Sevletcontext obj and empty set collection obj as the arguments.

=> onStartup(-,-) of org.springframework.web.SpringServletContainerInitializer class searches forWebApplicationInitialzer(I) impl class that is present in our current web application that is com.nt ServletInitializer class , then it loads that class , creates the object for that class and calls onstartup(-) having ServletContext obj .. since not available in ServletInitializer class .. the super class (SpringBootServletIntializer class) onStartup(-) excutes ..

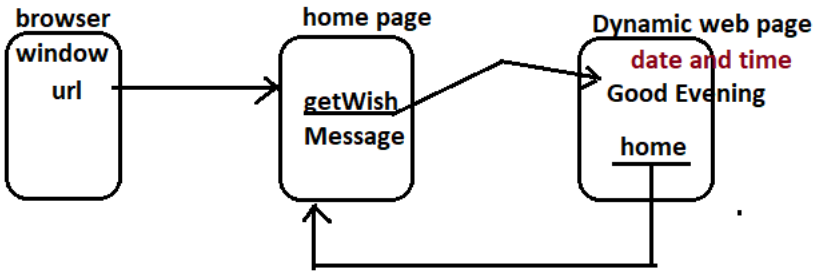
This onStartup(-) method contains the following logics

a) IOC container creation by taking our main class @SpringBootApplication class as configuration class

b) DispatcherServlet object creation and registering that object with ServletContainer using Servletcontext obj by calling sc.addServlet(-,-) havng url pattern "/" and enabling load on startup by calling setLoadonStartup(-) method.

# 4 NTSPBMS615- WishMessage App-- March4th- 2022

## Second Example App on spring boot MVC




Storyboard
==========
#1 index.jsp (default welcome)
<jsp:forward #2
page="home"/>

DispatcherServlet
(FrontControllerServlet)
#3 #16
[/] -->url pattern
#7 #20
#10 #13
#28 #31

#11 #29
InternalResourceViewResolver
|--->prefix: /WEB-INF/pages/
|--->suffix: .jsp
(comes becoz of application.properties)

View object
#12
/WEB-INF/pages/welcome.jsp
/WEB-INF/pages/show_result.jsp
#30

welcome.jsp (WEB-INF/pages/welcome.jsp)
---------- #14
get Wish message #15
( <a href="wish"> get wish message </a>

#32
show_result.jsp (WEB-INF/pages/show_result.jsp)
<h1> result page <h1>
wish message:: ${wMsg} <br>
sys date :: ${sysDate} <br>
home
<a href="home">home </a>

#4 #17
RequestMappingHandlerMapping
#6 #19

//HAndler or Controller class
@Controller
public class WishMessageController{
@Autowired
private IWishService service;
@RequestMapping("/home")
public String displayHomePage(){ #5?
//return lvn #8
return "welcome";
} #9

@RequestMapping("/wish") #21
public ModelAndView fetchWishMessage(){ #18?
//use service
#25 String msg= service.generateWishMessage(); #22
//keep data /results in MAV(ModelAndView)
ModelAndView mav=new ModelAndView();
#26 mav.addAttribute("wMsg",msg);
mav.addAttribute("sysDate",new Date());
mav.setViewName("show_result");
return mav; #27
}
}

=>The model attributes added to the MAV(ModelAndView) object goes to DS and become request scope data

=>The LVN added to the MAV object goes to DS and will be given ViewResolver to get View object having physical view name and location

Service Interface and ServiceImpl class
---

//serivce Interface
public interface IWishServIce{
public String generateWishMessage();
}

//service Impl class
@Service("wishService")
public class WishServiceImpl implements IWishService{
#23
public String generateWishService(){
....
.... //logic to generate wish message
...
return msg; #24
}
}

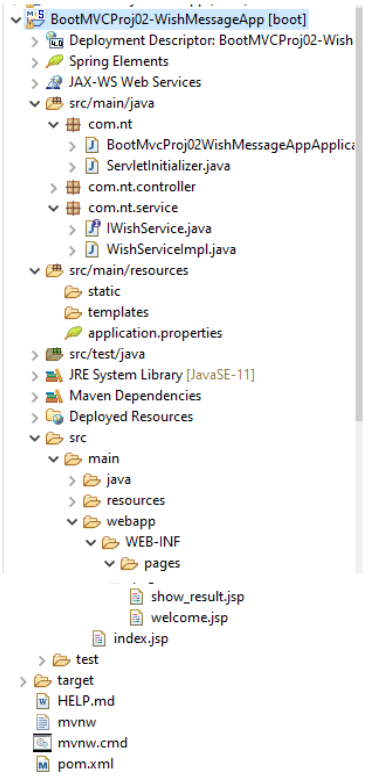
In most of servers ..the default welcome page.. when no welcome page is cfg is index.jsp or index.html .. if both are placed then it will take index.html

application.properties
---

```
#View Resolver inputs cfg
spring.mvc.view.prefix=/WEB-INF/pages/
spring.mvc.view.suffix=.jsp

# server port cfg (only for Embedeed server)
server.port=4041

#Context path for web application(only for Embedded Server)
server.servlet.context-path=/WishMessageApp
```

//Controller class
==========

```
package com.nt.controller;

import java.util.Date;

import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.stereotype.Controller;
import org.springframework.web.bind.annotation.RequestMapping;
import org.springframework.web.servlet.ModelAndView;

import com.nt.service.IWishService;

@Controller
public class WishMessageOperationsController {
	@Autowired
	private IWishService  service;

	@RequestMapping("/home")
	public  String showHomePage() {
		//return LVN
		return "welcome";
	}

	@RequestMapping("/wish")
	public  ModelAndView   fetchWishMessage() {
		//use service
		String  msg=service.generateWishMessage();
		//keep results and other data as Model attributes in MAV object
		ModelAndView mav=new ModelAndView();
		mav.addObject("wMsg", msg);  //attr name ,  value
		mav.addObject("sysDate", new Date());  //atrt name, value
		mav.setViewName("show_result");
		//return MAV
		return mav;
	}


}
```



## 5 NTSPBMS615- Data Rendering and Handler Method signatures-- March7th- 2022

**Data rendering and different signature of handler methods**

==========

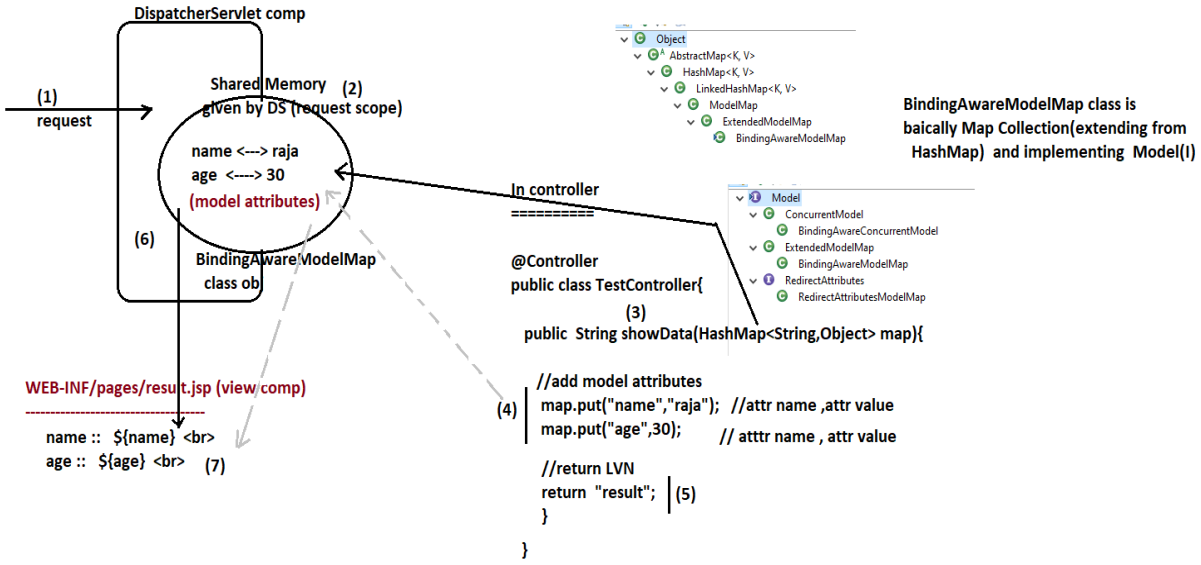
**Data rendering:: The process of passing data controller class to view comp through Dispatcherservlet is called Data Rendering..**

```
@RequestMapping("/wish")
public ModelAndView fetchWishMessage() {
    //use service
    String msg=service.generateWishMessage();
    //keep results and other data as Model attributes in MAV object
    ModelAndView mav=new ModelAndView();
    mav.addObject("wMsg", msg);  //attr name ,  value
    mav.addObject("sysDate", new Date());  //atrt name, value
    mav.setViewName("show_result");
    //return MAV
    return mav;
}
```

**Working with ModelAndView as the return type of handler method is bad pratice and legacy style becoz ModelAndView is spring api specific class name , more over we need to create ModelAndView class obj manually**

**=> Actually to pass data from controller to view comp through DispatcherServlet it is recomanded to use the shared memory given by DisatcherServlet**

**=>For Every request the DispatcherServlet object creates one Shared Memory in Dispatcher Servlet itself to carry data from Controller comp to View comp.**




**examples on Data Rendering**

==========

***example1:: (good to use)***

```
@RequestMapping("/wish")
public String fetchWishMessage(HashMap<String,Object> map) {
    System.out.println("shared Memory obj class name::"+map.getClass());
    //use service
    String msg=service.generateWishMessage();
     // keep data in model attributes
     map.put("wMsg",msg);
     map.put("sysDate",new Date());
    //return MAV
    return "show_result";
}
```

*=>super class reference variable can refer one of its sub class object*

*=> similarly Interface reference variable can refer one its impl class obj*

***example2*** **(Not good becoz Model(I) makes the method invasive method-spring specific)**

```
@RequestMapping("/wish")
public String fetchWishMessage(Model model) {
    System.out.println("shared Memory obj class name::"+model.getClass());
    //use service
    String msg=service.generateWishMessage();
     // keep data in model attributes
     model.addAttribute("wMsg", msg);
     model.addAttribute("sysDate",new Date());
    //return MAV
    return "show_result";
}
```

as

*example3::* (Not good becoz ModelMap(C) makes the method invasive method-spring specific)

```
@RequestMapping("/wish")
public String fetchWishMessage(ModelMap map) {
    System.out.println("shared Memory obj class name::"+map.getClass());
    //use service
    String msg=service.generateWishMessage();
    // keep data in model attributes
    map.addAttribute("wMsg", msg);
    map.addAttribute("sysDate",new Date());
    //return MAV
    return "show_result";
}
```

*example4:* *(best)* ( good becoz Map(I) makes the method as non-invasive method-nonspring specific)

```
@RequestMapping("/wish")
public String fetchWishMessage(Map<String,Object> map) {
    System.out.println("shared Memory obj class name::"+map.getClass());
    //use service
    String msg=service.generateWishMessage();
    // keep data in model attributes
    map.put("wMsg", msg);
    map.put("sysDate",new Date());
    //return MAV
    return "show_result";
}
```

example5:
=========
(Bad)

```
@RequestMapping("/wish")
public ModelMap fetchWishMessage() {
    //use service
    String msg=service.generateWishMessage();
    // keep data in model attributes
    ModelMap map=new BindingAwareModelMap();
    map.put("wMsg", msg);
    map.put("sysDate",new Date());
    //return MAV
    return map;
}
```

=>if no logical view name is taken taken then request path of the handler method by exclusing "/" becomes logical view name .. For example if the request path is "/wish" .. the logical view name will be "wish" .For this It internally uses RequestToViewNameTranslator comp.

Example6::
(Bad)

```
@RequestMapping("/wish")
public Model fetchWishMessage() {
    //use service
    String msg=service.generateWishMessage();
    // keep data in model attributes
    Model model=new BindingAwareModelMap();
    model.addAttribute("wMsg", msg);
    model.addAttribute("sysDate", new Date());
    //return MAV
    return model;
}
```

Example7:: (Bad)

```
@RequestMapping("/wish")
public Map<String,Object> fetchWishMessage() {
    //use service
    String msg=service.generateWishMessage();
    // keep data in model attributes
    Map<String,Object> map=new HashMap();
    map.put("wMsg", msg);
    map.put("sysDate", new Date());
    //return MAV
    return map;
}
```

## Limitations of taking Map<-,-> or ModelMap or Model(I) as return type of handler method

(a) we should create shared memory explicitly which gives burdern to programmer and memory utialization and cpu utilization

(b) The automatically created SharedMemory In DS (created for BindingAwareModelMap obj) will be wasted

(c) No control on Logical view NAme (LVN) we we need to take requeest path as the logical name

## Advantages of taking Map <-,->(I) or ModelMap(c), Model(I) as the paameter types of handler method

(a) we can use the DispatcherServlet created and refered SharedMemory Object to add model attributes

(b) Full control on Logical view name becoz we take java.lang.String as the return type

(c) No need of creating SharedMemories explicitly .. So no burdern on the Programmer

Best signature for handler methods in most of the situations

```
public String   <method name> (Map<String,Object> map , other params ...){
      .... //logic to invoke service class methods
      ...

       ... //logic to results to model attributes
       ...
      return "<lvn>";
 }
```

Q) what happens if we take handler method return as "void"?

Q) what happens if we return null from handler method irrespective of its return type?

## 6 NTSPBMS615- Data Rendering and Handler Method signatures -Reuquest Paths-- March8th- 2022

**Q) what happens if we take handler method return as "void"?**

Ans) It will take request path as the logical view name by excluding the slash.

```
@RequestMapping("/wish")
public void fetchWishMessage(Map<String,Object> map) {
    //use service
    String msg=service.generateWishMessage();
    // keep data in model attributes
    map.put("wMsg", msg);
    map.put("sysDate", new Date());
}
```

It takes the request path "wish" of "/wish" as the logical view name

**Q) what happens if we return null from handler method irrespective of its return type?**

Ans) It also takes requeat path as the logical view name.

```
@RequestMapping("/wish")
public String fetchWishMessage(Map<String,Object> map) {
    //use service
    String msg=service.generateWishMessage();
    // keep data in model attributes
    map.put("wMsg", msg);
    map.put("sysDate", new Date());
    return null;
}
```

**Q) can we send response directly to browser through DispatcherServlet from Controller comp with out involving ViewResolver and view comps ?**

Ans) Make HttpServletResponse as the parameter of the handler method .. get PrintWriter from that Object and write response to browser directly.. From this handler method we can return null (if we take some return type) or nothing ( if we do not take any return type)

```
@RequestMapping("/wish")
public String fetchWishMessage(HttpServletResponse res) throws Exception{
    //use service
    String msg=service.generateWishMessage();
```

```
        //get PrintWriter from response obj
        PrintWriter pw=res.getWriter();
        //write output to response object
        pw.println("<b> wish message is ::"+msg+"</b><br>");
        pw.println("<br> sys date and time ::"+new Date()+"</b>");
            return null;
        }
```

=>Sending output to browser (client) directly from controller class handler method is very useful while performing file downloading activties.
(nothing but sending the file content of server machine file system to client machine file system)

---

## Understanding end to end points of request paths

a) request path of handler method must start with "/"
b) request path is case-sensitive in the handler methods of one or more controller classes

```
@Controller
public class WishMessageController{

@RequestMapping("/report")
    public String showReport() throws Exception{
        return "show_report";
    }

    @RequestMapping("/REPORT")
    public String showReport1() throws Exception{
        return "show_report1";
    }
}
```

http://localhost:2525/WishMessageApp/report ---> executes showReport() method
http://localhost:2525/WishMessageApp/REPORT ---> executes showReport1() method

c) One handler method can be mapped with multiple request paths

```
@RequestMapping({"/report1","/report3","/report2"})
    public String showReport() throws Exception{
        System.out.println("WishMessageOperationsController.showReport()");
        return "show_report";
    }
```

if any data is given with out annotation param name then that data goes to param whose name is "value"

=> if param is array and u r intrested to maintain only one value in that array then u can place that value with out { }.

http://localhost:2525/WishMessageApp/report1 ---> executes showReport() method
http://localhost:2525/WishMessageApp/report2 ---> executes showReport() method
http://localhost:2525/WishMessageApp/report3 ---> executes showReport() method

d) if the request path is "/" for the handler method then it becomes default handler method in controller class i.e when no matching requestpath found then this method executes automatically

This kind of methods veryful take the request and to display home page through handler method

```
@RequestMapping("/")
public String showHomePage() {
    //return LVN
    return "welcome";
}
```

=>if we take handler method with "/" request path to lanuch the home page ..then there is not need of taking index.jsp seperate to send the implicit request , More over this technique works in both extenral tomcat server deployment and embedded tomcat server deployment of spring boot app.

http://localhost:4041/WishMessageApp (with respect to embedded tomcat) → executes showHomePage() method

http://localhost:2020/BootMVCProj02-WishMessageApp (with respect to external tomcat server) → executes showHomePage() method

e) if no request path is given for handler method .. the default request path will be "/"

```
@RequestMapping
    public  String showHomePage() {
        //return LVN
        return "welcome";
    }
```

http://localhost:4041/WishMessageApp (with respect to embedded tomcat) → executes showHomePage() method

http://localhost:2020/BootMVCProj02-WishMessageApp (with respect to external tomcat server) → executes showHomePage() method

if handler method that shows home page is having request path "/" then we need to give request to that hanlder method having "./" as the url .

*result page*

```
<a href="./">Go to home</a>
```

f) Taking request path as "/" is equal to not taking any request path

```
@RequestMapping("/")
    public  String showHomePage() {
          //return LVN
          return "welcome";
    }
```

is same as

```
@RequestMapping
public String  showHomePage(){
    //return LVN
     return "welcome";
 }
```

f) Two handler methods of controller class can have same request path having two different request modes like GET ,POST

```
@Controller
public class WishMessageController{

  //@RequestMapping(value="/report",method=RequestMethod.GET) (or)
    @GetMapping("/report")
    public String  showReport() throws Exception{
        System.out.println("WishMessageOperationsController.showReport()");
        return "show_report";
    }


    //@RequestMapping(value="/report", method=RequestMethod.POST)
    @PostMapping("/report")
    public String  showReport1() throws Exception{
        System.out.println("WishMessageOperationsController.showReport1()");
        return "show_report1";
    }

}
```

GET mode request

POST mode request

To send requests to the above handler methods

```
welcome.jsp
-----------
<a href="report"> get Report</a>
<br>
<form action="report"  method="POST">
  <input type="submit"  value="Get Report" />
</form>
```

note1:: Spring boot MVC/spring MVC application are web application and they can take requests only from browwer and browser can given only GET,POST mode requests

note2:: the request given from browser window by typing the url is GET mode request
the hyperlink generated request from browser window is GET mode request
the form page can generate either GET mode or POST mode request .. default is GET mode

note3: spring 4.x onwords @XxxMapping annotations are introduced as alternate for specifying request modes @RequestMapping annotation and these are recomaned to use

The @XxxMapping annotations are

| | |
|---|---|
| @GetMapping | spring MVC/spring BootMVC |
| @PostMapping | can use obly these two @XxxMapping annotations |
| @PutMapping | |
| @DeleteMapping | |
| @PatchMapping | |
| and etc.. | |

Spring Rest (extension of Spring MVC) can use all the five @XxxMapping annotations

Spring MVC/spring Boot MVC/sprWeb for developing web applications

Spring Rest (extension of spring MVC) is for develop Restful webServices (Distributed Applicaitons)

## g) What happens if two handler methods of a controller class having same request path and same request mode?

raises exception representing the Problem ::

java.lang.IllegalStateException: Ambiguous mapping. Cannot map 'wishMessageOperationsController' method
com.nt.controller.WishMessageOperationsController#showReport1()
to {GET [/report]}: There is already 'wishMessageOperationsController' bean method
com.nt.controller.WishMessageOperationsController#showReport() mapped.

*Throws the exception*

```
@Controller
public class WishMEssageController{

    @GetMapping("/report")
    public String   showReport() throws Exception{
            System.out.println("WishMessageOperationsController.showReport()");
            return "show_report";
    }

    @GetMapping("/report")
    public String   showReport1() throws Exception{
            System.out.println("WishMessageOperationsController.showReport1()");
            return "show_report1";
    }
}
```

h) In spring MVC/spring boot MVC maximum two methods can have same request path
one method with "GET" mode and another method with "POST"

refer the above example

i) In spring MVC /Spring boot MVC maxiumum two methods of a controller class can be there with out request path

```
@Controller
public class WishMessageOperationsController {

 @GetMapping    //Mapped with default request path "/" with GET mode
public  String showHomePage1() {
        //return LVN
        return "welcome";
}

@PostMapping    //Mapped with default request path "/" with POST mode
public  String showHomePage2() {
        //return LVN
        return "welcome";
}
}
```

To generate requests to the above handler methods of a controller class

```
<br><br>
 <a href="./"> Get -Home page</a>
 <br>
 <form action="./"  method="POST">
   <input type="submit"  value="POst -Home page"/>
 </form>
```

*j)* ***What happens of two handler methods of two different controller classes are having same request path?***

Problem::

```
@Controller
public class WishMessageOperationsController {

    @GetMapping("/all")
    public  String  showAllData() {
      return "show_report";
    }

}
```

```
@Controller
public class TestController {

    @GetMapping("/all")
    public String  getAllTestsData() {
          return "show_report1";
    }

}
```

Caused by: java.lang.IllegalStateException: Ambiguous mapping. Cannot map 'wishMessageOperationsController' method com.nt.controller.WishMessageOperationsController#showAllData() to {GET [/all]}: There is already 'testController' bean method com.nt.controller.TestController#getAllTestsData() mapped.

**Solution:: along with method level request paths provide the class level global path using @RequestMapping annotation as shown below**

global path or global request path

```
@RequestMapping("/wish-operations")
@Controller
public class WishMessageOperationsController {

    @GetMapping("/all")
    public  String  showAllData() {
      return "show_report";
    }

}
```

method path (or) method request path

global path or global request path

```
@RequestMapping("/test-operations")
@Controller
public class TestController {

    @GetMapping("/all")
    public String  getAllTestsData() {
          return "show_report1";
    }
}
```

method path or method request path

**http://localhost:2020/BootMVCProj02-WishMessageApp/wish-operations/all --> sends request to showAllData() method of WishMessageOperationsController class**

**http://localhost:2020/BootMVCProj02-WishMessageApp/test-operations/all --> sends request to showAllTestsData() method of TestController class**

**k) The request given to one handler method of one controller can be forwarded to another method of same handler class or different handler class by using "forward: xxxx" concept which internally uses rd.foward(-,-) for forwarding the request.** ***(This concept is called Handler methods chanining)***

***scenario1:***

```
@Controller
public class WishMessageOperationsController {

    @GetMapping("/all")
    public  String  showAllData() {
          System.out.println("WishMessageOperationsController.showAllData()");
      return "show_report";
    }

    @GetMapping
    public  String showHomePage1() {
          System.out.println("WishMessageOperationsController.showHomePage1()");
          //return LVN
          //return "forward:wish-operations/all";
          return "forward:all";
    }
```

*http://localhost:2020/BootMVCProj02-WishMessageApp/*

*request goes to showHomePage1() method ---> from ther*
*it goes showAllData() becoz "forward:all"*

*scenario2:*

```
@Controller
public class WishMessageOperationsController {

    @GetMapping
    public  String showHomePage1() {
        System.out.println("WishMessageOperationsController.showHomePage1()");
        //return LVN
        return  "forward:test-operations/all";
    }
}
```

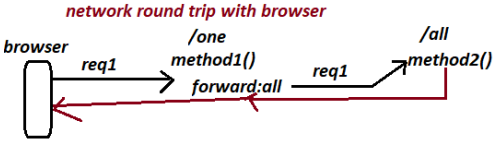
```
@Controller
@RequestMapping("/test-operations")
public class TestController {

    @GetMapping("/all")
    public String  getAllTestsData() {
        System.out.println("TestController.getAllTestsData()");
        return "show_report1";
    }

}
```

*http://localhost:2020/BootMVCProj02-WishMessageApp/*

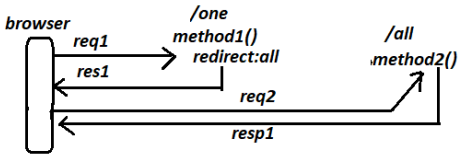
*request goes to showHomePage1() method ---> from ther*
*it goes to* getAllTestsData() method of TestController class
becoz of "forward:test-operations/all" statement

*I) We can perform handler methods chaining using "redirect:xxx" statement which internally uses send Redirection with the support of response.sendRedirect(-) method*

*=>forwarding request mode communication takes place directly from method1 to method2*
*=> send redirection mode communication takes place from method to method2 after having network round trip with browser*




*Here method2 can be there either same controller or different controller of same MVC application*




*Here method2 can be there either same controller or different controller of same MVC web application or different MVC web application of same server or different server belonging same machine or different machine*

# 8 NTSPBMS615- -Reuquest Paths and Data Rendering- March 10th- 2022

=>we can do Handler method chaining either through forwarding request operation and send redirection opeartion

=>For forwaring request based handler method chaining use "forward: <path>"
=>For redirection based based handler method chaining use "redirct: <path>"

```
@Controller
public class WishMessageOperationsController {

	@GetMapping("/all")
	public   String  showAllData() {
		System.out.println("WishMessageOperationsController.showAllData()");
	 return "show_report";
	}

	@GetMapping
	public  String showHomePage1() {
		System.out.println("WishMessageOperationsController.showHomePage1()");
		//return LVN
		return  "redirect:all";
	}
}
```

*redirects request to showAllData() handler method whose request path "/all" by having network roundtrip with browser window.*

*=> http://localhost:2020/BootMVCProj02-WishMessageApp/ url based request first goes showHomePage1() method .. from there it goes to showAllData() method.*

*=>we can inject the following objects created by the Servletcontainer to the @Controller class through @Autowiring process.*

*a) ServletContext obj (1 per web application)*
*b) ServletConfig object (1 per each Servlet comp/jsp comp)*
*c) HttpSession object (1 per browser s/w of each client machine)*

*In controller class*
*==========*

```
@Controller
public class WishMessageOperationsController {

    @Autowired
    private ServletContext sc;
    @Autowired
    private ServletConfig cg;
    @Autowired
    private HttpSession ses;

    @GetMapping("/all")
    public String showAllData() {
        System.out.println("WishMessageOperationsController.showAllData()");
        System.out.println(" web application's name::"+sc.getContextPath());
        System.out.println("session id::"+ses.getId());
        System.out.println("DS logical name::"+cg.getServletName());

        return "show_report";
    }
```

*Spring's IOC container is getting the ServletContainer created Servletcontext, ServletConfig ,HttpSession object to the controller class*

---

```
@GetMapping
public String showHomePage1(ServletContext sc, ServletConfig cg, HttpSession ses) {
        System.out.println("WishMessageOperationsController.showHomePage1()");

        System.out.println(" web application's name::"+sc.getContextPath());
        System.out.println("session id::"+ses.getId());
        System.out.println("DS logical name::"+cg.getServletName());

        return "result";
}
```

invalid handler method designing..

=>This handler method throws exception becoz of two reasons
(a) ServletContext , ServletConfig are not the valid parameter types in the handler methods i.e they are not in the list of possible parameter types.

(b) ServletContext obj is one per web application and ServletConfig object is one per ServletComp .. So it is not allowed to make them specific to one request of one handler method

=>we can take handler method having HttpSession as the method parameter type becoz HttpSession object will be created using req object .. and handler method execution takes place on 1 per request basis.

```
@GetMapping
public String showHomePage1(HttpSession ses) {
        System.out.println("WishMessageOperationsController.showHomePage1()");

        System.out.println("session id::"+ses.getId());      // valid method..
        //return LVN
        return "redirect:all";
}
```

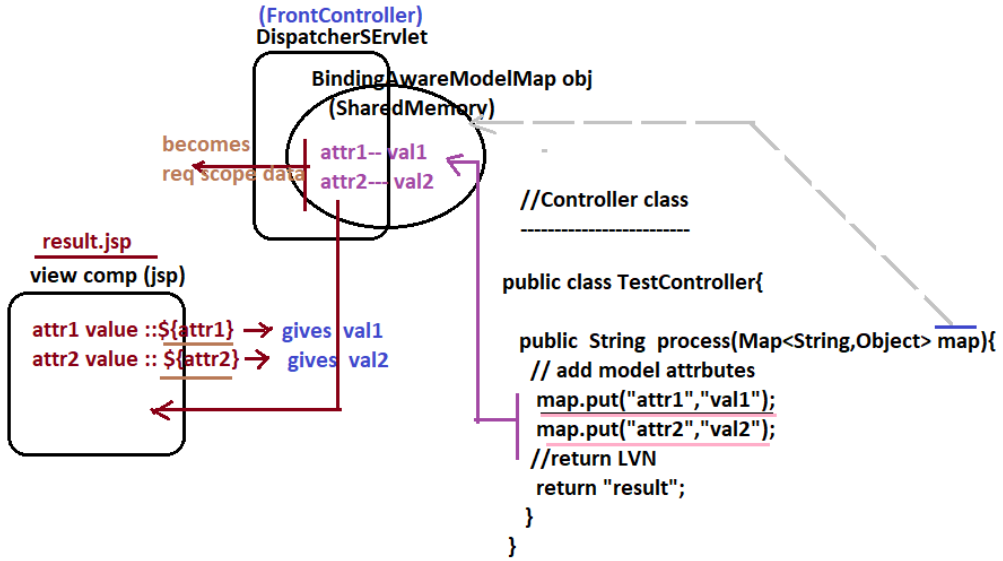
## What is the difference b/w Frontcontroller and Controller/Handler

| FrontController | controller /Handler |
|---|---|
| a) It is Servlet comp or Servlet Filter comp | a) It is java class |
| b) It is one per project or web application | b) It is generally taken on 1 per module basis |
| c) contains ServletLife cycle methods like init() ,service(-,-),destroy() directly or indirectly | c) contains user-defined methods as handler methods |
| d) It acts as entry and exit point for all requests | d) It contains request delegation logic for different url requests based to send the delegate reuqets to service ,DAO classes. |
| e) Will be instantiated and managed by ServletCotnainer | e) Will be instantiated and managed by IOC container |
| f) Identified with url pattern like "/" which traps and takes all requests | f) Indenfied with global path given in @RequestMapping and the handler methods are idenfied with request path again given using @RequestMapping |
| g) Entire spring mvc designed aroung DispatcherServlet i.e it controls the entire navigation and also takes care of navigation mgmt, view mgmt, model mgmt | g) HandlerMapping , viewResolver , controller classes are hepler classes for FrontrController comp. |

## Data Rendering

It is the process passing data from Controller class to view comp as request scope data through DispatcherServlet comp by keeping the data in shared memory created in DispatcherServlet comp

=>This Shared Memory in DispatcherSErvlet will be created as Map object for the class BindingAwareModelMap class object .. The controller keeps data in this shared memory as Model attributes and the view comp reads data from the same shared memory in the form model attributes.




## Different scenarios of Data Rendering

a)Passing simple values from controller class to View comps
b)Passing arrays,collection values from controller class to View comps
c)Passing Model class obj from controller class to view comps
d)Passing Collection of Model class objs from controller class to view comps

## a)Passing simple values from controller class to View comps

In controller class

```
@Controller
public class DataRenderingController {

	@GetMapping("/report")
	public  String   showReportData(Map<String,Object> map) {
		//add simple values as the model attributes
		map.put("name", "raja");
		map.put("age",30);
		map.put("addrs", "hyd");
		//return LVN
		return "show_report";
	}

}
```

In vie comp (show_report.jsp)

```
<%@page  isELIgnored="false" %>

 <b>model is  is </b><br>

   <b> name:: ${name}</b> <br>
   <b> age:: ${age}</b> <br>
   <b> addrs:: ${addrs}</b> <br>
<br><br>
```

## b)Passing arrays,collection values from controller class to View comps

code in controller class

```
@Controller
public class DataRenderingController {
	@GetMapping("/report")
	public  String   showReportData(Map<String,Object> map) {
		//add simple values as the model attributes  (Generally these values  are not hardcode
		 //static values - these values will  come from DB s/w through DAO,Service class)
		map.put("favColors",new String[] {"red","green","yellow","white"});
		map.put("nickNames",List.of("raja","maharaja","king","prince"));
		map.put("phoneNumbers", Set.of(999999L,888888L,7777L,666666L));
		map.put("idDetails",Map.of("aadhar",4545353L,"voterId",45345353L,"panNo","453H545"));
		//return LVN
		return "show_report";
	}
}
```

java9 features

show_report.jsp (view comp)

```
<%@page isELIgnored="false" %>
<%@taglib uri="http://java.sun.com/jsp/jstl/core" prefix="c"%>

<b>Model data(Array,collections) is :: </b><br>
 favourite colors(arary)::
 <c:if test="${!empty favColors}">
   <c:forEach var="color" items="${favColors}">
       ${color},
   </c:forEach>
 </c:if>
 <br>
 Nicknames(List Collection)::
 <c:if test="${!empty nickNames}">
   <c:forEach var="name" items="${nickNames}">
       ${name},
   </c:forEach>
 </c:if>
 <br>
 PhoneNumber(Set Collection)::
 <c:if test="${!empty phoneNumbers}">
   <c:forEach var="phone" items="${phoneNumbers}">
       ${phone},
   </c:forEach>
 </c:if>

   <br>
 IdDetails(Map Collection -->gives only values by taking keys)::
 <c:if test="${!empty idDetails}">
       ${idDetails.aadhar},
       ${idDetails.panNo},
       ${idDetails.voterId}<br>
 </c:if>
 <br>
 IdDetails(Map Collection (gives both keys and values))::
 <c:if test="${!empty idDetails}">
   <c:forEach var="id" items="${idDetails}">
     ${id.key}<----> ${id.value} <br>
   </c:forEach>
 </c:if>
```

*importing JSTL core tag library*

*For this we need to add JSTL taglibrary in pom.xml file*

```
<!-- https://mvnrepository.com/artifact/javax.servlet/jstl -->
<dependency>
   <groupId>javax.servlet</groupId>
   <artifactId>jstl</artifactId>
   <version>1.2</version>
</dependency>
```

## c)Passing Model class obj from controller class to view comps

```
@Controller
public class DataRenderingController {
      @GetMapping("/report")
      public  String  showReportData(Map<String,Object> map) {
            // create Model class obn having data (Generally this object comes from DAO, service classes
             //having db table record
            Product prod=new Product(1001, "sofa",56789.0 , 1.0);
            //make  model class obj as the model attribute
            map.put("prodData",prod);
            //return LVN
            return "show_report";
      }
}
```

**View comp (show_report.jsp)**

```
<b>Model  data  is <b> <br>
  <c:if test="${!empty prodData}">
     product id ::  ${prodData.pid} <br>
     product name ::  ${prodData.pname} <br>
     product price ::  ${prodData.price} <br>
     product qty ::  ${prodData.qty} <br>
  </c:if>
```

***Model class***

```
package com.nt.model;
import lombok.AllArgsConstructor;
import lombok.Data;
import lombok.NoArgsConstructor;

@Data
@NoArgsConstructor
@AllArgsConstructor
public class Product {
      private Integer pid;
      private String pname;
      private  Double price;
      private Double qty;
}
```

## d)Passing Collection of Model class objs from controller class to view comps

**In controller class**

```
@GetMapping("/report")
      public  String  showReportData(Map<String,Object> map) {
            //create List of Model class objs as  the model attribute
            List<Product>  list=List.of(new Product(1001, "sofa", 897688.0, 1.0),
                                        new Product(1002, "chair",554555.0, 2.0));
            map.put("prodList",list);
            //rerturn lvn
            return "show_report";
      }
```

**show_report.jsp**

---

```
<%@page  isELIgnored="false" %>
<%@taglib  uri="http://java.sun.com/jsp/jstl/core" prefix="c"%>


 <c:choose>
    <c:when test="${!empty prodList}">
      <table align="center" bgcolor="cyan" border="1">
        <tr>
          <th>PID </th> <th>PNAME </th> <th>PRICE </th> <th>QTY</th>
        </tr>
        <c:forEach var="prod"  items="${prodList}">
          <tr>
            <td>${prod.pid} </td>
            <td>${prod.pname} </td>
            <td>${prod.price} </td>
            <td>${prod.qty} </td>
          </tr>
        </c:forEach>
      </table>
    </c:when>
    <c:otherwise>
          <h1 style="color:red;text-align:center"> No Records found </h1>
    </c:otherwise>
  </c:choose>
```

Data Rendering :: Passing data from controller comp to view comp through DispatcherServlet using the SharedMemory Support

Data Binding :: Passing data from View comp to Controller comp through DispatcherServlet

Two ways of Data Binding

(a) Passing Form data Controller class handler method as Model class obj using @ModelAttribute(-) annotation. (Form binding /Form Data binding)

(b) Passing hyperlink supplied addtional request params to handler method params through DispatcherServlet using @RequestParam annotation (param binding /param data binding)

## (a) Passing Form data Controller class handler method as Model class obj using @ModelAttribute(-) annotation. (Form binding /Form Data binding)

To bind form data (form page form comp values) to Model class /Command class obj we need to do following operations

(a) count form page form comps and take same number of properties of required type in Model class

(b) Match Form page comp names with Model class property names

(c) add getter setter methods those properties in in Model class

(d) In Controller class Handler method take Model class type parameter having @ModelAttribute(-) annotation

Form page using html tags

student_register.jsp

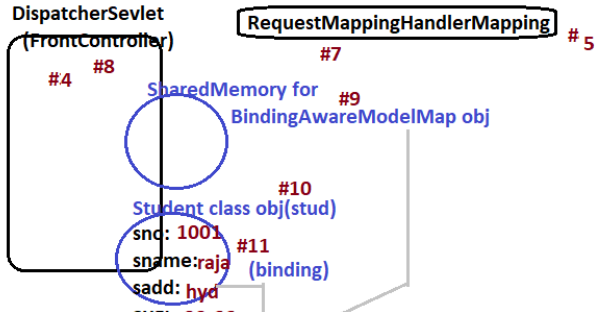
#3

```
<form action="register" method="POST">
  student id :: <input type="text" name="sno"/> <br>
  student name :: <input type="text" name="sname"/> <br>
  student address:: <input type="text" name="sadd"/> <br>
  student avg:: <input type="text" name="avg"/> <br>
  <input type="submit" value="register">
</form>
```

#1 fill form page

#2

1001 raja hyd 90.66




```
//Model class
@Data
public class Student{
  private Integer sno;
  private String sname;
  private Float avg;
  private Stirng sadd;

}
```

```
@Controller
public class StudentRegistrationController{

  @PostMapping("/register")
  public String registerStudent(Map<String,Object> map,
                                #12
                                @ModelAttribute("stud") Student st){
    ...
    ... //pass model class obj to service ,DAO classes
    ...   for registration and get results

    // keep results a model attributes #13
      ...
      ...
    //return LVN
     return "result";
    }
```

#6? (verifies for /register request path handler method)

Internal activities end to end

#1 & #2 ) Enduser fills up the form page and submits the form page

#3 &4) based on the action path kept in "action" attribute of <form> tag the DS traps and takes the request

#5) DS hand overs the request to Handler Mapping comp

#6 &#7) Handler mapping comp searches form Handler method whose t in controller classes whose request path is "/regiser" and gets registerStudent(-,-) method signature and relevant controller bean id

#8) HandlerMapping passes controller class bean id and handler method signature back to DS

#9) Based on Map<String ,Object> of HandlerMethod signature the SharedMemory will be reffered

#10) Based on @ModelAttribute("stud") Student st of handler method signature it creates Student class obj as the model class obj (Best pratice)

Student stud =new Student();

note:: if @ModelAttribute is taking without attribute name like "stud" then the Model class obj will be created having the class name as the attribute name (student)

Student student=new Student(); (model class name as object name)

#11) DS reads form data as request param values and binds them to the matched Model class obj properties as shown below (it is called form data binding (or) request wrapping)

```
stud.setSno(Integer.parseInt(req.getParameter("sno")));
stud.setSname(req.getParameter("sname"));
stud.setSadd(req.getParameter("sadd");
stud.setAvg(Float.parseFloat(req.getParameter("avg")));
```

Data binding from data to Model class obj

#12) DS calls handler method having Map object pointing SharedMemory and Model class obj representing from data as the argument values

#13) Handler method uses the service,DAO classes support to process the request and to generate the response.

=> While dealing with form page submission related request processing we generally two handler methods in the controller class

a) GET mode handler method to launch the form page (displaying form page)
b) POST mode handler method to process form page sumbisssion request (Processing form page)

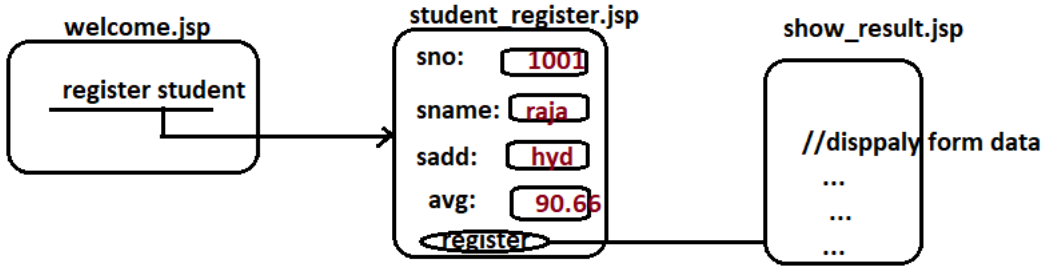
note:: Both these methods can have same request path becoz the request modes are different

```
@Controller
public class StudentRegistrationController{

  @GetMapping("/register")
  public String showForm(){
    //return LVN
     return "student_register";
   }

  @PostMapping("/register")
  public String registerStudent(Map<String,Object> map,
                                @ModelAttribute("stud") Student st){
    ...
    ...
   return "show_result";
  }

}//class
```

=>Model class obj default scope is request scope

Example app Story board

==========



#1) create spring boot starter project having the following depdencices a) web b) lombok c) tomcat-embedded-jasper with scope provided

#2) Develop model class

```
package com.nt.model;
import lombok.Data;
@Data
public class Student {
	private Integer so;
	private String sname;
	private String sadd;
	private Float avg;
}
```

#3) Add the following entries in application.properties

application.properties

```
#For view resolver
spring.mvc.view.prefix=/WEB-INF/pages/
spring.mvc.view.suffix=.jsp

# for embedded server
server.port=4041
```

#4) DEVELOP CONTROLLER CLASS

```
package com.nt.controller;

import java.util.Map;
import org.springframework.stereotype.Controller;
import org.springframework.web.bind.annotation.GetMapping;
import org.springframework.web.bind.annotation.ModelAttribute;
import org.springframework.web.bind.annotation.PostMapping;
import com.nt.model.Student;

@Controller
public class StudentOperationsController {

	@GetMapping("/")
	public String showHomePage() {
		//return LVN (home page --welcome.jsp)
		return "welcome";
	}

	@GetMapping("/register")
	public String showStudentFormPage() {
		//return LVN (form page --> student_register.jsp
		return "student_register";
	}

	@PostMapping("/register")
	public String registerStudent(Map<String,Object> map,
				@ModelAttribute("stud") Student st) {
		System.out.println(st);
		//return lvn
		return "show_result";
	}
}
```

#5) DEVELOP THE VIEW COMPS (JSP PAGES)

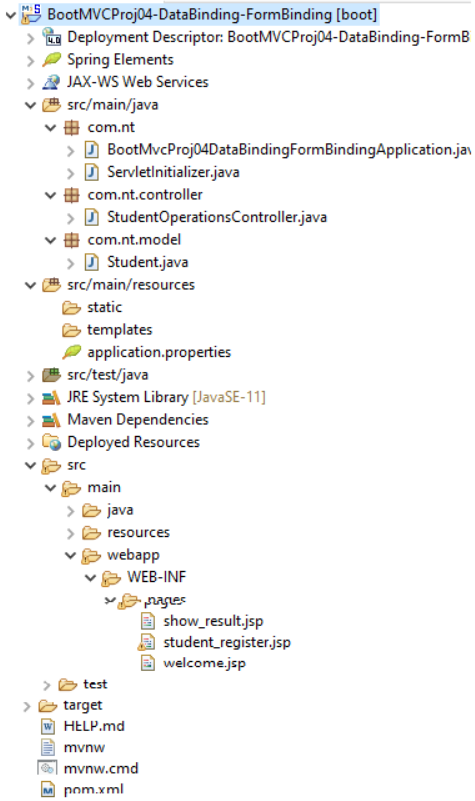
welcome.jsp

```
<%@ page isELIgnored="false" %>
  <h1 style="color:red;text-align:center">Home page</h1>
  <br><br>
   <h2 style="color:red;text-align:center"><a href="register">register student</a>  </h2>
```

**student_register.jsp**

---

```
<%@ page language="java" contentType="text/html; charset=ISO-8859-1"
  pageEncoding="ISO-8859-1"%>

  <h1 style="color:red;text-aling:center">student registration page</h1>

   <form action="register" method="POST">
     <table align="center" bgcolor="cyan">
       <tr>
         <td>student number  </td>
         <td><input type="text"  name="sno"> </td>
       </tr>
       <tr>
         <td>student name  </td>
         <td><input type="text"  name="sname"> </td>
       </tr>
       <tr>
         <td>student address  </td>
         <td><input type="text"  name="sadd"> </td>
       </tr>
       <tr>
         <td>student avg  </td>
         <td><input type="text"  name="avg"> </td>
       </tr>
       <tr>
         <td colspan="2"><input type="submit" value="Register"></td>
       </tr>
     </table>
   </form>
```




***show_result.jsp***

```
<%@page isELIgnored="false"  %>

 <br>
  <b> student  data is :: ${stud} </b>

  <br>
  <a href="./">home</a>
```

**While making java bean class as the model class to hold form data if @ModelAttribute with logical name then the Model class obj will be created with that logical name .. if same @ModelAttrbute is taken with out logical name then the Model class obj will be created having the class name as Model class object name.**

**Case1:**

```
@PostMapping("/register")
      public  String  registerStudent(Map<String,Object> map,
                                      @ModelAttribute Student st) {
            System.out.println(st);
           //return lvn
           return "show_result";

      }
```

**Model class object name internally is :: student**

```
Student  student=new Student();
```

**In show_result.jsp**

---

```
<b> student  data is :: ${student} </b>
```

**Case2:**

---

**In controller class**

---

```
@PostMapping("/register")
public  String  registerStudent(Map<String,Object> map,
                                @ModelAttribute("stud") Student st) {
        System.out.println(st);
      //return lvn
      return "show_result";          =>The Model class object name
                                     intenrally is  "stud"
}
                                          Student stud=new Student();
```

**In show_result.jsp**

---

```
<b> student  data is :: ${stud}
```

---

**@ModelAttribute is multi-purpose annotation**

**a) To make  java bean class  as model class to bind form data into model class obj**

**b) To prepare hold  reference data /addtional data for the comps**

**Select box , List box and grouped checkboxes. (will be discussed later)**

---

**if i take <form> with out action attriubte or <a> tag with out href attribute then what happens?**

**=> Form submission / hyperlink submission goes to that url using which the form page is launched or the hyperlink is launched.**

**=> In spring /spring boot MVC Applications if the GET mode request path that lanuches form page is same as POST mode request path that process the form submission request then there is no need of giving "action" attribute in the <form> tag.**

***controller class***

```
@Controller
public class StudentOperationsController {

    @GetMapping("/")
    public  String showHomePage() {
          //return LVN (home page --welcome.jsp)
          return "welcome";
    }

    @GetMapping("/register")
    public  String  showStudentFormPage() {
          //return LVN (form page --> student_register.jsp
          return "student_register";
    }

    @PostMapping("/register")
    public  String  registerStudent(Map<String,Object> map,
                                    @ModelAttribute Student st) {
          System.out.println(st);
          //return lvn
          return "show_result";

    }

}
```

***Form page***

```
<%@ page language="java" contentType="text/html; charset=ISO-8859-1"
  pageEncoding="ISO-8859-1"%>

  <h1 style="color:red;text-aling:center">student registration page</h1>

        no action attribute is required
  <form  method="POST">
    <table align="center" bgcolor="cyan">
      <tr>
        <td>student number  </td>
        <td><input type="text"  name="sno"> </td>
      </tr>
      <tr>
        <td>student name  </td>
        <td><input type="text"  name="sname"> </td>
      </tr>
      <tr>
        <td>student address  </td>
        <td><input type="text"  name="sadd"> </td>
      </tr>
      <tr>
        <td>student avg  </td>
        <td><input type="text"  name="avg"> </td>
      </tr>
      <tr>
        <td colspan="2"><input type="submit" value="Register"></td>
      </tr>
    </table>
  </form>
```

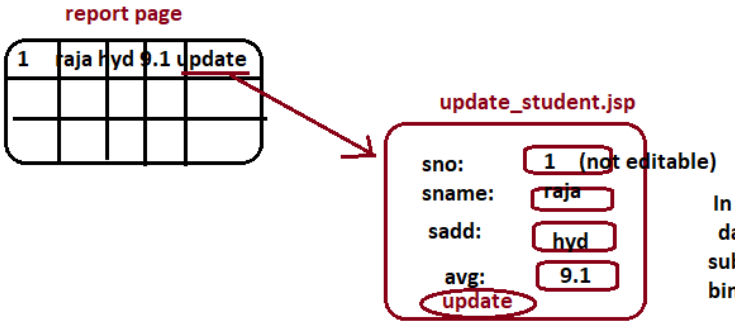
**=>For every submission of form page the DispatcherServlet creates one object of model class object binds the form data and keeps in request scope i.e the objects for model class will be created on 1 per form submission request.**

**we can design form page in spring MVC /spring boot MVC applications in two ways**

**a) using tradtional html tags (old -- not recomanded)**

**(it supports one way binding i.e we can bind form data into Model class obj but reverse is not possible)**

b) using spring MVC supplied jsp taglibrary form tags ( recomanded)
(It supports two way binding i.e we can bind form data into
Model class obj and Model class obj data to form comps in the form launch)




In form launching we need model class obj data to form comps binding and on the form submission we need reverse (form comps dat binding to Model class obj)

note: binding Model class object data into form comps on the lanuch form page is very much required in the edit usecase as shown above

Spring MVC supplied "form" jsp taglibrary tags are
==========

<form:form>
<form:input>
<form:checkbox>
<form:checkboxes>
<form:option>
<form:options>
<form:select>
<form:radiobutto>
<form:password> ,<form:errors> ,<form:textarea>
and etc..

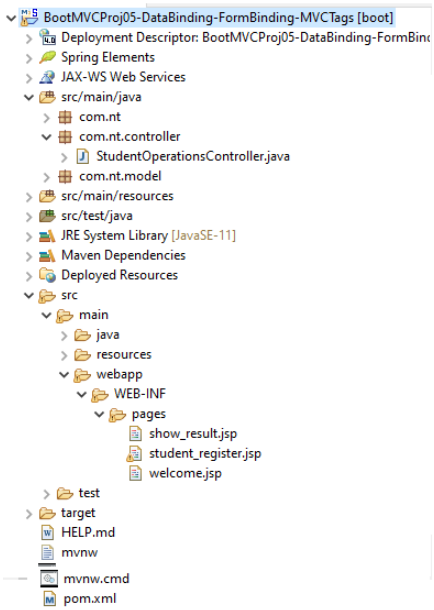
For submit button we still need to use
<input type="submit" >

| Tags | HTML | Spring |
|---|---|---|
| Input | <input type = "text"> | <form:input> |
| Radiobutton | <input type="radiobutton"> | <form:radiobutton><br><form:radiobuttons><br>Specify list of values for radiobuttons in one shot |
| Checkbox | <input type="checkbox"> | <form:checkbox><br><form:checkboxes><br>Specify list of values for checkboxes in one shot |
| Password | <input type="password"> | <form:password> |
| Select and option | <select name="course"><br><option value="java">java</option><br><option value="spring">spring</option><br></select> | <form:select name="course"><br><form:option value="java" label="java"/><br><form:option value="spring" label="spring"/><br></form:select><br><br><form:options><br>Specify the list of options in one shot |
| Text area | <input type="textarea"> | <form:textarea> |
| Hidden | <input type="hidden"> | <form:hidden> |

To this "form" jsp taglibrary of spring /spring boot MVC we need to import taglib uri using <%@taglib uri="....." prefix=".."%>

<%@taglib uri="http://www.springframework.org/tags/form" prefix="form"%>
(fixed) (programmer choice)

*example app*
==========




**StudentOpertaionsController.java**

```
package com.nt.controller;

import java.util.Map;

import org.springframework.stereotype.Controller;
import org.springframework.web.bind.annotation.GetMapping;
import org.springframework.web.bind.annotation.ModelAttribute;
import org.springframework.web.bind.annotation.PostMapping;

import com.nt.model.Student;

@Controller
public class StudentOperationsController {

    @GetMapping("/")   (f)                    (d?)
    public  String showHomePage() {
        //return LVN (home page --welcome.jsp)
        return "welcome";   (g)
    }

(p?)
    @GetMapping("/register")     (s)
    public  String  showStudentFormPage(@ModelAttribute("stud") Student st) {
        st.setAvg(1.0f);  //generally comes  form DB in case edit usecase
 (t)    //return LVN (form page --> student_register.jsp
        return "student_register";
    }

(f1?)
    @PostMapping("/register")     (j1)
    public  String  registerStudent(Map<String,Object> map,
                                    @ModelAttribute Student st) {
        System.out.println(st);
        //return lvn                                   (k1)
        return "show_result";

    }

}
```

**student_register.jsp** *(WEB-INF/pages)* (y)

```
<%@ page language="java" contentType="text/html; charset=ISO-8859-1"
    pageEncoding="ISO-8859-1"%>
    <%@taglib uri="http://www.springframework.org/tags/form"  prefix="form"%>

    <h1 style="color:red;text-align:center">student registration page</h1>
                ( c1) no action , so last /register with POST
     <form:form  method="POST"  modelAttribute="stud">                (z)1
       <table align="center" bgcolor="cyan">
         <tr>
           <td>student number  </td>
           <td><form:input path="sno"/> </td>
         </tr>   1001                 null- empty
         <tr>
           <td>student name  </td>
           <td><form:input path="sname"/> </td>                       (z)2
         </tr>   rajesh               null -empty
         <tr>
           <td>student address  </td>
           <td><form:input path="sadd"/>  </td>
         </tr>  hyd                   hyd
         <tr>
           <td>student avg  </td>
           <td><form:input path="avg"/>  </td>
         </tr>  90.0                  1.0
         <tr>
           <td colspan="2"><input type="submit" value="Register"></td>
         </tr>                                                        ( b)
       </table>
     </form:form>
```

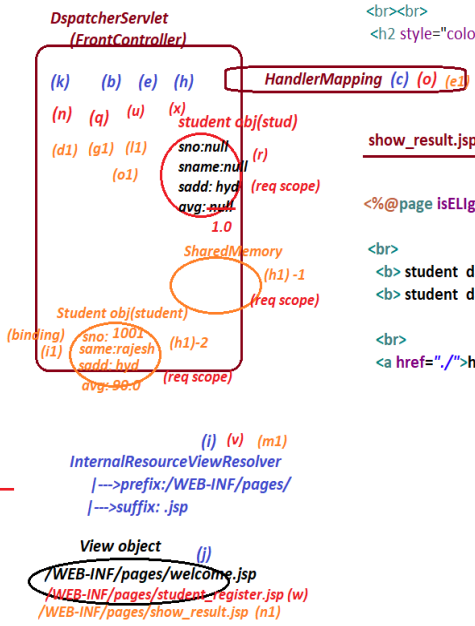
fills the form (a1)

**welcome.jsp** *(WEB-INF/pages)* (l)

```
<%@ page isELIgnored="false" %>

  <h1 style="color:red;text-align:center">Home page</h1>

  <br><br>
   <h2 style="color:red;text-align:center"><a href="register">register student</a
                                                                  (m)
```

**show_result.jsp** *(WEB-INF/pages)*
(p1)

```
<%@page isELIgnored="false"  %>

<br>
 <b> student  data is :: ${stud} </b> <br>
 <b> student  data is :: ${student} </b>

 <br>
 <a href="./">home</a>
```




***from browser***

***http://localhost:2020/BootMVCProj05-DataBinding-FormBinding-MVCTags/register***

***(a)***

## 9 NTSPBMS615- -Data Binding using @RequestParam- March 18th- 2022

what is the differnce desing form pages using html form tags and spring mvc supplied jsp form tags?

| Trandtional html form tags | spring MVC supplied jsp form tags |
|---|---|
| (a) These tags are given by w3c (world wide web consortium) | (a) These tags are given spring MVC framework (pivotal team) |
| (b) These tags support one way data binding when they are used spring mvc apps (form data to Model class obj) | b)These tags support two way data binding when they are used spring mvc apps (form data to Model class obj and vice-versa) |
| (c) default request method for the form page is GET | (c) default request method for the form page is POST |
| (d) These tags not strictly typed | (d) these tags strictly typed |
| (e) These tags not case-sensitive | (e) These tags are very much case-sensitive |
| (f) can be used in html programming and also in jsp programming | (f) can be used only in jsp programming |

### b) Data binding using @RequestParam
### ( Binding request param values to handler method param values)

=>sometimes hyperlinks cary addtional data along with the generated request in the form of request params which will be appended to the requst url as part of query String

```
<a href="editstudent?sno=101"> edit student </a>
<a href="editstudent?sno=102"> edit student </a>
        url having query String (request params)
```

=>These request params can be bound with Handler method params using the support of @RequestParam annotations

ex1:: request url :: http://localhost:2020/BootMVCProj06-DataBinding-RequestParamBinding/data?sno=1001&sname=rajesh

In controller class

```
@GetMapping("/data")
public String process(@RequestParam("sno") int no, @RequestParam("sname") String name) {
    System.out.println(no+"  "+name);
    //return LVN
    return "show_result";
}
```

*request params are bound to handler method params*

*=> if request param names are matching with handler method param name then there is no need of giving request param names in @RequestParam annotation*

ex2: http://localhost:2020/BootMVCProj06-DataBinding-RequestParamBinding/data?sno=9001&sname=rakesh

Handler method in controller class

```
@GetMapping("/data")
public String process(@RequestParam int sno, @RequestParam String sname) {
    System.out.println(sno+"  "+sname);
    //return LVN
    return "show_result";
}
```

*If any request param name is not matching with @RequestParam attribute name or method param name of handler method then we get exception*

[org.springframework.web.bind.MissingServletRequestParameterException: Required request parameter 'sname' for method parameter type String is not present]

ex3:: http://localhost:2020/BootMVCProj06-DataBinding-RequestParamBinding/data?sno=6001&name=mahesh

Handler method of controller class

```
@GetMapping("/data")
public String process(@RequestParam int sno, @RequestParam String sname) {
    System.out.println(sno+"  "+sname);
    //return LVN
    return "show_result";
}
```

macthing so binding takes place

not matching so 400 error status will be raised.

throws Exception

*By default @RequestParam based method param value should be filledup becoz the default value for required annotation in @RequestParam is true.*

Solution 1 for ex3 problem (take required=false in @RequestParam annotation)

optional to place

request url :: http://localhost:2020/BootMVCProj06-DataBinding-RequestParamBinding/data?sno=1021&name=raju

Handler method of controller class

```
@GetMapping("/data")
public String process(@RequestParam int sno, @RequestParam(required = false) String sname) {
    System.out.println(sno+"  "+sname);
    //return LVN
    return "show_result";
}
```

matching

not matching so null will be taken

gives 1021 null

solution2: (take defauilt value for the request param in @RequestParam)

http://localhost:2020/BootMVCProj06-DataBinding-RequestParamBinding/data?sno=1022&name=rajesh
http://localhost:2020/BootMVCProj06-DataBinding-RequestParamBinding/data?sno=1022
http://localhost:2020/BootMVCProj06-DataBinding-RequestParamBinding/data?sno=1022&sname=king

handler method of controller class

```
@GetMapping("/data")
public String process(@RequestParam int sno,
                      @RequestParam(defaultValue = "rrr") String sname) {
    System.out.println(sno+"  "+sname);
    //return LVN
    return "show_result";
}
```

1022 rrr
1022 rrr
1022 king

*What the difference b/w required="false" and defaultValue of @RequestParam annotation?*

*=> required=false says though certain req param value is not given in the request url then it should not give any exception rather assigns null value method param*
*=>defaultValue="xxxx" assigns the given default value method param if the req param is got given or request param name is not matching.*

For numeric type method param if we try to pass string type value from request param then we get Number Format Exception .. No Solution for this problem exception passing correct format value.

case1:: http://localhost:2020/BootMVCProj06-DataBinding-RequestParamBinding/data?sno=101f&sname=raja

In controller class

```
@GetMapping("/data")
public String process(@RequestParam("sno") int no,
                      @RequestParam("sname") String name) {
    System.out.println(no+"  "+name);
    //return LVN
    return "show_result";
}
```

raises :: 2022-03-18 19:37:46.115 WARN 6872 --- [nio-2020-exec-5] .w.s.m.s.DefaultHandlerExceptionResolver : Resolved [org.springframework.web.method.annotation.MethodArgumentTypeMismatchException: Failed to convert value of type 'java.lang.String' to required type 'int'; nested exception is java.lang.NumberFormatException: For input string: "102ff"]

=> for number type method param of handler method ,if u try to pass no value or empty string "" then also we get NumberFormatException .. This problem can solved using "defaultValue" or require=false with Wrapper type params.

http://localhost:2020/BootMVCProj06-DataBinding-RequestParamBinding/data?sno=&sname=raja

In controller class

```
@GetMapping("/data")
public String process(@RequestParam("sno") int no, @RequestParam("sname") String name) {
    System.out.println(no+"  "+name);
    //return LVN
    return "show_result";
}
```

raises :: 2022-03-18 19:38:36.517 WARN 6872 --- [io-2020-exec-11] .w.s.m.s.DefaultHandlerExceptionResolver : Resolved [org.springframework.web.method.annotation.MethodArgumentTypeMismatchException: Failed to convert value of type 'java.lang.String' to required type 'int'; nested exception is java.lang.NumberFormatException: For input string: ""]

for

Soultion1: Assign default value handler method parameter

http://localhost:2020/BootMVCProj06-DataBinding-RequestParamBinding/data?sno=&sname=raja

Handler method of controller class

```
@GetMapping("/data")
public String process( @RequestParam(name="sno",defaultVlaue="2001") int no,
                       @RequestParam("sname") String name) {
    System.out.println(no+"  "+name);
    //return LVN
    return "show_result";
}
```

gives 2001 raja

solution2: take required=false having wrapper type method param

http://localhost:2020/BootMVCProj06-DataBinding-RequestParamBinding/data?sno=&sname=raja

Handler method in controller class

```
@GetMapping("/data")
public String process(@RequestParam(name = "sno",required = false) Integer no,
                      @RequestParam("sname") String name) {
    System.out.println(no+"  "+name);
    //return LVN
    return "show_result";
}
```

gives null raja

---

=>if we pass same request param with multiple values in the query String to bind them for handler method parameter we can the parameter type as the array or List or Set type as shown below

request url :: http://localhost:2020/BootMVCProj06-DataBinding-RequestParamBinding/data?sno=1022&sname=raja&sadd=hyd&sadd=vizag&sadd=delhi

In the handler method controller class

```
@GetMapping("/data")
public String process(@RequestParam(name = "sno",required = false) Integer no,
                      @RequestParam("sname") String name,
                      @RequestParam("sadd") String addrs[],
                      @RequestParam("sadd") List<String> saddList,
                      @RequestParam("sadd") Set<String> saddSet) {
    System.out.println(no+"  "+name+"  "+Arrays.toString(addrs)+"  "+saddList+"  "+saddSet);
    //return LVN
    return "show_result";
}
```

gives 1022 raja [hyd, vizag, delhi] [hyd, vizag, delhi] [hyd, vizag, delhi]

*if the handler method param type is simple string and we are trying to give multiple values through request param the simple stirng param holds the multiple values as the comma seperated list of values.*

*request url ::*
*http://localhost:2020/BootMVCProj06-DataBinding-RequestParamBinding/data?sno=101&sname=raja&sadd=hyd&sadd=vizag*

handler method of controller class

```
@GetMapping("/data")
    public  String   process(@RequestParam(name = "sno",required = false) Integer no,
                             @RequestParam("sname") String name,
                             @RequestParam("sadd") String addrs) {
        System.out.println(no+"   "+name+"  "+addrs);
        //return  LVN
        return "show_result";
    }
```

101 raja hyd,vizag

*note:: if form page is having group of checkboxes or List box which allows to select multiple items at a time then we need to take array or List of Set type properties in Model class that will be used in form data binding.*

secase of @Requestparam in real applications

usecase1::

webpage

```
generateExcel report
    href= report?type=excel
generate pdf report
    href=report?type=pdf
```

```
@Controller
public class ReportGenerationController{
  @Autowired
  private ReportDataService service;

public   String   generateReport(Map<String,Object> map,
                                 @RequestParam(name="type") String type){
   List<Product> list=service.getProductsInfo();
    map.put("reportData",list);
     if(type.equalsIgnoreCase("excel")){
          return "excel_report";
        }
     else if(type.equalsIgnoreCase("pdf")){
          return "pdf_report";
       }
     }
}
```

ReportPage (jsp page)

| PID | PNAME | PRICE | QTY | operations | |
|---|---|---|---|---|---|
| 101 | table | 90.44 | 10 | edit | delete |
| 102 | chair | 45.77 | 19 | edit | delete |
| | | | | | |
| | | | | | |

edit?no=101 delete?no=101

edit?no=102 delete?no=102

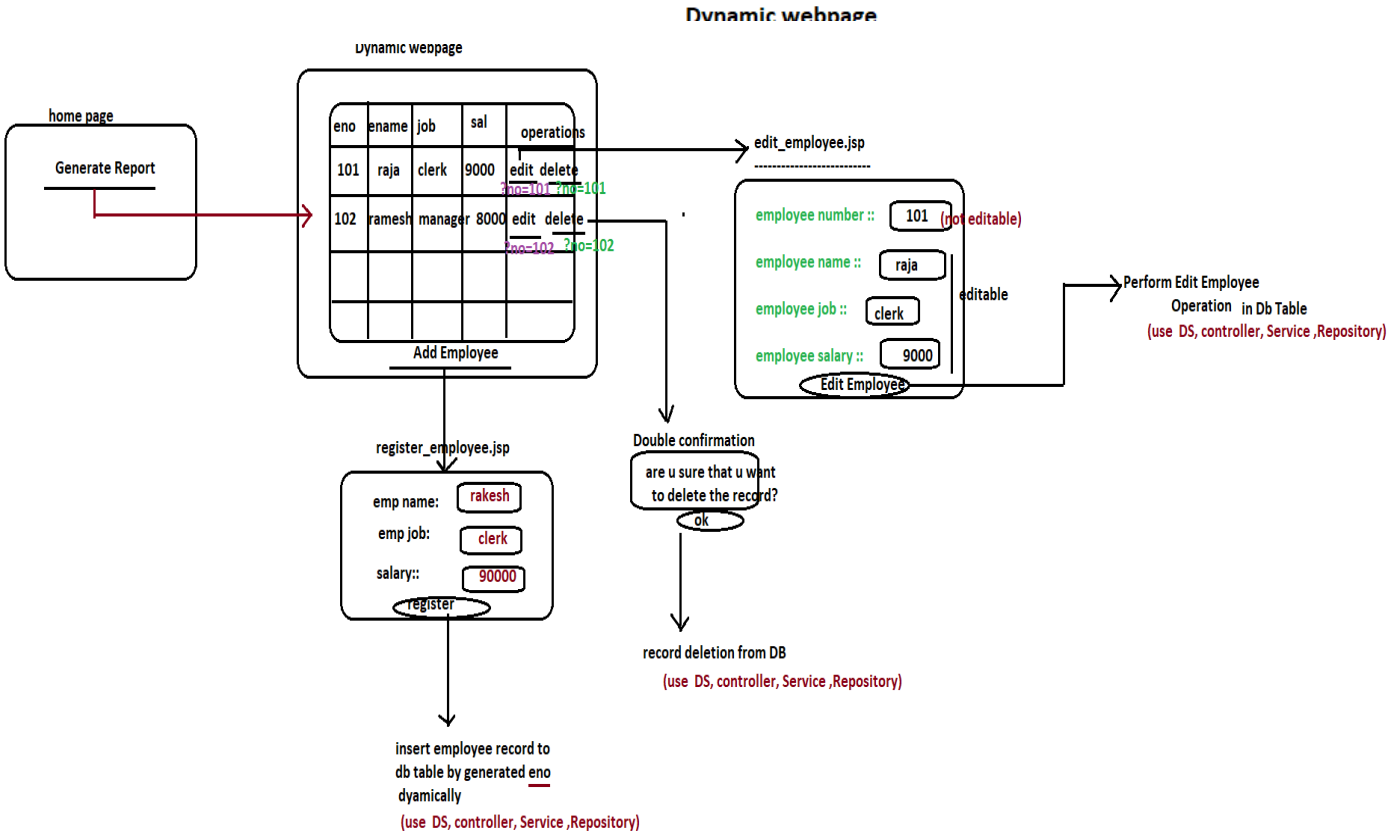
```
@Controller
public class CURDOperationsContrller{

  @GetMapping("/edit")
  public String  editProduct(Map<String,Object> map,
                             @RequestParam("no") int no){
     ...
     ... //invoke service logic to modify the record
      ..
  }

  @GetMapping("/delete")
  public String  deleteProduct(Map<String,Object> map,
                               @RequestParam("no") int no){
     ...
      .. //invoke service logic to delete the record
      ..
  }

}//class
```

## Spring Boot MVC based Layered Application

jsp --------> DispatcherServlet ---------> controller ----------> service class ----------> Repository----> Db s/w

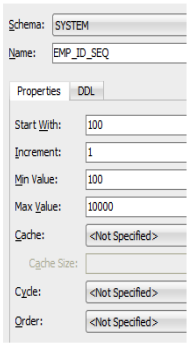
(view) (FrontController) (controller) (Mode layer) (Model layer)

(presenntation logic) navigation logic (delegation logic +exception handling) (b.logic) (persinstence logic)




step1) make sure that "emp" db table in oracle Db s/w

step2) make sure that "emp_id_seq" sequence is created in oracle Db s/w having ability to generate emp no dynamically

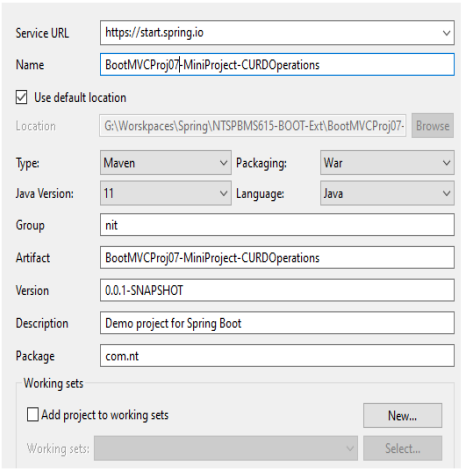



=> CREATE SEQUENCE "SYSTEM"."EMP_ID_SEQ" MINVALUE
100 MAXVALUE 10000 INCREMENT BY 1 START WITH 100 CACHE 20 NOORDER NOCYCLE ;

step3) create spring boot starter Project having the following dependencies

web , data jpa, lombok api , tomcat-embeeded-jasper , ojdbc8 ,jstl

File menu --->new ---> Project ---> spring startter




-->next ---> select the following dependenices

web, lombok, spring data jpa, oracle driver

add extra dependencies in pom.xml by collecting them from mvnrepoistory.com

```
<dependency>
   <groupId>org.apache.tomcat.embed</groupId>
   <artifactId>tomcat-embed-jasper</artifactId>
   <scope>provided</scope>
</dependency>
```

```
<!-- https://mvnrepository.com/artifact/javax.servlet/jstl -->
<dependency>
  <groupId>javax.servlet</groupId>
  <artifactId>jstl</artifactId>
</dependency>
```

**step4) create the following packages in the Project**

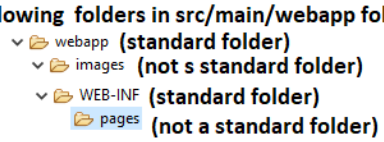

**step5) add the following entries in application.properties**

=>For data source cfg
=>For jpa-hibernate properties
=>For view resovlers
=>For Embedded Ports
=>For Context path of web application
while runing in Embedded Tomcat server

**application.properties**

```
#View Resolver cfg
spring.mvc.view.prefix=/WEB-INF/pages/
spring.mvc.view.suffix=.jsp

#Embedded server port number
server.port=4041
#Context path
server.servlet.context-path=/Employee-CURDOperations

#DataSource  cfg
spring.datasource.driver-class-name=oracle.jdbc.driver.OracleDriver
spring.datasource.url=jdbc:oracle:thin:@localhost:1521:xe
spring.datasource.username=system
spring.datasource.password=manager

#Hibernate -JPA properties
spring.jpa.hibernate.ddl-auto=update
spring.jpa.show-sql=true
spring.jpa.database-platform=org.hibernate.dialect.Oracle10gDialect
```

**step6) creating the following folders in src/main/webapp folder**




**step7) Write the neccessary code to display the home page**

i) place report icon as png or jpeg image in images folder
ii) Develop controller class having handler method with request path "/"

```
@Controller
public class EmployeeOperationsController {      (partial code)

    @GetMapping("/")
  public        String showHome() {
            return "home";
    }
}
```

iii) place home.jsp in WEB-INF/pages folder

home.jsp (WEB-INF/pages)

```
<%@ page isELIgnored="false" %>

 <h1 style="color:red;text-align:center"><a href="report">Get Employee Data</a></h1>
   <br><br>
<h1 style="color:red;text-align:center"><a href="report"><img src="images/report1.png"
            alt="image not found"/></a></h1>
```

*step8) Develop Model /Entity class*

*Employee.java*

```
package com.nt.model;

import java.io.Serializable;

import javax.persistence.Column;
import javax.persistence.Entity;
import javax.persistence.GeneratedValue;
import javax.persistence.GenerationType;
import javax.persistence.Id;
import javax.persistence.SequenceGenerator;
import javax.persistence.Table;

import com.sun.source.doctree.SerialDataTree;

import lombok.Data;

@Entity
@Table(name="emp")
@Data
public class Employee  implements Serializable {
    @Id
    @SequenceGenerator(name = "gen1",sequenceName = "emp_id_seq")
    @GeneratedValue(generator = "gen1",strategy = GenerationType.SEQUENCE)
    private Integer empno;
    @Column(length = 20)
    private  String ename;
    @Column(length = 20)
    private  String  job;
    private   Float sal;
}
```

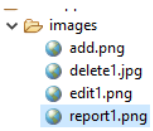
step9) Develop Repository Interface for Employee class

IEmployeeRepo.java

```
package com.nt.repo;

import org.springframework.data.jpa.repository.JpaRepository;

import com.nt.model.Employee;

public interface IEmployeeRepo extends JpaRepository<Employee, Integer> {

}
```

step10) Perform all the activities in in service class, Controller class and in the view comps to perform Report Generation operation

i) gather add icon images in src/main/webapp/images folder related edit , delte and add operations




ii) Develop service interfce and service Impl class having logics for getting all records for report generation

Service Interface

```
public interface IEmployeeMgmtService {
    public  List<Employee>  getAllEmployees();
}
```

//service impl class

```
@Service("empService")
public class EmployeeMgmtServiceImpl implements IEmployeeMgmtService {
    @Autowired
    private IEmployeeRepo empRepo;

    @Override
    public List<Employee> getAllEmployees() {
        return empRepo.findAll();
    }
}
```

iii) Add the following handler method in controller class

```
@GetMapping("/report")
public  String  showEmploeeReport(Map<String,Object> map) {
    //use serivce
    List<Employee> list=service.getAllEmployees();
    // put the results in model attributes
    map.put("empsData",list);
    //return LVN
    return "employee_report";
}//method
```

iv) Develop employee_report.jsp page aa shown below

employee_report.jsp

```
<%@ page isELIgnored="false"  %>
<%@taglib uri="http://java.sun.com/jsp/jstl/core"  prefix="c"%>
<c:choose>
  <c:when test="${!empty empsData}">
   <table border="1" bgcolor="cyan"  align="center">
    <tr>
      <th>EmpNo  </th>
      <th>EmpName </th>
      <th>Job </th>
      <th>Salary</th>
      <th> Operations </th>
    </tr>
```

```
    <c:forEach var="emp" items="${empsData}">
      <tr>
        <td>${emp.empno} </td>
        <td>${emp.ename} </td>
        <td>${emp.job} </td>
        <td>${emp.sal} </td>
        <td><a href="edit?no=${emp.empno}"><img src="images/edit1.png" width="50" height="50"/></a>   
      </tr>                                  : <a href="delete?no=${emp.empno}"><img src="images/delete1.jpg" width="50" height="50"></a>  </td>
    </c:forEach>
    </table>
  </c:when>
    <c:otherwise>
      <h1 style="color:red;text-align:center"> Records not found </h1>
    </c:otherwise>
</c:choose>
<br><br>
<hr>
 <h1 style="text-align:center"><a href><img src="images/add.png" width="50" height="50"> Add Employee</a> </h1>
```

step11) Perform the following operations to complete Add Employee operation

(i) write the following logics in Serivce Interface and Serivce Impl class

In service Interface

```
public  String  registerEmployee(Employee emp);
```

Serivce Impl class

```
@Override
    public String registerEmployee(Employee emp) {
   int idVal=empRepo.save(emp).getEmpno();
        return "Employee is saved with the id value ::"+idVal;
    }
```

ii) In controller class add two handler methods
one for showing addEmployee formpage (form launching)
another for processing of the form page (form submission)

```
@GetMapping("/add")
public String showAddEmployeeForm(@ModelAttribute("emp") Employee emp) {
        emp.setJob("CLERK");  //intial value to display in form comp as initial value
        //return lvn
        return "employee_register";
}
```

For fom launching

```
@PostMapping("/add")
public String addEmployee(Map<String,Object> map,
                          @ModelAttribute("emp") Employee emp) {
    //use service
  String result=service.registerEmployee(emp);
  List<Employee> list=service.getAllEmployees();
  //keep results in model attributes
  map.put("resultMsg", result);
  map.put("empsData",list);
  //return LVN
  return "employee_report";

}
```

For form submission

iii) develop the employee register,jsp page

```
<%@ page isELIgnored="false"  %>
<%@taglib uri="http://www.springframework.org/tags/form"  prefix="form" %>
 <h1 style="color:red;text-align:center"> Register Employee </h1>
 <form:form modelAttribute="emp">
   <table border="1" bgcolor="cyan"  align="center">
     <tr>
       <td> employee name ::  </td>
       <td> <form:input path="ename"/>  </td>
     </tr>
```

```
    <tr>
      <td> employee desg ::  </td>
      <td> <form:input path="job"/>  </td>
    </tr>
    <tr>
      <td> employee salary ::  </td>
      <td> <form:input path="sal"/>  </td>
    </tr>

    <tr>
      <td colspan="2" align="center"><input type="submit" value="register Employee"/></td>
    </tr>
  </table>
</form:form>
```

*iv) add the following addtional code in employee_report.jsp*

```
<c:if test="${!empty resultMsg}">
    <h3 style="color:green;text-align:center"> ${resultMsg }</h3>
</c:if>
```

**step12) Perform the following operations to edit product job**

Two phases of edit operation
a) Launching selected Employee record for editing (for edit hyperlink request) GET
b) perform edit employee operation ( form submission related POST request)

**a) Launching selected Employee record for editing**

i) add the following code in service interface ,service impl class
to get Employee details based on the given employee number

In service Interface

```
public  Employee   getEmployeeByNo(int no);
```

In service Impl class

```
@Override
    public Employee getEmployeeByNo(int no) {
        Employee emp=empRepo.findById(no).get();
        return emp;
    }
```

ii ) Add the following code in Controller class to launch edit_employee form page having dyamically selected emp no based Emloyee details in Model class obj

```
@GetMapping("/edit")        for edit hyperlink request
public String  showEditEmployeeForm(@RequestParam("no") int no,
                                    @ModelAttribute("emp") Employee emp) {
    //get Employee details dyamically based on the given emp no
    Employee emp1=service.getEmployeeByNo(no);
    //emp=emp1;
    BeanUtils.copyProperties(emp1, emp);
    //return lvn
    return "employee_edit";
}
```

iii) develop WEB-INF/pages/employee_edit.jsp page specifying the model attribute "emp"

employee_edit.jsp

```
<%@ page isELIgnored="false" %>
<%@taglib uri="http://www.springframework.org/tags/form" prefix="form" %>
<h1 style="color:red;text-align:center"> Employee Employee </h1>
<form:form modelAttribute="emp">
 <table border="1" bgcolor="cyan" align="center">
 <tr>
    <td> employee no :: </td>
    <td> <form:input path="empno" readonly="true"/> </td>
  </tr>
  <tr>
    <td> employee name :: </td>
    <td> <form:input path="ename"/> </td>
  </tr>

  <tr>
    <td> employee desg :: </td>
    <td> <form:input path="job"/> </td>
  </tr>

  <tr>
    <td> employee salary :: </td>
    <td> <form:input path="sal"/> </td>
  </tr>

  <tr>
    <td colspan="2" align="center"><input type="submit" value="Edit Employee"/></td>
  </tr>
 </table>
</form:form>
```

## b) perform edit employee operation ( form submission related POST request)

i) add the following code in serivce interface and service Impl class to perform edit employee operation

In service Interface

```
public String editEmployee(Employee emp);
```

In service Impl class

```
@Override
    public String editEmployee(Employee emp) {
        int idVal=empRepo.save(emp).getEmpno();  //save(-) method can perform both save /edit operations
            return idVal+" Employee is updated ";

    }
```

ii) add the following @PostMapping("/edit") handler method in controller class to complte edit operation by processing the POST mode form submission request

step13) Perform the following operations to complete delete employee activities

i) Add the following code in service interface and service Impl class

In service interface

```
public String deleteEmployee(int no);
```

In service impl class

```
@Override
    public String deleteEmployee(int no) {
            empRepo.deleteById(no);
            return no+" emp no Employee is deleted";
    }
```

ii) Write @GetMapping("/delete") in controller class as shown below

```
@GetMapping("/delete")
public String  deleteEmployee(@RequestParam("no") int no,
                              Map<String,Object> map) {
    //use service
    String msg=service.deleteEmployee(no);
     List<Employee> list=service.getAllEmployees();
     //keep results in model attributes
      map.put("resultMsg", msg);
      map.put("empsData",list);
    //return lvn
      return "employee_report";
}
```

ii) Add onclick based javascript confirm(' ___') function call to get double confirmation from enduser towards the deletion of record.

In employee_report.jsp

```
<td>
  <a onclick="return confirm('Do you want to delete')"
      href="delete?no=${emp.empno}"><img src="images/delete1.jpg" width="50" height="50">
 </a>
</td>
```

*What is Double posting problem and how to solve it?*

*Ans) Repeating the request of form submission for multiple times becoz the clicks on refresh of button for multiple times and getting side effects in bad manner is called Duplicate form sumbission or double posting problem .. Generally form submission requests are POST mode requests carrying data .. The repetation of the same request definetely leads to problems.*

*=>POST is non idempotent i.e not safe to repeat the request becoz it carries data and updates/modifies the data of server*

*=>GET is idempotent i.e safe to repeate the request becoz the does not carry data along with the request, in fact it reads the data from the server if repeat the reading data .. not a problem*

Double posting problem use-cases are

(a) Form filled with credit/debit card details .. for payment.
On the result page of this form submission if u press refresh button for multiple times then payment will be taken/deducted for multiple times.

(b) Form filled for employee/student/... registration
On the result page of this form submission ,if u press refresh button for multiple times then same student will be studnet/employee/... for multiple times with different ids .. if the app is generating id dynamically

The solutions for Double Posting Problem are

(a) Disable refresh Button using Java Script (Very complex - may not work or many give other side effeccts)
(b) use Serlvet Filters Session tokens logics (Complext implement using Servlet Filter)
(c) use PRG Pattern (PRG-POST REDIRECT -GET ) (Easy to implement every where)

Legacy techniques

Modren technique

## (c) use PRG Pattern (PRG-POST REDIRECT -GET ) (Easy to implement every where)

=>This pattern says do not send response to browser from the POST mode handler method of the controller class becoz repeating the post mode request is always costly side effect as disscussed above..
So make the POST mode handler method redirecting the request to GET Mode handler method and send response to browser from there,becoz the repeation of GET mode request is not having any side effects.

**Basic solution with PRG patttern**

**In controller class**

```
@PostMapping("/add")
    public String addEmployee(Map<String,Object> map,
                              @ModelAttribute("emp") Employee emp) {
        System.out.println("EmployeeOperationsController.addEmployee()");
        //use service
      String result=service.registerEmployee(emp);
      //keep results in model attributes
       map.put("resultMsg", result);
      //return LVN
      return "redirect:report";

    }

    @GetMapping("/report")
      public  String  showEmployeeReport(Map<String,Object> map) {
          System.out.println("EmployeeOperationsController.showEmployeeReport()");
           //use serivce
          List<Employee> list=service.getAllEmployees();
          // put the results in model attributes
          map.put("empsData",list);
          //return LVN
          return "employee_report";
      }//method
```

**Limitation ::** The model atttribute give POST mode hander method can nit be accessed in the view comp becoz that model attribute scope requst scope ..But GET mode handler method gets new request becoz redirection happend with browser.
Final Impact :: Report data comes with out add operation messages

**Improved Solution1: (PRG Pattern with Redriect Scope Flash Attributes)**

**In controller class**

```
@PostMapping("/add")
    public String addEmployee(RedirectAttributes attrs,
                              @ModelAttribute("emp") Employee emp) {
        System.out.println("EmployeeOperationsController.addEmployee()");
        //use service
      String result=service.registerEmployee(emp);
      //keep results in model attributes (RedirectAttributes) .
      attrs.addFlashAttribute("resultMsg", result);
      //return LVN
      return "redirect:report";

    }

    public  String  showEmployeeReport(Map<String,Object> map) {
          System.out.println("EmployeeOperationsController.showEmployeeReport()");
           //use serivce
          List<Employee> list=service.getAllEmployees();
          // put the results in model attributes
          map.put("empsData",list);
          //return LVN
          return "employee_report";
      }//method
```

**pro:** RedirectAttributes scope is maintaindata b/w source request and redirected requested (bigger than request scope and smaller than session scope)
**final impact ::** Report data will be placed flash attribute data given POST mode but that will go off from second refresh of report page onwords.

cons

**Improved Solution2: (PRG Pattern with Redriect Scope Flash Attributes)**

==========

**In controller class**

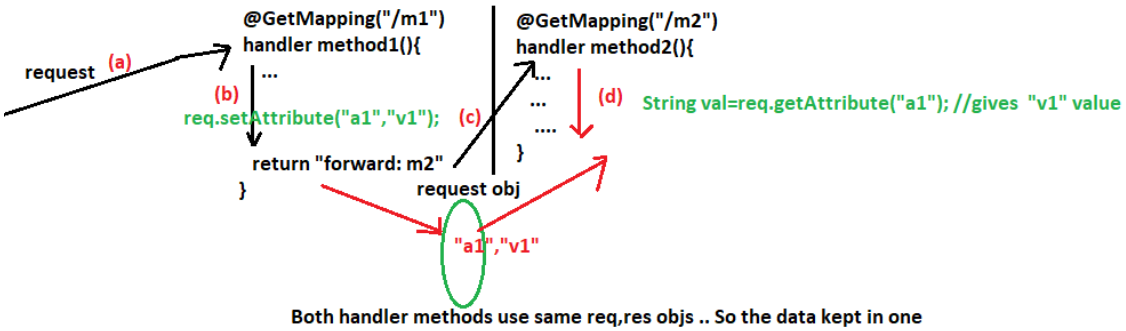
---

```
@PostMapping("/add")
    public String addEmployee(HttpSession ses,
                              @ModelAttribute("emp") Employee emp) {
        System.out.println("EmployeeOperationsController.addEmployee()");
        //use service
      String result=service.registerEmployee(emp);
      //keep results in session attributes
       ses.setAttribute("resultMsg", result);
      //return LVN
      return "redirect:report";

    }

    @PostMapping("/add")
        public String addEmployee(HttpSession ses,
                                  @ModelAttribute("emp") Employee emp) {
            System.out.println("EmployeeOperationsController.addEmployee()");
            //use service
          String result=service.registerEmployee(emp);
          //keep results in session attributes
           ses.setAttribute("resultMsg", result);
          //return LVN
          return "redirect:report";

        }
```

*pros: The Session atttributes data given by Post mapping method will be displayed on the result page will remain on it across the multiple requests becoz its session scope.*

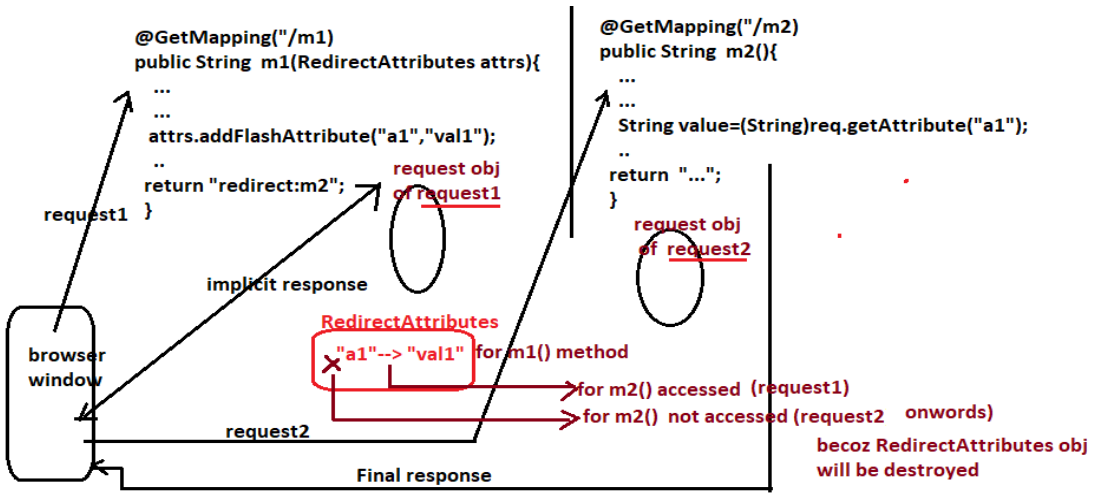
**Q)What is difference among the request attributes scope , Redirect attributes scope and Sesssion Attributes Scope?**

**=>request attributes scope is specific to each request i.e they are visible through out request**



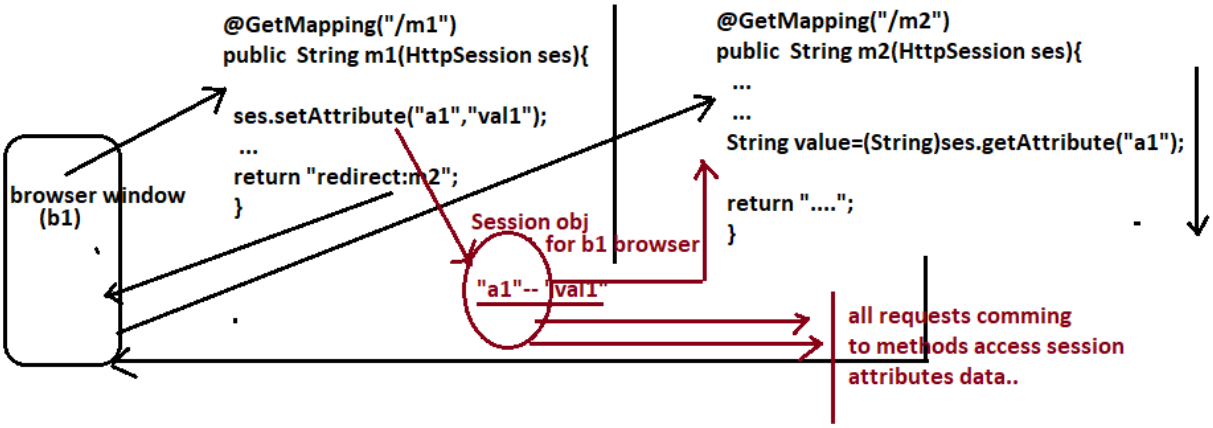

**Both handler methods use same req,res objs .. So the data kept in one req object is visible and accessible in another req object.**

**=>RedirectAtrtibutes Scope Ridrection scope i.e source comp request data can be aaccessed in destination comp after redirecting request**



=> Session attributes scope is session scope i.e specific to each browser s/w

=> Session atrributes data is visible and accessible across the multiple requests that are coming from a browser s/w




Conclusion:: a) request scope :: specific to each request
b) session scope :: specific to each browser s/w
c) Redirection scope :: specifc each redirection activity
right from source request to dest request

---

EmployeeController.java

```
package com.nt.controller;

import java.util.List;
import java.util.Map;

import javax.servlet.http.HttpSession;

import org.springframework.beans.BeanUtils;
import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.stereotype.Controller;
import org.springframework.web.bind.annotation.GetMapping;
import org.springframework.web.bind.annotation.ModelAttribute;
import org.springframework.web.bind.annotation.PostMapping;
import org.springframework.web.bind.annotation.RequestParam;
import org.springframework.web.servlet.mvc.support.RedirectAttributes;

import com.nt.model.Employee;
import com.nt.service.IEmployeeMgmtService;


@Controller
public class EmployeeOperationsController {
	@Autowired
	private IEmployeeMgmtService service;

	@GetMapping("/")
  public String showHome() {
		return "home";
	}
```

```
@GetMapping("/report")
public  String  showEmployeeReport(Map<String,Object> map) {
        System.out.println("EmployeeOperationsController.showEmployeeReport()");
         //use serivce
        List<Employee> list=service.getAllEmployees();
        // put the results in model attributes
        map.put("empsData",list);
        //return LVN
        return "employee_report";
}//method

@GetMapping("/add")
public String showAddEmployeeForm(@ModelAttribute("emp") Employee emp) {
        System.out.println("EmployeeOperationsController.showAddEmployeeForm()");
          emp.setJob("CLERK");  //intial value to display in form comp as initial value
          //return lvn
          return "employee_register";
}

@PostMapping("/add")
public String addEmployee(RedirectAttributes attrs,
                          @ModelAttribute("emp") Employee emp) {
        System.out.println("EmployeeOperationsController.addEmployee()");
        //use service
  String result=service.registerEmployee(emp);
  //keep results in model attributes (RedirectAttributes)
  attrs.addFlashAttribute("resultMsg", result);
  //return LVN
  return "redirect:report";

}

@GetMapping("/edit")
public String  showEditEmployeeForm(@RequestParam("no") int no,
                                    @ModelAttribute("emp") Employee emp) {
       //get Employee details dyamically based on the given emp no
        Employee emp1=service.getEmployeeByNo(no);
        //emp=emp1;
        BeanUtils.copyProperties(emp1, emp);
        //return lvn
        return "employee_edit";
}


      @PostMapping("/edit")
      public String  EditEmployee(@ModelAttribute("emp") Employee emp,
                                  RedirectAttributes attrs) {
            //use  service
             String msg=service.editEmployee(emp);
             //keep results  as flashAttributes attributes in Redirect scope
              attrs.addFlashAttribute("resultMsg", msg);
            //return lvn
              return "redirect:report";
      }


      @GetMapping("/delete")
      public String  deleteEmployee(@RequestParam("no") int no,
                                    RedirectAttributes attrs) {
            //use service
            String msg=service.deleteEmployee(no);
             //keep results in model attributes
              attrs.addFlashAttribute("resultMsg", msg);
            //return lvn
              return "redirect:report";
      }


}//class
```

## Adding Bootstrap support to Project

=>Bootstrap is collection ready made css styles ... which will be used to improve presentation part of the view comps..

=>By importing bootstrap readymade CSS Libraries we can apply ready made css styles to magnify responsiness in the application..

types of CSS (Cascading Styple sheets)

a) inline styles ( can be applied on every tag seperately using style attribute)

b) Embedded styles ( we can prepre sepreate style classes to use them in the page)

c) exteranl styles (we can prepare seperate css files and we and link them with .html , .jsp files to apply the styles)

=>Bootstrap lots extenal styles to apply on our jsp or html tags of view comps.

Procedure to apply bootrap styles on employee_report.jsp

step1) import boostrap css link to employee_report.jsp

in employee_report.jsp

```
<link rel="stylesheet"
    href="https://cdn.jsdelivr.net/npm/bootstrap@5.1.3/dist/css/bootstrap.min.css"/>
```

*collect this from www.bootstrapcdn.com (https://www.bootstrapcdn.com/)*

step2) *collect container styles and apply on whole page using div tag*

```
<div class="container">
  ...
  ....
  ....
  ....
  ....
</div>
```

step3) apply style classes like "table" ,"table-stripped", "table-hover" and etc.. on <table> tag.

```
<div class="container">

<c:choose>
  <c:when test="${!empty empsData}">
   <!-- <table border="1"  class="table table-striped" > -->
    <!--  <table border="1"  class="table table-hover" > -->
    <table border="1"  class="table" >
    <tr class="table-danger">
      <th>EmpNo  </th>
      <th>EmpName </th>
      <th>Job </th>
      <th>Salary</th>
      <th> Operations </th>
    </tr>
```

```
    <c:forEach var="emp" items="${empsData}">
       <tr  class="table-success">
         <td>${emp.empno} </td>
         <td>${emp.ename} </td>
         <td>${emp.job} </td>
        <td>${emp.sal} </td>
        <td><a href="edit?no=${emp.empno}"><img src="images/edit1.png" width="50" height="50"/></a>
                <a onclick="return confirm('Do you want to delete')" href="delete?no=${emp.empno}">
<img src="images/delete1.jpg" width="50" height="50"></a>  </td>
       </tr>
    </c:forEach>
    </table>
  </c:when>
    <c:otherwise>
       <h1 style="color:red;text-align:center"> Records not found </h1>
    </c:otherwise>
</c:choose>

                  <c:if test="${!empty resultMsg}">
                     <h3 style="color:green;text-align:center"> ${resultMsg }</h3>
                  </c:if>

 <br><br>
 <hr>
       <h1 style="text-align:center"><a href="./"><img src="images/home1.png" width="50" height="50">Home</a> </h1>
 <hr>
  <h1 style="text-align:center"><a  href="add"><img src="images/add.png" width="50" height="50"> Add Employee</a>
</h1>
```

## 10 NTSPBMS615- March28th -MiniProject - Form Validations

Form validations in spring boot mvc

=> The process of verifying the pattern and format of the form data is called form validations

=> The difference b/w form validation logic and b.logic is

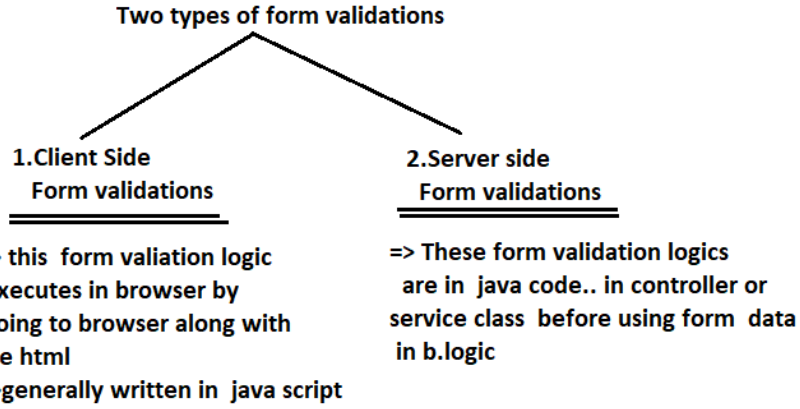
In form validation we verify pattern and format of the data .. where as in b.logic we use form data as inputs to perform calculations and to generate the results

examples for form validation logics

a) name is required
b) address should have minimum of 10 chars
c) age must be numeric value and should be there in the range of 1 through 100 and etc..

examples for b.logics

a) given name is already registered or not ?
b) credit number is valid or not
c) for the given address , product delivery is possible or not




=> The Best pratice for form validations is "write both Client side and server side form validations but enable server side form validations only when Cient side form validations are not done"

## Different approaches of form validations implementation in spring boot mvc application

a) Using Programatic approach (Best)
( we can enable server side form validations only when client side form validations not done)
(Here we take seperate Validator class for validations)

b) Using Annotation driven approach (Not that much recomanded)
(Here Server side form validation will always be applied irrespective of the Client side form validations are performed or not)
Hibernate
(Here we add validation annotation in the Entity /Model class)

## Procedure to apply Programatic form validations on spring boot mvc mini Project

step1) prepare seperate properties file having form validation error messages

validation.properties (com.nt.validations pkg)

```
# Form validation Error message
empname.required=employee name is required
empname.maxlength= employee name can have max of 10 chars
empdesg.required=employee desg is required
empdesg.maxlength= employee desg can have max of 9 chars
empsal.required=employee salary is required
empsal.range= employee salary must be in 1 to 100000 range
```

note:: here keys and values are programmer choice

step2) Configure this properties file in application.properties

In application.properties

```
spring.messages.basename=com/nt/validations/validation
spring.messages.encoding=UTF-8
```

step3) Develope Validator class implementing spring api's Validator(I) and provide form validation logic by overriding validate(-) method

EmployeeValidator.java

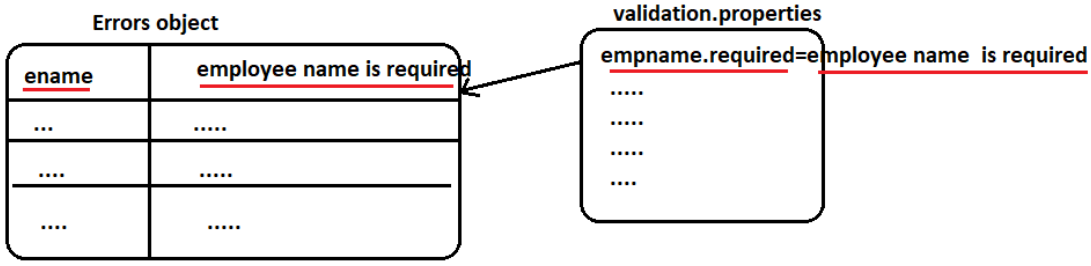
```
package com.nt.validations;

import org.springframework.validation.Errors;
import org.springframework.validation.Validator;

import com.nt.model.Employee;
@Component
public class EmployeeValidator implements Validator {
```

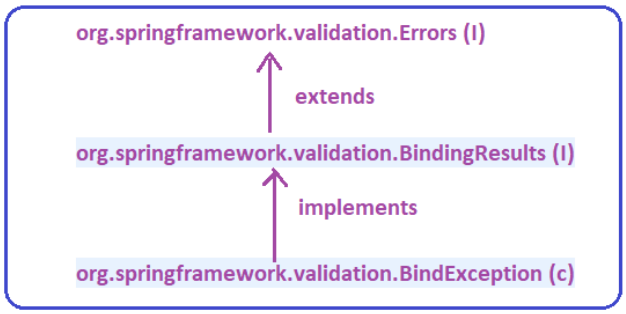
if the supports(-) method returns false then validate(-) will not executed otherwise will be executed

```
@Override
public boolean supports(Class<?> clazz) {
        return clazz.isAssignableFrom(Employee.class);  //checks wheather we are passing
                                                        //correct model class or not
}
```

```
@Override
public void validate(Object target, Errors errors) {
        System.out.println("EmployeeValidator.validate()");
        //type casting
        Employee emp=(Employee)target;
        //form validation logics
          //required rule  ename
        if(emp.getEname()==null || emp.getEname().length()==0 || emp.getEname().equals(""))
            errors.rejectValue("ename","empname.required");
          //max length ename                                  key in the properites file
        else if(emp.getEname().length()>10)
                errors.rejectValue("ename","empname.maxlength");

          //required rule  job
        if(emp.getJob()==null || emp.getJob().length()==0 || emp.getJob().equals(""))
            errors.rejectValue("job","empdesg.required");
          //max length  job
        else if(emp.getJob().length()>9)
                errors.rejectValue("job","empdesg.maxlength");

          //required rule  sal
        if(emp.getSal()==null )
            errors.rejectValue("sal","empsal.required");
        else if(emp.getSal()<1 || emp.getSal()>100000)
                errors.rejectValue("sal","empsal.range");
}

}
```

=>It is recomanded to write seperate validator class  for every Entity class



step4) Inject EmployeeValidator class obj to Controller class and call supports(-) and validate(-,-) method in @PostMapping handlermethods related to addEmployee , Edit Employee operations

In controller class

```
@Controller
public class EmployeeOperationsController {
	@Autowired
	private IEmployeeMgmtService service;
	@Autowired
	private EmployeeValidator  empValidator;

	@GetMapping("/")
  public  String showHome() {
		return "home";
	}

	@GetMapping("/report")
	public  String  showEmployeeReport(Map<String,Object> map) {
		System.out.println("EmployeeOperationsController.showEmployeeReport()");
		 //use serivce
		List<Employee> list=service.getAllEmployees();
		// put the results in model attributes
		map.put("empsData",list);
		//return LVN
		return "employee_report";
	}//method

	@GetMapping("/add")
	public String showAddEmployeeForm(@ModelAttribute("emp") Employee emp) {
		System.out.println("EmployeeOperationsController.showAddEmployeeForm()");
		  emp.setJob("CLERK");  //intial value to display in form comp as initial value
		  //return lvn
		  return "employee_register";
	}

@PostMapping("/add")
public String addEmployee(RedirectAttributes attrs,
                          @ModelAttribute("emp") Employee emp,
                          BindingResult  errors) {
    System.out.println("EmployeeOperationsController.addEmployee()");
    if(empValidator.supports(emp.getClass())) {
        empValidator.validate(emp, errors); //T
        if(errors.hasErrors())
            return "employee_register";
    }
    //use service
  String result=service.registerEmployee(emp);
  //keep results in model attributes (RedirectAttributes)
  attrs.addFlashAttribute("resultMsg", result);
  //return LVN
  return "redirect:report";

}
```

```
@GetMapping("/edit")
public String  showEditEmployeeForm(@RequestParam("no") int no,
                                    @ModelAttribute("emp") Employee emp) {
      //get Employee details dyamically based on the given emp no
       Employee emp1=service.getEmployeeByNo(no);
       //emp=emp1;
       BeanUtils.copyProperties(emp1, emp);
       //return lvn
       return "employee_edit";
}


@PostMapping("/edit")
public String  EditEmployee(@ModelAttribute("emp") Employee emp,
                            RedirectAttributes attrs,
                            BindingResult errors) {
      if(empValidator.supports(emp.getClass())) {
            empValidator.validate(emp, errors); //T
            if(errors.hasErrors())
                  return "employee_edit";
      }
       //use  service
       String msg=service.editEmployee(emp);
       //keep results  as flashAttributes attributes in Redirect scope
        attrs.addFlashAttribute("resultMsg", msg);
       //return lvn
         return "redirect:report";
}


@GetMapping("/delete")
public String  deleteEmployee(@RequestParam("no") int no,
                              RedirectAttributes attrs) {
      //use service
      String msg=service.deleteEmployee(no);
       //keep results in model attributes
        attrs.addFlashAttribute("resultMsg", msg);
      //return lvn
        return "redirect:report";
}


}//class
```

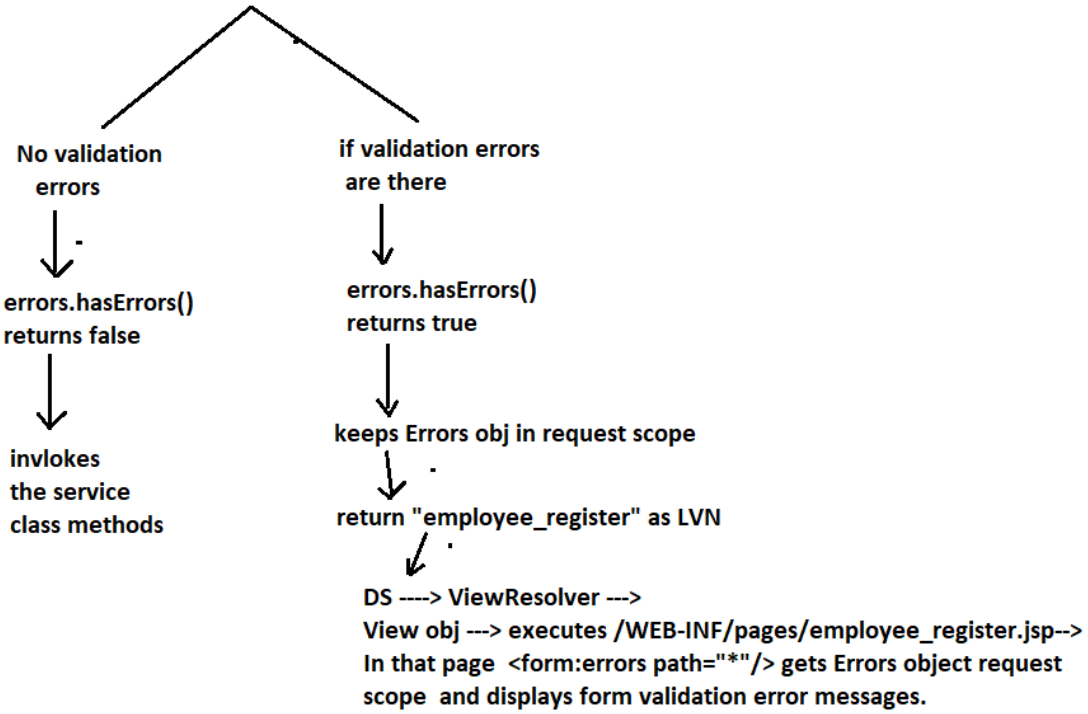
*step5) place <form:errors> tag in employee_register.jsp , employee_edit.jsp pages to display form validation error messages*

*In employee_register.jsp and employee_edit.jsp*

```
<form:form modelAttribute="emp">
    <p style="  color:red;text-align:center">

    <form:errors  path="*"/>

      </p>
```

Flow of execution w.r.t form validations

employee_register.jsp (form page) submission ----> DS ----> HadlerMapping --> gets
addEmployee(RedirectAttributes attrs,
@ModelAttribute("emp") Employee emp,
BindingResult errors) method signature which is havig @PostMapping("/register")-->
DS prepare empty RedirectAttributes obj, writes form data to Employee class obj , create
BindException obj and calls addEmployee(-,-,-) having those objs as the arguments --->
calls vaidator.suppors(-) having Model class name as argument --->
calls validator.validate(-,-) having model class obj and BindException obj(errors) as the argiments




How can we display form validation error messages beside the form comps?
==========
=>use <form:errors> by specifying form comp name in "path" attribute

```
<form:form modelAttribute="emp">

   <table border="1" bgcolor="cyan"  align="center">
     <tr>
       <td> employee name ::  </td>
       <td> <form:input path="ename"/>  <form:errors cssStyle="color:red" path="ename"/>  </td>
     </tr>

     <tr>
       <td> employee desg ::  </td>
       <td> <form:input path="job"/> <form:errors cssStyle="color:red" path="job"/> </td>
     </tr>

     <tr>
       <td> employee salary ::  </td>
       <td> <form:input path="sal"/> <form:errors cssStyle="color:red" path="sal"/>  </td>
     </tr>

     <tr>
       <td colspan="2" align="center"><input type="submit" value="register Employee"/></td>
     </tr>
   </table>
 </form:form>
```

(or)

```
<style media = "all">
    body {
      background-color: pink;
    }
    span {
      color: red;
    }
  </style>
```

```
<h1 style="color:red;text-align:center"> Register Employee </h1>
<form:form modelAttribute="emp">

 <table border="1" bgcolor="cyan"  align="center">
   <tr>
     <td> employee name ::  </td>
     <td> <form:input path="ename"/>  <form:errors  path="ename"/>  </td>
   </tr>

   <tr>
     <td> employee desg ::  </td>
     <td> <form:input path="job"/> <form:errors  path="job"/> </td>
   </tr>
   <tr>
     <td> employee salary ::  </td>
     <td> <form:input path="sal"/> <form:errors  path="sal"/>  </td>
   </tr>

   <tr>
     <td colspan="2" align="center"><input type="submit" value="register Employee"/></td>
   </tr>
 </table>
</form:form>
```

---

**3 types of validation errors in spring mvc /spring boot mvc web application**

==========

(a) form validation errors (discussed above)
(b) typeMimatch errors
(c) Application logic errors

**Procedure to place TypeMist match errors and application logic errors in existing project**

==========

=>typeMisatch errors will be raised if form data binding to Model class obj gives problem like if we try to store string value(form data) to numeric property of model class then we get NumberFormat Exception with other messges which is basically the typemismatch error .. To replce technical message with our choice custom message take the support of "typeMistmatch.<property>" key in the properties file

in validation.properties

```
#typeMismatch error messages   (typeMismatch.<property>= message )
typeMismatch.sal=salary must be numeric value
```

=>small b.logic related rejection error are called application logic errors .. they can be placed in properties with our choice keys and values.

in validation.properties

```
# application logic-error messsages
job.reject=hackers are not allowed to register
```

Code in Controller class Handler methods

```
@PostMapping("/add")
    public String addEmployee(RedirectAttributes attrs,
                              @ModelAttribute("emp") Employee emp,
                              BindingResult  errors) {

        System.out.println("EmployeeOperationsController.addEmployee()");
    //checking for type mismatch errors
        if(errors.hasFieldErrors())
            return "employee_register";

        //checking form validation errors
  if(empValidator.supports(emp.getClass())) {
            empValidator.validate(emp, errors); //T
            if(errors.hasErrors())
                return "employee_register";
        }
      //application logic errors
    if(emp.getJob().equalsIgnoreCase("hacker")) {
     errors.rejectValue("job", "job.reject");
     return "employee_register";
    }

        //use service
      String result=service.registerEmployee(emp);
      //keep results in model attributes (RedirectAttributes)
      attrs.addFlashAttribute("resultMsg", result);
      //return LVN
      return "redirect:report";

    }

    @PostMapping("/edit")
        public String  EditEmployee(@ModelAttribute("emp") Employee emp,
                                    RedirectAttributes attrs,
                                    BindingResult errors) {
          //checking for type mismatch errors
           if(errors.hasFieldErrors())
                return "employee_edit";

           //checking form validation errors
     if(empValidator.supports(emp.getClass())) {
                empValidator.validate(emp, errors); //T
                if(errors.hasErrors())
                    return "employee_edit";
            }
        //application logic errors
      if(emp.getJob().equalsIgnoreCase("hacker")) {
        errors.rejectValue("job", "job.reject");
        return "employee_edit";
      }
           //use  service
           String msg=service.editEmployee(emp);
           //keep results  as flashAttributes attributes in Redirect scope
            attrs.addFlashAttribute("resultMsg", msg);
           //return lvn
            return "redirect:report";
        }
```

## 11 NTSPBMS615- March31st -MiniProject - Form Validations

**Writing Client side form vlaidation logics in the form pages of the Mini Project**

==========

**=>For this it is better to write Java Script code in seperate .js file and link the file in multiple form pages using <script> tag.**

**step1) write JS form validation logics in seperate .js file**

**validations.js (in src/main/webapp/js folder)**

---

```
function validation(frm){
        //empty the error messages
    document.getElementById("enameErr").innerHTML="";
    document.getElementById("jobErr").innerHTML="";
    document.getElementById("salErr").innerHTML="";
   //read form data
    let ename=frm.ename.value;
    let job=frm.job.value;
    let sal=frm.sal.value;
     let flag=true;
   //form validations (client side)
   if(ename==""){  //ename required rule
         document.getElementById("enameErr").innerHTML="employee name is mandatory(cs)";
      flag=false;
    }
  else if(ename.length>10){   //ename -max length rule
         document.getElementById("enameErr").innerHTML="employee name must have max of 10 chars(cs)";
     flag=false;
   }


  if(job==""){   //job -required rule
         document.getElementById("jobErr").innerHTML="employee desg is required(cs)";
     flag=false;
   }
  else if(job.length>9){  //job -max length rule
         document.getElementById("jobErr").innerHTML="employee desg  can hav max 9 characters(cs)";
    flag=false;
  }


  if(sal==""){  //sal required
         document.getElementById("salErr").innerHTML="employee salary is required(cs)";
    flag=false;
  }
 else if(isNaN(sal)){  //sal must be numeric vlaue
         document.getElementById("salErr").innerHTML="employee salary must numberic value(cs)";
     flag=false;
   }
  else if(sal<0 || sal>100000){  //sal -range rule
        document.getElementById("salErr").innerHTML="employee salary must be in the range 1 through 1000000(cs)";
        flag=false;
}


return flag;

}
```

**step2) write the following code in form pages (employee_register.jsp and employee_edit.jsp)**

**employee_register.jsp**

---

```
<%@ page isELIgnored="false"  %>
<%@taglib uri="http://www.springframework.org/tags/form"  prefix="form" %>
```

```
<style media = "all">
      body {
        background-color: pink;
      }
      span {
        color: red;
      }
    </style>

    <script language="JavaScript"  src="js/validations.js">
    </script>

<h1 style="color:red;text-align:center"> Register Employee </h1>
<form:form modelAttribute="emp" onsubmit="return validation(this)">
  <%-- <p style="color:red;text-align:center">
    <form:errors  path="*"/>
  </p>
  --%>
  <table border="1" bgcolor="cyan"  align="center">

    <tr>
      <td> employee name ::  </td>
      <td> <form:input path="ename"/>   <form:errors  path="ename"/> <span id="enameErr"></span></td>
    </tr>

    <tr>
      <td> employee desg ::  </td>
      <td> <form:input path="job"/>  <form:errors  path="job"/> <span id="jobErr"></span></td>
    </tr>

    <tr>
      <td> employee salary ::  </td>
      <td> <form:input path="sal"/>  <form:errors  path="sal"/><span id="salErr"></span></td>
    </tr>

    <tr>
      <td colspan="2" align="center"><input type="submit" value="register Employee"/></td>
    </tr>
  </table>
</form:form>
```

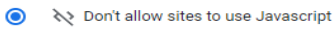
**employee_edit.jsp**

```
<%@ page isELIgnored="false"  %>
<%@taglib uri="http://www.springframework.org/tags/form"  prefix="form" %>
 <h1 style="color:red;text-align:center"> Employee Employee </h1>

  <script language="JavaScript"  src="js/validations.js">
    </script>

 <form:form modelAttribute="emp"  onsubmit="return validation(this)">
 <%-- <p style="color:red;text-align:center">
     <form:errors  path="*"/>
  </p> --%>

  <table border="1" bgcolor="cyan"  align="center">
  <tr>
      <td> employee no ::  </td>
      <td> <form:input path="empno"  readonly="true"/>  </td>
    </tr>

    <tr>
      <td> employee name ::  </td>
      <td> <form:input path="ename"/>  <span id="enameErr"></span></td>
    </tr>
```

```
    <tr>
      <td> employee desg ::  </td>
      <td> <form:input path="job"/>  <span id="jobErr"></span></td>
    </tr>

    <tr>
      <td> employee salary ::  </td>
      <td> <form:input path="sal"/>  <span id="salErr"></span></td>
    </tr>

    <tr>
      <td colspan="2" align="center"><input type="submit" value="Edit Employee"/></td>
    </tr>
  </table>
</form:form>
```

***How to disable java script through chrome settings***

chrome menu button : (three dots) ---> settings ---> search for javascript ---> site settings --->




**How can we diaply fallback message when the java script is disabled using chrome settings?**

**Ans) place <noscript> tag having fallback message**

```
<noscript>
    <h1 style="color:red;text-align:center">Please enable java script </h1>
</noscript>
```

**Enablind Server Side form Validations only when Client Side Form validations are not done**

==========

**=> Send flag to server side form client side indicating wheather client side form validations are done or not .. if done ignore execution of server form validation logics otherwise execute the server side form validation logics.**

**=>we can send the above flag with the support of hidden box having intial value "no" asssuming client side form validations are not done.. for onsubmit event if java script code executed then change that value to "yes" ... Based this hidden box value "yes" or "no" take the decision of executing server side form validation logics.**

**step1) place hidden box in both employee_register.jsp and employee_edit.jsp pages**

```
<form:hidden path="vflag" />
```

***step2) Take property in Model class having name "vflag" with initial value "no"***

*In Employee.java*

---

```
private String vflag="no";
```

***step3) Write code in Java script file /code to change vflag to "yes" indication the client side java script code is executed.***

*In validation.js file*

---

```
// change vflag value to "yes" indicating client side form validations are done
frm.vflag.value="yes";
```

*step4)* ***Add the following code in @PostMapping addEmployee(-,-,-) , editEmployee(-,-,-) methods to enable server side form validations only when client side form validations are not done.***

***In Controller class***

---

```
@PostMapping("/add")
        public String addEmployee(RedirectAttributes attrs,
                                  @ModelAttribute("emp") Employee emp,
                                  BindingResult  errors) {

                System.out.println("EmployeeOperationsController.addEmployee()");
                //enable Server side form validations only when client side form validations are not done
              if(emp.getVflag().equalsIgnoreCase("no")) {
                //checking for type mismatch errors
                 if(errors.hasFieldErrors())
                        return "employee_register";

                 //checking form validation errors
                if(empValidator.supports(emp.getClass())) {
                        empValidator.validate(emp, errors); //T
                        if(errors.hasErrors())
                                return "employee_register";
                  }
                }
             //application logic errors
              if(emp.getJob().equalsIgnoreCase("hacker")) {
               errors.rejectValue("job", "job.reject");
               return "employee_register";
              }
                    //use service
                String result=service.registerEmployee(emp);
                //keep results in model attributes (RedirectAttributes)
                attrs.addFlashAttribute("resultMsg", result);
                //return LVN
                return "redirect:report";
               }

    @PostMapping("/edit")
          public String  EditEmployee(@ModelAttribute("emp") Employee emp,
                                      RedirectAttributes attrs,
                                      BindingResult errors) {
              if(emp.getVflag().equalsIgnoreCase("no")) {
                    //checking for type mismatch errors
                     if(errors.hasFieldErrors())
                            return "employee_edit";

               //checking form validation errors
          if(empValidator.supports(emp.getClass())) {
                    empValidator.validate(emp, errors); //T
                    if(errors.hasErrors())
                          return "employee_edit";
              }
          }//if
 //application logic errors
if(emp.getJob().equalsIgnoreCase("hacker")) {
   errors.rejectValue("job", "job.reject");
   return "employee_edit";
}
        //use  service
         String msg=service.editEmployee(emp);
         //keep results  as flashAttributes attributes in Redirect scope
          attrs.addFlashAttribute("resultMsg", msg);
        //return lvn
          return "redirect:report";
  }
```

**To make vflag property of Entity class not participating in any persistence activitu use @TRansient on the top of property**

**In Employee.java**

---

```
@Transient
private  String vflag="no";
```

## soft deletion vs hard deletion

**Hard deletion :: Deleting the record of the db table perminently is called hard deletion**

-> removing product from inventory/catalog
-> removing items added to Shoppring cart
-> Removing cards added for the payment

**Soft deletion ::Not Physically deleting the record from db table .. but marking the record as not avaiable record or not active record is called soft deletion**

=> closing bank account , employee regignation , patient discharge and etc..

**=>For this in JPA , we have @SQLXxx annotation are given to execute custom query for standard persistence operations.. The annotations are**

**@SQLInsert :: we can place custom query form standard save(-) method (insert operation)**

**@SQLDelete :: we can place custom query from standard delete(-) method**

**@SQLUpdate :: we can place custom query for standard save(-) method (update operation)**

**and etc..**

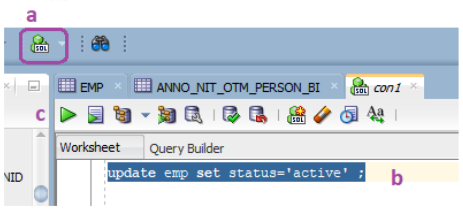
**=>using @SQLDelete(-) we execute update query for repo.delete(-) method which changes the status of record to inactive.. This is nothing but soft deletion**
**=>But inacive status records should not participate in report generation select operation for that we need need @Where to form global implicit condition to filter softetly deleted records from queries exeution.**

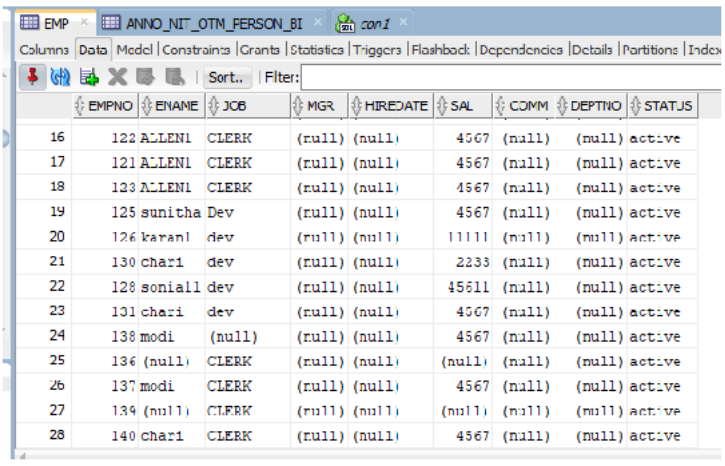
### Example App

==========

**step1) add addtional "status" column in emp db table and place default "active" for all records**

| PK | Name | Data Type | Size | Not Null | Default |
|---|---|---|---|---|---|
| | EMPNO | NUMBER | 4 | ☑ | |
| | ENAME | VARCHAR2 | 10 | ☐ | |
| | JOB | VARCHAR2 | 9 | ☐ | |
| | MGR | NUMBER | 4 | ☐ | |
| | HIREDATE | DATE | | ☐ | |
| | SAL | NUMBER | 7 | ☐ | |
| | COMM | NUMBER | 7 | ☐ | |
| | DEPTNO | NUMBER | 2 | ☐ | |
| | STATUS | VARCHAR2 | 10 | ☐ | |




| | EMPNO | ENAME | JOB | MGR | HIREDATE | SAL | COMM | DEPTNO | STATUS |
|---|---|---|---|---|---|---|---|---|---|
| 16 | 122 | ALLEN1 | CLERK | (null) | (null) | 4567 | (null) | (null) | active |
| 17 | 121 | ALLEN1 | CLERK | (null) | (null) | 4567 | (null) | (null) | active |
| 18 | 123 | ALLEN1 | CLERK | (null) | (null) | 4567 | (null) | (null) | active |
| 19 | 125 | sunitha | Dev | (null) | (null) | 4567 | (null) | (null) | active |
| 20 | 126 | karan1 | dev | (null) | (null) | 11111 | (null) | (null) | active |
| 21 | 130 | chari | dev | (null) | (null) | 2233 | (null) | (null) | active |
| 22 | 128 | soniall | dev | (null) | (null) | 45611 | (null) | (null) | active |
| 23 | 131 | chari | dev | (null) | (null) | 4567 | (null) | (null) | active |
| 24 | 138 | modi | (null) | (null) | (null) | 4567 | (null) | (null) | active |
| 25 | 136 | (null) | CLERK | (null) | (null) | (null) | (null) | (null) | active |
| 26 | 137 | modi | CLERK | (null) | (null) | 4567 | (null) | (null) | active |
| 27 | 139 | (null) | CLERK | (null) | (null) | (null) | (null) | (null) | active |
| 28 | 140 | chari | CLERK | (null) | (null) | 4567 | (null) | (null) | active |

**step2)** place @SQLDelete having update query that makes status col value as inactive value for delete operation

Also palce @Where annotation having status (which is global implicit condition)

*SQL Queries*

```
@Entity
@Table(name="emp")
@SQLDelete(sql = "UPDATE EMP SET STATUS='inactive' WHERE EMPNO=?")
@Where(clause = "STATUS <> 'inactive' ")
@Data
public class Employee  implements Serializable {
	@Id
	@SequenceGenerator(name = "gen1",sequenceName = "emp_id_seq",allocationSize = 1, initialValue = 1)
	@GeneratedValue(generator = "gen1",strategy = GenerationType.SEQUENCE)
	private Integer empno;
	@Column(length = 20)
	private  String ename;
	@Column(length = 20)
	private  String  job;
	private   Float sal;
	@Transient
	private  String vflag="no";
}
```

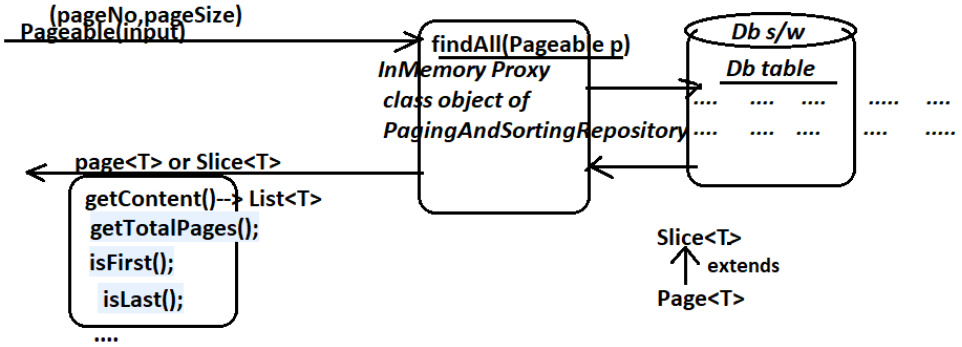
***step3) execute the application.***

*Spring Boot MVC with spring data jpa Pagination*

NOTE:: if one Project demands both soft deletion and hard deletion then use @SQLDelete(-) , deletById(-) methods of for softdeletion by having update query. So go for HQL/JPQL delete for hard deletion operation

```
Page<T> findAll(Pageable pageable);   (PagingAndSortingRepository)
```

*=> This methods takes pageNo(0 based),pageSize as inputs in the form of Pageable obj and returns output as Page<T> /Slice<T> obj having requested page records , pages count , current numbers ,total records and etc..*




if total records count is 20 .. and pagesize is 5 then it gives 20 records in to 4 pages(5,5,5,5).. if we ask for 3 page (indirectly 4 page) records then it gives 16 to 20 records. if ask for 2nd page (indirectly 3 page) recors then it gives 11 to15 records.

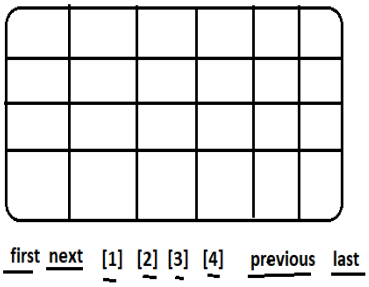
```
Pageable pageable=PageRequest.of(2,5);
```

note:: Pageable object can have both Paging and Sorting info

*=> DispatcherServlet can prepare Pageable object and can give as handler method arg value if the parameter type is Pageable ... In this process it prepares that Pageable object having pageNo , pageSize gathered from the request parameters "page" ,"size".*
*=>We can give default pageNo, pageSize to the Pageable object of Handler method parameter using @PageableDefault annotation as shown below*

```
@GetMapping("/emp_report")
    public String showEmployeeReport(
        @PageableDefault(page=0,size=3,sort="job",direction=Sort.Direction.ASC) Pageable pageable,
        Map<String,Object> map) {

    }
```

Report havin pagination..



| EmpNo | EmpName | Job | Salary | Operations |
|---|---|---|---|---|
| 120 | ALLEN1 | CLERK | 4567.0 |  |
| 7934 | MILLER | CLERK | 1300.0 |  |
| 7876 | ADAMS | CLERK | 1100.0 |  |

previous first [1] [2] [3] [4] [5] [6] [7] [8] [9] Last next

**steps for coding**

==========

**step1) Add pagingation related report method in service interface and ins service impl class**

**In service Interface**

```
public Page<Employee> getEmployeesPageData(Pageable pageable);
```

**In service Impl class**

```
@Override
    public Page<Employee> getEmployeesPageData(Pageable pageable) {
        Page<Employee> page=empRepo.findAll(pageable);
         return page;
    }
```

**step3) place the following handler method in controller class**

```
@GetMapping("/report")
    public String showEmployeeReport(@PageableDefault(page=0,size=3,sort = "job",direction =Sort.Direction.ASC ) Pageable pageable,
                                     Map<String,Object> map) {
        System.out.println("EmployeeOperationsController.showEmployeeReport()");
         //use serivce
        Page<Employee> page=service.getEmployeesPageData(pageable);
        // put the results in model attributes
        map.put("empsData",page);
        //return LVN
        return "employee_report";
    }//method
```

**step3) Write the following code in employee_report.jsp**

```
<%@ page isELIgnored="false" %>
<%@taglib uri="http://java.sun.com/jsp/jstl/core" prefix="c"%>

<link rel="stylesheet"
    href="https://cdn.jsdelivr.net/npm/bootstrap@5.1.3/dist/css/bootstrap.min.css"/>

<div class="container">

<c:choose>
  <c:when test="${!empty empsData.getContent()}">
   <!-- <table border="1" class="table table-striped" > -->
    <!-- <table border="1" class="table table-hover" > -->
    <table border="1" class="table" >
    <tr class="table-danger">
      <th>EmpNo </th>
      <th>EmpName </th>
      <th>Job </th>
      <th>Salary</th>
      <th> Operations </th>
    </tr>
    <c:forEach var="emp" items="${empsData.getContent()}">
       <tr class="table-success">
         <td>${emp.empno} </td>
         <td>${emp.ename} </td>
         <td>${emp.job} </td>
        <td>${emp.sal} </td>
        <td><a href="edit?no=${emp.empno}"><img src="images/edit1.png" width="50" height="50"/></a>
                <a onclick="return confirm('Do you want to delete')" href="delete?no=${emp.empno}"><img src="images/delete1.jpg" width="50" height="50"></a> </td>
       </tr>
    </c:forEach>
    </table>
```

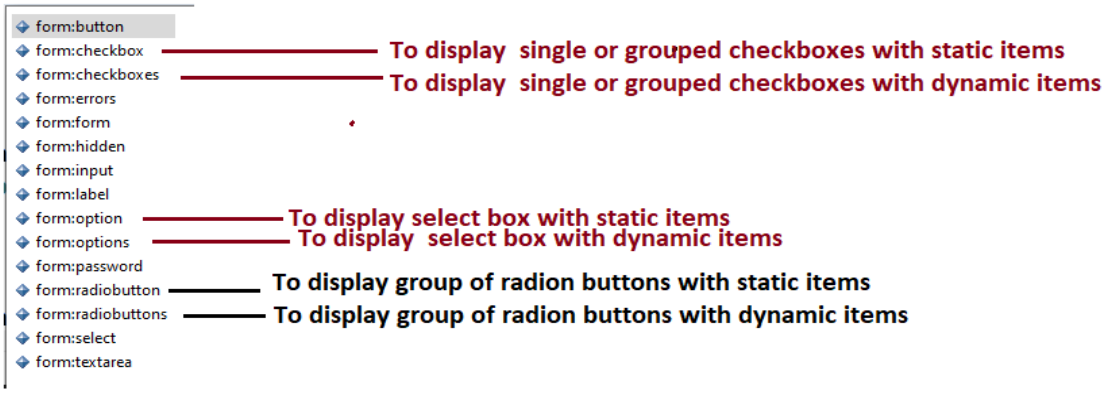
```
    <p  style="text-align:center">
    <c:if test="${empsData.hasPrevious()}">
      <a href="report?page=${empsData.getPageable().getPageNumber()-1}"> previous </a>     
    </c:if>
    <c:if test="${!empsData.isFirst()}">
      <a href="report?page=0">first</a>     
    </c:if>

        <c:forEach var="i" begin="1" end="${empsData.getTotalPages()}" step="1">
            [<a href="report?page=${i-1}">${i}</a>]    
        </c:forEach>

    <c:if test="${!empsData.isLast()}">
      <a href="report?page=${empsData.getTotalPages()-1}">Last</a>     
    </c:if>


     <c:if test="${empsData.hasNext()}">
        <a href="report?page=${empsData.getPageable().getPageNumber()+1}"> next </a>
     </c:if>
    </p>

  </c:when>
    <c:otherwise>
      <h1 style="color:red;text-align:center"> Records not found </h1>
    </c:otherwise>
</c:choose>

                <c:if test="${!empty resultMsg}">
                   <h3 style="color:green;text-align:center"> ${resultMsg }</h3>
                </c:if>

 <br><br>
 <hr>
      <h1 style="text-align:center"><a href="./"><img src="images/home1.png" width="50" height="50">Home</a> </h1>
 <hr>
  <h1 style="text-align:center"><a  href="add"><img src="images/add.png" width="50" height="50"> Add Employee</a> </h1>
</div>
```

## 13 NTSPBMS615- ReferenceData - April4th

- **Reference Data generation using @ModelAttribute(-) for select box , list box , group checkboxes and grouped radion buttons**

---

**spring mvc form tag library tags**




| Component in form page | property type in Model class |
|---|---|
| 1) select box (allows single item selection) | String |
| 2) List box (Allows to select multiple items) | String[] or java.util.List or java.util.Set |
| 3) Single checkbox (allows to select or deselected) | String |
| 4) Group checkboxes (allow to select/deselect bunch of items) | String[] or java.util.List or java.util.Set |
| 5) Grouped Radio Buttons ( allows to select one radion button at a time) | String |

=> if want to get initial value for text box or password box we can do that work from Model class properties by assinging initial values.

name :: <form:input path="name"/>

name :: raja

In Model class

```
private  String name="raja";
```

=>For List Box ,select box ,grouped checkboxes, grouped radio buttons  if want to get their all items  dynamically from Db s/w then we can not dependent on putting those values to the model class properties.

In form page

```
<form:select  path="language">

</form>
```

In Model class

```
String language="hindi";
```

=>For these special 4 comps we need to take the support of reference Data constructed by @ModelAttribute(-)  to put  data into elements dynamically

@ModelAttribute(-) is multiple pupose annotations

a) To bind from data into  Model class object  (data binding)

b)  To create dyanmic data as the reference data required for the  special 4 comps (making reference data as  special 4 comps dynamic element values)

use-cases ::  a)  displaying all countries to select box by collecting from DB m service class

b) displaying all languages to select box by collecting from DB or service class

c) displaying all hobies to grouped checkboxes by collecting from DB or service class

d) displaying all IT courses to the ListBox by collecting  them from DB or service class

To consturct  addtional reference required for 4 comps we need to use @ModelAttribute(-) method in controller class having the following syntax

Giving addtional reference data required for the select box

In controller class

```
@ModelAttribute("countriesInfo")
public  List<String>  populateCountries(){
   ...
   ... //logic to get countries  dyamically from DB  or service class
   ..
}
```

must match

In form page

```
<form:select path="country">
  <form:options  items="${countriesInfo}"/>
</form:select>
```

In Model class

```
private   String   country="india";  //becomes  default item that is selected.
```

Locale  means  language +country

eg:: en-US

fr-FR

de-DE

fr-CA (french as it speaks in candata)

hi-IN

en-IN  (english as it speaks in India)

## Example App  displaying  select box with  dyamic countries with the support of  reference data using @ModelAttribute(-)

step1)  Add the following code  in service Inteface , service Impl class to  get all countries dyamically with the support of Locale API (java.util pkg)

In service Interface

```
public Set<String> getAllCountries();
```

**In service Impl class**

---

```
@Override
    public Set<String> getAllCountries() {
        // get All Locales of the world
        Locale locales[]=Locale.getAvailableLocales();
        Set<String> countrySet=new TreeSet();
        for(Locale l:locales) {
            if(l!=null)
              countrySet.add(l.getDisplayCountry());
        }
        return countrySet;
    }//method
```

**step3) place @ModelAttribute(-) method in Controller class invoking the service class method**

```
@ModelAttribute("countriesInfo")
    public Set<String> populateCountries(){
        System.out.println("EmployeeOperationsController.populateCountries()");
        //use service
        Set<String> countrySet=service.getAllCountries();
        return countrySet;
    }
```

*This method will be called by for every GET ,POST mode request and makes the returned Collection data as the reference data in request scope having given name "countriesInfo" as the attribute name*

***step4) add addtional comp in the form page of type select box by making reference data as select box items data..***

*In employee_register.jsp*

---

```
<tr>
    <td> select counstry :: </td>
    <td><form:select path="country">
            <form:options items="${countriesInfo}"/>
        </form:select>
    </td>
</tr>
```

*form comp name*

*Model attribute name (reference attribute name)*

**step5) take addtional attribute in model class to hold default item for the the above select box and also hold the selected item as part of data binding.**

```
@Entity
@Table(name="emp")
@SQLDelete(sql = "UPDATE EMP SET STATUS='inactive' WHERE EMPNO=?")
@Where(clause = "STATUS <> 'inactive' ")
@Data
public class Employee  implements Serializable {
    @Id
    @SequenceGenerator(name = "gen1",sequenceName = "emp_id_seq",allocationSize = 1, initialValue = 1)
    @GeneratedValue(generator = "gen1",strategy = GenerationType.SEQUENCE)
    private Integer empno;
    @Column(length = 20)
    private  String ename;
    @Column(length = 20)
    private  String  job;
    private   Float sal;
    private  String status="active";
    @Transient
    private  String vflag="no";
    private String country="India";

}
```

**Q) In Spring MVC tags , what is difference b/w <form:option> tag and <form:options> tag?**

## 14 NTSPBMS615- ReferenceData -Selecting item in one select box to get items in another select box - April5th

**Getting states into one SelectBox based on country from another SelectBox Box?**

select country :: [ india ]

select state :: [ AP ]
TS
MH
..
..

---

=>There is no pre-defined class to get states based on the select country .. So we need to maintain either in properties file or DB or RestAPI comp.
(eg: ApiGee)

**step1) add states of India , UnitedStates in properties file manually**

In application.properties

```
# Add Sates for countries
India=AP,TS,MH,OD,TN,KR,MP,UP,BR,DL,WB,RJ,JH,AS,PB,KL,CH,GA,JK,NL,UK,MZ,MN,LD,HR,HP,DD,GJ,PY,AN
United\u0020States=LA,KY,NY,KS,LA,ME,MD,MA,MI,MN,MS,AS,WS,CA,WD,AK,GA,TS,AR,OR,AL,VT,WY,DE,HI,ID,IA,NV,OK,SC,SD,RI,PA,WI
```

*space in unicode char set*

**step2) add the following code in serivce Interface and service Impl class**

In service Interface

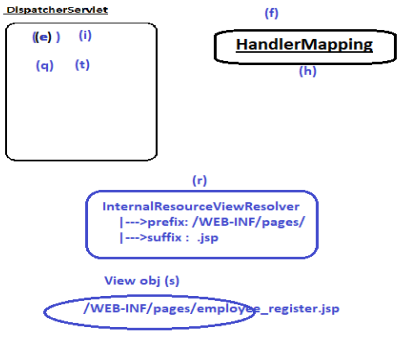
```
public List<String> getStatesByCountry(String country);
```

In service Impl class

```
@Override                                   (l)
public List<String> getStatesByCountry(String country) {
    // get states of a country through Environment obj
    String statesInfo=env.getRequiredProperty(country);
    //convert comma seperated values into List colelction using "," as delimeter
     List<String> statesList=Arrays.asList(statesInfo.split(","));
     // sort collection   (natural sorting)
      Collections.sort(statesList);
      return statesList;   (m)
}
```

**step3) Add "state" property in Model class**

```
@Entity
@Table(name="emp")
@SQLDelete(sql = "UPDATE EMP SET STATUS='inactive' WHERE EMPNO=?")
@Where(clause = "STATUS <> 'inactive' ")
@Data
public class Employee implements Serializable {
    @Id
    @SequenceGenerator(name = "gen1",sequenceName = "emp_id_seq",allocationSize = 1, initialValue = 1)
    @GeneratedValue(generator = "gen1",strategy = GenerationType.SEQUENCE)
    private Integer empno;
    @Column(length = 20)
    private String ename;
    @Column(length = 20)
    private String job;
    private Float sal;
    private String status="active";
    @Transient
    private String vflag="no";
    private String country="India";
    private String state;
}
```




**step4) add the following employee_register.jsp (java script code + spring mvc tags code)**

In *employee* register.jsp

```
<script language="JavaScript">   (c)
    function sendReqForStates(frm){
      frm.action="statesurl"  //request path for handler method
      frm.submit();  //submits the request
    }          (d)

  </script>

 <tr>
   <td> select country :: </td>                    (b)
   <td><form:select path="country" onchange="sendReqForStates()">
          <form:options items="${countriesInfo}"/>
     </form:select>                  select_UnitedStates  (a)
   </td>
 </tr>

 <tr>
   <td> select state :: </td>
   <td><form:select path="state">                                    (u)
          <form:options items="${statesInfo}"/>
     </form:select>                  Model attribute name having states Info
   </td>
 </tr>
```

**step4) add the following addtional handler method in controller class**

```
@PostMapping("/statesurl")      (j)
    public String  showStatesByCountry(@RequestParam("country") String country,
                                       @ModelAttribute("emp") Employee emp,
                                       Map<String,Object> map ) {
        //use service
(n)     List<String> statesList=service.getStatesByCountry(country);   (k)
        // put statesList in model attribute
        map.put("statesInfo", statesList);   (o)
        //return LVN of form page
        return "employee_register";   (p)

    }
```

(g)

What is the difference between <form:options> and <form:option>?

Ans) <form:option> for aadding static items select box or list box

```
<form:select path="country">
   <form:option value="india">India</form:option>
   <form:option value="China">China</form:option>
   ....
   ...
</form:select>
```

<form:options> tag is given to add items to select box /list box dyamically by getting them from Model attributes of any form

In form page

```
<tr>
    <td> select country ::  </td>
    <td><form:select path="country" onchange="sendReqForStates()">
            <form:options items="${countriesInfo}"/>
        </form:select>
    </td>
</tr>
```

*In controller class*

```
@ModelAttribute("countriesInfo")
    public Set<String>  populateCountries(){
        System.out.println("EmployeeOperationsController.populateCountries()");
        //use service
        Set<String> countrySet=service.getAllCountries();
        return countrySet;
    }
```

==========
Assignment
==========

add following comps with dynamic data using reference data concept

(a) grouped radio buttons having gender info
(b) grouped checkboxes having hobies info
(c) List box having courses to select

## 15 NTSPBMS615- Spring Boot MVC -Init Binder -April6th

InitBinder in spring MVC /Spring boot MVC

==========

=>In spring we use the support of PropertyEditors to convert given String values to different types of required value before performing injection or binding.

=> All PropertyEditors are classes implementing PropertyEditor(I) directtly or indirectly

=> Spring gives multiple Built-in PropertyEditors

| | |
|---|---|
| ByteArrayPropertyEditor | LocaleEditor |
| CharacterEditor | PathEditor |
| CharArrayPropertyEditor | PatternEditor |
| CharsetEditor | PropertiesEditor |
| ClassArrayEditor | ReaderEditor |
| ClassEditor | ResourceBundleEditor |
| CurrencyEditor | StringArrayPropertyEditor |
| CustomBooleanEditor | StringTrimmerEditor |
| CustomCollectionEditor | TimeZoneEditor |
| CustomDateEditor | URIEditor |
| CustomMapEditor | URLEditor |
| CustomNumberEditor | UUIDEditor |
| FileEditor | ZoneIdEditor |
| InputSourceEditor | |

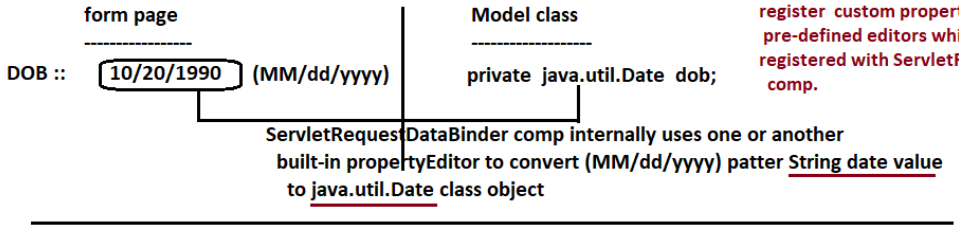
s are

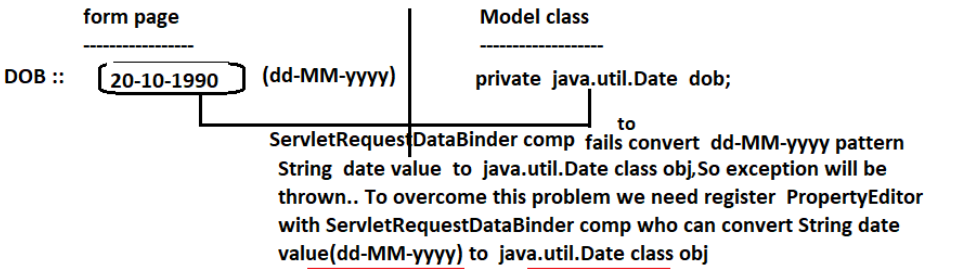
=>Most of these propertyeditor automatically registered with IOC container and will be used internally towards data injection or data binding process.

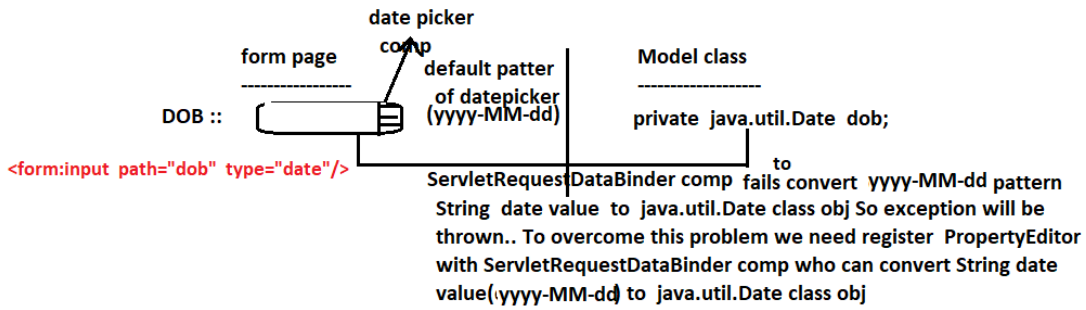
java.lang.Object
org.springframework.validation.DataBinder
org.springframework.web.bind.WebDataBinder
org.springframework.web.bind.ServletRequestDataBinder

=> DispatcherServlet intenrally uses ServletRequestDataBinder comp to perform data binding activity that is writing form data to Model class object properties. This binder comp internally uses multiple registered Property editor to convert form comps supplied string input values to different types values as required for the Model class object proeprties.

DS uses ServeltRequestDataBinder for data binding activity.. So we need register custom propertyeditors or pre-defined editors which are not already registered with ServletRequestDataBinder comp.



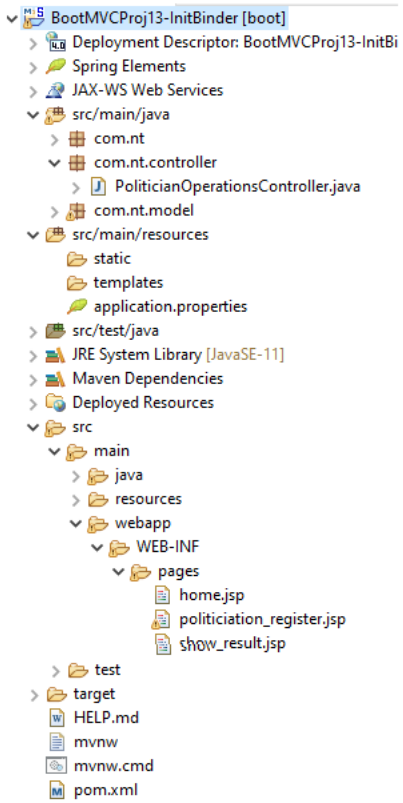



note:: To register PropertyEditors (ready made or custom ) with ServletRquestDataBinder comp we need to use @InitBinder methods..

```
@InitBinder
public void myBinder(WebDataBinder binder){
binder.registerCustomEditor(-,-,-);
}
```

note:: @ModelAttribute(-) method (reference data method) executes every time form launch
note: @InitBinder method executes for each form lanuch and form sumission

=>CustomDateEditor is pre-defined PropertyEditor that takes given SimpleDateFromat obj's date pattern ..converts String date value that is given in the specified pattern to java.util.Date class obj




**home.jsp**

```
<h1 style="color:red;text-align:center"><a href="register"> Register Politician</a></h1>
```

***Model class***

```
package com.nt.model;

import java.util.Date;

import lombok.Data;

@Data
public class PoliticianProfile {
        private Integer pid;
        private String pname;
        private  String party;
        private  Date  dob=new Date(100,0,01);
        private  Date  doj;
        private  boolean consPost=false;

}
```

```
//controlelr clss

package com.nt.controller;

import java.text.SimpleDateFormat;

import org.springframework.beans.propertyeditors.CustomDateEditor;
import org.springframework.stereotype.Controller;
import org.springframework.web.bind.WebDataBinder;
import org.springframework.web.bind.annotation.GetMapping;
import org.springframework.web.bind.annotation.InitBinder;
import org.springframework.web.bind.annotation.ModelAttribute;
import org.springframework.web.bind.annotation.PostMapping;

import com.nt.model.PoliticianProfile;
```

```java
@Controller
public class PoliticianOperationsController {

	@GetMapping("/")
	public  String  showHome() {
		System.out.println("PoliticianOperationsController.showHome()");
		 //return lvn
		return "home";
	}


	@GetMapping("/register")
	public   String showFormPage(@ModelAttribute("pp") PoliticianProfile profile) {
		System.out.println("PoliticianOperationsController.showFormPage()");
		//return LVN
		return  "politiciation_register";
	}

	@PostMapping("/register")
	public  String   registerPolitician(@ModelAttribute("pp") PoliticianProfile profile) {
		System.out.println("PoliticianOperationsController.registerPolitician()");
		System.out.println("model class obj data::"+profile);
		//by invoking service class .. u can execute b.logic

		return "show_result";
	}

	@InitBinder
	public  void  myDateBinder(WebDataBinder binder) {
		System.out.println("PoliticianOperationsController.myDateBinder()");
		SimpleDateFormat sdf=new SimpleDateFormat("yyyy-MM-dd");
		binder.registerCustomEditor(java.util.Date.class, new CustomDateEditor(sdf, true));
	}

}
```

*form page*

```jsp
<%@ page isELIgnored="false"%>
<%@taglib uri="http://www.springframework.org/tags/form"  prefix="form"%>

<h1 style="color:red;text-align:center">Politician Registration</h1>

<form:form method="POST" modelAttribute="pp">
  <table border="0" bgcolor="cyan" align="center" >
    <tr>
     <td> Policitiiation name::   </td>
     <td><form:input path="pname"/> </td>
    </tr>

    <tr>
     <td> Policitiiation Party Name::   </td>
     <td><form:input path="party"/> </td>
    </tr>

    <tr>
     <td> Policitiiation DOB::   </td>
     <td><form:input path="dob"  type="date"/> </td>
    </tr>
    <tr>
     <td> Policitiiation DOJ::   </td>
     <td><form:input path="doj"  type="date"/> </td>
    </tr>
     <tr>
     <td>Has ConstitutionPost?::   </td>
     <td>  <form:radiobutton  path="consPost"  value="true" /> yes   
           <form:radiobutton  path="consPost"  value="false" /> no
      </td>
    </tr>
    <tr>
     <td colspan="2"> <input type="submit"  value="register"> </td>
    </tr>
  </table>

</form:form>
```

show_result.jsp

```jsp
<%@page isELIgnored="false" %>

 <b><i> Model class obj data is :: ${pp}</i></b>
 <br>
 <a href="./">home</a>
```

## 16 NTSPBMS615- Spring Boot MVC -Handler Interceptor -April 8th

**Handler Interceptor**
==========

=> This comp logic can be added to controller comp as the extension hook logic ... which can be executed as pre , post and after logics with respect to controller classes execution

=> These are like servlet filter comps .. but servlet filter comps allows us to add only pre ,post request processisng logics with respect to other web comps of the web application where as HandlerInterceptor allows us to add pre,post, after logics with respect to controller classes.

=> To develop Handler Interterceptor for Controller class we need to take a class implementing HandlerInteceptor (I) which is having 3 methods (java 8 interface having all the 3 methods as the default methods)

```
default void        postHandle(HttpServletRequest request, HttpServletResponse response, Object handler, ModelAndView modelAndView)
                    Interception point after successful execution of a handler.
```

usecase :: sending addional model data having system date,time and etc..

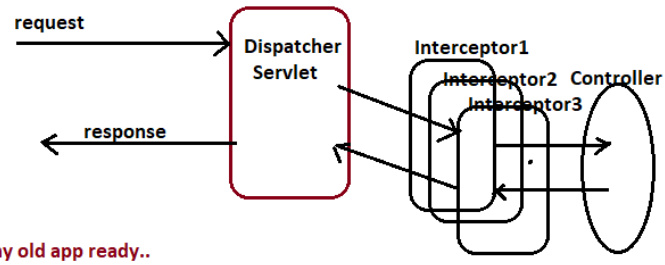
```
default boolean     preHandle(HttpServletRequest request, HttpServletResponse response, Object handler)
                    Interception point before the execution of a handler. (controller)
```

usecase:: time checking (trading b/w 9am to 3pm) , allowing requests only from certain browser and etc..

```
default void        afterCompletion(HttpServletRequest request, HttpServletResponse response, Object handler, Exception ex)
                    Callback after completion of request processing, that is, after rendering the view.
```

usecase : Nullifying request attributes ,session attributes and etc..

=>Since all the 3 methods are default methods.. So we can overide only those methods in which we are intrested in




if multiple interceptors are applied on the same controller class then trap request in certain order before going to controller.. but they trap response in revers order while leaving the controller (1,2,3) (3,2,1)

Example App
==========

step1) Keep any old app ready..

(BootMVCProj14-WishMessageApp-HandlerInterceptor)

step2) Develop Handler Interceptor class.

TimeCheckInterceptor.java

```
import java.time.LocalDateTime;

import javax.servlet.RequestDispatcher;
import javax.servlet.http.HttpServletRequest;
import javax.servlet.http.HttpServletResponse;

import org.springframework.web.servlet.HandlerInterceptor;

public class TimeCheckInterceptor implements HandlerInterceptor {

    @Override
    public boolean preHandle(HttpServletRequest req, HttpServletResponse res, Object handler)
            throws Exception {
        System.out.println("TimeCheckInterceptor.preHandle()");
        // get System date and time
        LocalDateTime ldt=LocalDateTime.now();
        //get current hour of the day
        int hour=ldt.getHour();
        if(hour<9 || hour>17 ) {

        RequestDispatcher rd=req.getRequestDispatcher("/timeout.jsp");
        rd.forward(req, res);
        return false;
    }
    return true;

    }
}
```

*step4) place timeout.jsp page in src/main/web app folder*

*timeout.jsp*

```
<%@ page isELIgnored="false" %>

<h1 style="color:red;text-align:center"> Trading timing are 9am to  5pm</h1>

<a href="./">home</a>
```

*step5) Register Interceptor with Inteceptor registry by Web MVC configurer class as spring bean*

*MyWebMVCConfigurer.java*

```
package com.nt.config;

import org.springframework.stereotype.Component;
import org.springframework.web.servlet.config.annotation.EnableWebMvc;
import org.springframework.web.servlet.config.annotation.InterceptorRegistry;
import org.springframework.web.servlet.config.annotation.WebMvcConfigurer;

import com.nt.interceptor.TimeCheckInterceptor;


@Component
public class MyWebMVCConfigurer implements WebMvcConfigurer {

	@Override
	public void addInterceptors(InterceptorRegistry registry) {
		System.out.println("MyWebMVCConfigurer.addInterceptors()");
	 registry.addInterceptor(new TimeCheckInterceptor());
	}

}
```

## 17 NTSPBMS615- Spring Boot MVC -I18n -April 10th

=>In servlet ,jsp based web application we take the support servlet filters to add pre-request processing and post response generation logics

=>In Spring MVC,spring boot MVC web applications we take the support of Handler interfaceptors to pre ,post after completion logics.

==========
I18n in spring boot MVC application
==========
I18n :: Internationlization (I 18 letters n)

=> Making our app working for different Locales is called enabling I18n on the application
=> Locale means language + country
eg:: en-US (english as it speaks in USA)
fr-FR (french as it speaks in France)
hi -IN (hindi as it speaks in India)
fr- CA (french as it speaks in Canada)
and etc..

=>By enabling I18n on the web application we can change the following presentations according to the Locale that is chosen

a) Presentation Lables
b) Date patterns
c) Time patterns
d) Number formats

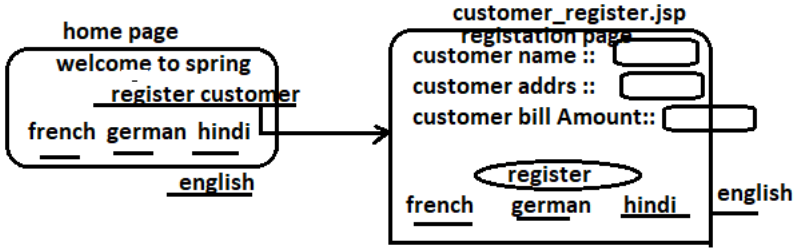
e) Currency Symbols
f) Content indentation ( most of languages left to right
but urdu,arabic and etc.. right to left)
and etc..

eg: google home page , gmail inbox page , youtube , facebook,amazon and etc..

=> By adding I18n support we can sell our software products to more clients .. if they are web applications then we can attract more customer belonging different coutries and localaties.

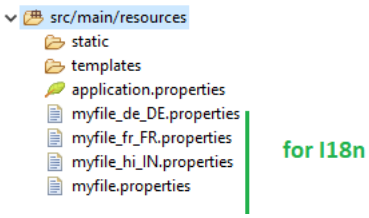
=> For presentation labels of I18n we need to multiple properties files for multiple locales on 1 per Locale basis
App.properties (base properties file -- english lables)
App_fr_FR.properties (for french --> french labels)
App_de_DE.properties (for german --> german labels)
App_hi_IN.properties (for hindi --> hindi labels)
and etc..

All these properties file must have same key but different values collected from google translator




step1) create spring starter project adding the following dependencies
a) lombok b) spring web c) jstl

step2) prepare multiple properties for multiple locales as shown above having same keys with different values collected from google translator.



myfile.properties

```
#Base file  (english lables)
home.title=Welcome to Spring boot MVC
home.link= register customer

cust.registration.title=Customer Registration Page
cust.registration.name=Customer name
cust.registration.addrs=Customer Address
cust.registration.billAmt=Customer BillAmount
cust.btn.register= register
```

myfile_hi_IN.properties

```
#Hindi Hocale  (hindi lables)
home.title= \u090F\u092E\u0935\u0940\u0938\u0940 \u092E\u0947\u0902 \u0906\u092A\u0915\u093E \u0938\u094D\u0935\u093E\u0917\u0924 \u0939\u0948
home.link= \u0917\u094D\u0930\u093E\u0939\u0915 \u092A\u0902\u091C\u0940\u0915\u0943\u0924 \u0915\u0930\u0947\u0902

cust.registration.title=\u0917\u094D\u0930\u093E\u0939\u0915 \u092A\u0902\u091C\u0940\u0915\u0930\u0923 \u092A\u0943\u0937\u094D\u0920
cust.registration.name=\u0917\u094D\u0930\u093E\u0939\u0915 \u0915\u093E \u0928\u093E\u092E
cust.registration.addrs=\u0917\u094D\u0930\u093E\u0939\u0915 \u0915\u093E \u092A\u0924\u093E
cust.registration.billAmt=\u0917\u094D\u0930\u093E\u0939\u0915 \u092C\u093F\u0932 \u0930\u093E\u0936\u093F
cust.btn.register=\u092A\u0902\u091C\u0940\u0915\u0943\u0924 \u0915\u0930\u0947\u0902
```

**myfile_de_DE.properties**

```
#german Locale
home.title=Willkommen bei Spring Boot mvc
home.link= Kunde registrieren

cust.registration.title=Kundenregistrierungsseite
cust.registration.name=Kundenname
cust.registration.addrs=Rechnungsbetrag des Kunden
cust.registration.billAmt=Montant de la facture client
cust.btn.register=registrieren
```

**myfile_fr_FR.properties**

```
#French Locale  (french lables)
home.title=Bienvenue sur Spring Boot MVC
home.link= enregistrer le client

cust.registration.title=Page d'enregistrement client
cust.registration.name=Nom du client
cust.registration.addrs=Adresse du client
cust.registration.billAmt=Rechnungsbetrag des Kunden
cust.btn.register=S'inscrire
```

**step3) Cfg base properties file in application.properties**

In application.properties

```
# configure base properties file
spring.messages.basename=myfile
```

**step3) Activate I18n in spring boot MVC Application by configuring SessionLocaleResolver as the spring bean**

In main class

```
@Bean(name="localeResolver")  //fixed bean id
public SessionLocaleResolver createSLResolver() {

    SessionLocaleResolver resolver=new SessionLocaleResolver();
    resolver.setDefaultLocale(new Locale("en","US"));
    return resolver;
}
```

The moment this spring bean class obj is created.. it makes the underlying spring mvc or spring boot mvc app to activate the I18n on the application.

Resolvers are given to activate certain facility in spring mvc or spring boot mvc appliation which will not come automatically

eg: TilesResolver (To activate tile framework)
SessionLocaleResolver (To activate I18n )
CosMultipartResolver (To activate file uploading)

**step4) Configure LocalChangeInterceptor as spring bean in main class using @Bean method**

This interceptor takes the locale value from specified request param and changes locale of every request by trapping the request.

```
@Bean
public LocaleChangeInterceptor createLCInterceptor() {
    LocaleChangeInterceptor interceptor=new LocaleChangeInterceptor();
    interceptor.setParamName("lang");   //default is locale
    return interceptor;
}
```

=>This Interceptor that allows for changing the current locale on every request, via a configurable request parameter (default parameter name: "locale").

**step5) Develop Custom Configiurer class as spring bean to register the above interceptor with InterceptorRegistry**

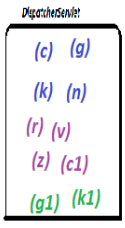
```
//MyWebMVCConfigurer.java
package com.nt.config;

import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.stereotype.Component;
import org.springframework.web.servlet.config.annotation.InterceptorRegistry;
import org.springframework.web.servlet.config.annotation.WebMvcConfigurer;
import org.springframework.web.servlet.i18n.LocaleChangeInterceptor;

@Component
public class MyWebMVCConfigurer implements WebMvcConfigurer {
        @Autowired
         private LocaleChangeInterceptor  interceptor;

        @Override
        public void addInterceptors(InterceptorRegistry registry) {
           registry.addInterceptor(interceptor);
        }

}          The interceptors in spring boot mvc web application will be activated
           only after registering with  InterceptorRegistry
```

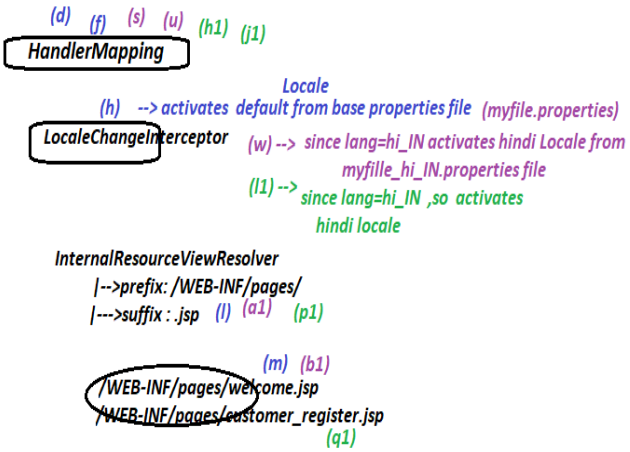
**step6) Develop the Model class**

```
package com.nt.model;
import lombok.Data;
@Data
public class Customer {
        private Integer  cno;
        private String cname;
        private  String caddrs;
        private  Float billAmount;
 }
```

**step7) develop the Controller class having handler methods to lanunch home pag, form page**

```
//controller class
package com.nt.controller;
import java.util.Map;
import org.springframework.stereotype.Controller;
import org.springframework.web.bind.annotation.GetMapping;
import org.springframework.web.bind.annotation.ModelAttribute;

import com.nt.model.Customer;

@Controller
public class CustomerOperationsController {

  (i)   @GetMapping("/")                (e?)   (t?)
  (x)   public String showHome() {
              //return  LVN
              return "welcome";   (j)  (y)
        }

        @GetMapping("/register")                (i1?)
  (m1)  public  String  showCustomerFormPage(@ModelAttribute("cust") Customer cust,
                                                 Map<String,Object> map) {
              //return LVN
              return  "customer_register";   (n1)

        }

}
```



**step8) Develop jsp pages enabling UTF-8 content type and reading locale specific messges from properties files.**

**WEB-INF/pages/welcome.jsp** *(o) (d1)*

```
---------------------------------------
<%@page isELIgnored="false" contentType="text/html; charset=UTF-8" %>
<%@taglib uri="http://www.springframework.org/tags"  prefix="sp"%>

<h1 style="color:blue;text-align:center"> <sp:message code="home.title"/></h1>
 <br><br>
  <a href="register"><h2 style="color:red;text-align:center"><sp:message code="home.link"/></h2> </a>

  <br><br>

  <p align="center">
    <a href="?lang=fr_FR">French</a>    
    <a href="?lang=de_DE">German</a>    
    <a href="?lang=hi_IN">  हिन्दी (q) </a>    
    <a href="?lang=en_US">English</a>

  </p>
```

*(f1)*

*(e1) collects the messages from myfile_hi_IN.properties file*

*(p) collects messages from default properties file (english labels)*

*=>if <a> tag href not having url or href itself not placed then the generated request goes to that url using which the web page is launched.*

**WEB-INF/pages/customer_register.jsp** *(s1)*

```
<%@ page isELIgnored="false"  contentType="text/html; charset=UTF-8" %>
<%@taglib uri="http://www.springframework.org/tags/form"  prefix="form"%>
<%@taglib uri="http://www.springframework.org/tags"  prefix="sp"%>

  <h1 style="color:red;text-align:center"><sp:message code="cust.registration.title"/></h1>

  <form:form modelAttribute="cust">
   <table border="1" align="center" bgcolor="cyan">
    <tr>
      <td><sp:message code="cust.registration.name"/>  </td>
      <td><form:input path="cname"/> </td>
    </tr>
    <tr>
      <td><sp:message code="cust.registration.addrs"/>  </td>
      <td><form:input path="caddrs"/> </td>
    </tr>
    <tr>
      <td><sp:message code="cust.registration.billAmt"/>  </td>
      <td><form:input path="billAmount"/> </td>
    </tr>
    <tr>
      <td><input type="submit"  value="<sp:message code="cust.btn.register"/>"/>  </td>
    </tr>
   </table>
  </form:form>

   <br><br>

  <p align="center">
    <a href="?lang=fr_FR">French</a>    
    <a href="?lang=de_DE">German</a>    
    <a href="?lang=hi_IN">    हिन्दी      </a>    
    <a href="?lang=en_US">English</a>

  </p>
```

*(t1)*
*collects the message from myfile_hi_IN.properties file*

*(a)During the deployment of web application all singleton scope spring beans like SessionLocaleResolver, LocaleChangeInterceptor , CustomerOperationsController , MyWebMVCConfigurer classes will be pre-instantiated and the the injections takes place*

*=>SessionLocaleResolver obj creation activates the I18n*

*=>LocaleChnageInterceptor will be activated becoz it is registered with InterceptorRegistry*

*(b) http://localhost:2020/BootMVCProj15-I18n*

## 18 NTSPBMS615- Spring Boot MVC -I18n -File Uploading and Downloading -April 11th

**Applying Date ,time , number ,currency formts in the I18n App**

=>We can use JSTL core, formatting tag libraries together to format date,time, number and currency values as show below.

step1) add JSTL libaries to build path

```
<!-- https://mvnrepository.com/artifact/javax.servlet/jstl -->
<dependency>
  <groupId>javax.servlet</groupId>
  <artifactId>jstl</artifactId>
  <version>1.2</version>
</dependency>
```

step2) Import JSTL core , formatting tag libaries

welcome.jsp

```
<%@page isELIgnored="false" contentType="text/html; charset=UTF-8" %>
<%@taglib uri="http://www.springframework.org/tags"  prefix="sp"%>
<%@taglib uri="http://java.sun.com/jsp/jstl/fmt"  prefix="fmt" %>
<%@taglib uri="http://java.sun.com/jsp/jstl/core"  prefix="c" %>

 <h1 style="color:blue;text-align:center"> <sp:message code="home.title"/></h1>
 <br><br>
  <a href="register"><h2 style="color:red;text-align:center"><sp:message code="home.link"/></h2> </a>
  <br>

   <h1>Current  active Locale is :: ${pageContext.response.locale} </h1>
   <fmt:setLocale value="${pageContext.response.locale}"/>

   <jsp:useBean id="dt" class="java.util.Date"/>
   <fmt:formatDate var="fdt"  value="${dt}" type="date"  dateStyle="SHORT" />
   <b>formatted date :: ${fdt} </b><br>
   <fmt:formatDate var="ftime"  value="${dt}" type="time"  timeStyle="FULL" />
   <b>formatted time :: ${ftime} </b>

   <fmt:formatNumber var="fnumber" value="1000000" type="number"/> <br>
   <b>formatted number :: ${fnumber}</b>

   <fmt:formatNumber var="fcurrency" value="1000000" type="currency"/> <br>
   <b>formatted currency :: ${fcurrency}</b>

   <fmt:formatNumber var="fpercentage" value="0.211"  type="PERCENT"/> <br>
   <b>formatted percentage :: ${fpercentage}</b>


  <br><br>

  <p align="center">
    <a href="?lang=fr_FR">French</a>    
    <a href="?lang=de_DE">German</a>    
    <a href="?lang=hi_IN">□□□□□□</a>    
    <a href="?lang=en_US">English</a>

  </p>
```

=> pageContext,response are implicit objs from 9 implcit objs provided by the jsp page
=> ${pageContet.response.locale} gives curreent active locale.

The LocaleInterceptor keeps
the activate Locale in the "locale"
property of "response" obj .From theere
this EL expression gets the current active locale.

File Uploading and File downloading spring boot MVC
==========

Microservices arch impl in spring = spring boot + spring rest/web + spring clould

Spring Rest (logical name) =spring web++

File uploading
---

The process of selecting files from Client machien file sytem and sending them server file system is file uploading

n
File dowloanding
---

=>The getting server machine file system files content to client machine file system is called file donwloading

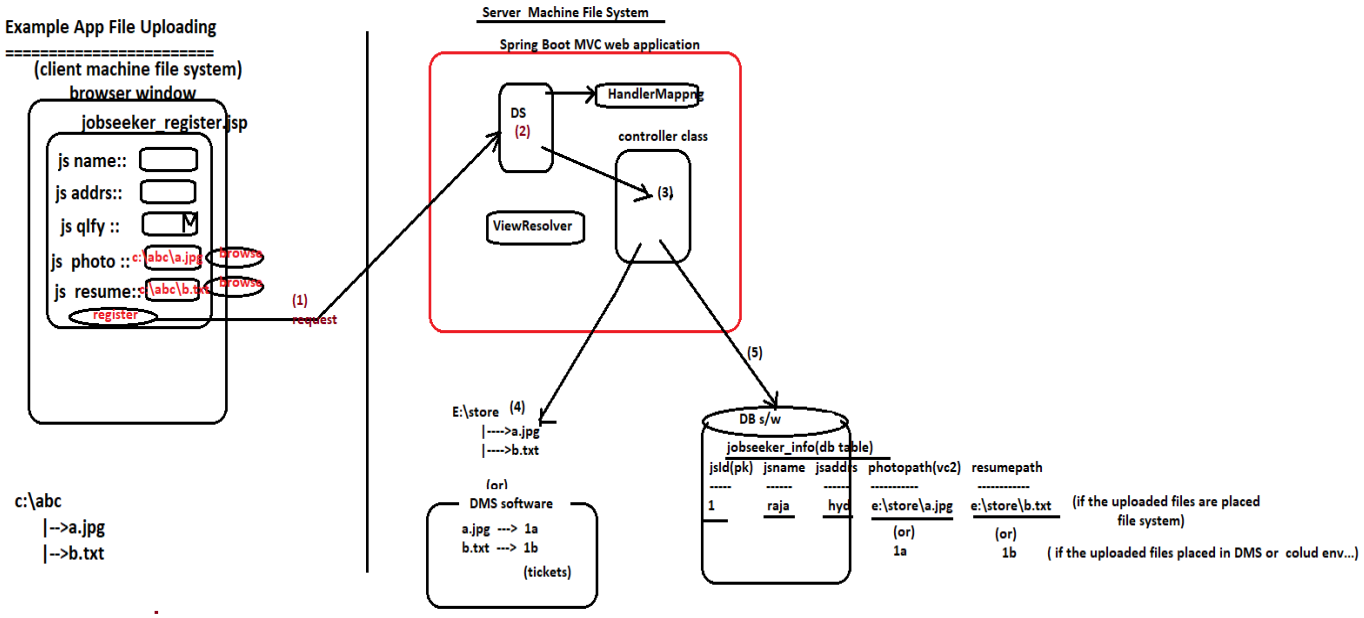
usecases:: job portal apps, matrimony apps, social working netwokings apps, video sharing apps, profile mgmt apps, our classcontent sharing and etc..

=>Only in standalone apps , the files content (LOBs like CLOB,BLOB) will be stored directly db table cols... in other apps like distributed apps, web applications and etc.. the LOBs (files) will saved in server machine file system or in special cloud softwares like EDN (Eletronic document network), s3Bucket(given by aws) ,DMS(document mangement system), cloud front ,google bucket and etc.. but the ticket/tocken or path of file will be saved in db table cols as String values

some link to cloud storage

link to file system

## 19 NTSPBMS615- Spring Boot MVC -File Uploading and Downloading -April 12th




=> To represent the content of uploaded files of form page in Model class obj , we take the support of MultipartFile type properties in Model class .. which are input streams representing the content of the uploaded files .. So we can take the support of outstreams to write the content to server machine file system

**step1) create spring starter Project adding spring web , jstl , spring data jpa , lombok, common-io , ojdbc8 , tomcat-embedded jasper jar files.**

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

    <dependency>
        <groupId>com.oracle.database.jdbc</groupId>
        <artifactId>ojdbc8</artifactId>
        <scope>runtime</scope>
    </dependency>
    <dependency>
        <groupId>org.projectlombok</groupId>
        <artifactId>lombok</artifactId>
        <optional>true</optional>
    </dependency>
```

```
    <dependency>
        <groupId>org.springframework.boot</groupId>
        <artifactId>spring-boot-starter-tomcat</artifactId>
        <scope>provided</scope>
    </dependency>
    <dependency>
        <groupId>org.springframework.boot</groupId>
        <artifactId>spring-boot-starter-test</artifactId>
        <scope>test</scope>
    </dependency>

        <!-- https://mvnrepository.com/artifact/javax.servlet/jstl -->
<dependency>
    <groupId>javax.servlet</groupId>
    <artifactId>jstl</artifactId>
</dependency>
        <!-- https://mvnrepository.com/artifact/org.apache.tomcat.embed/tomcat-embed-jasper -->
<dependency>
    <groupId>org.apache.tomcat.embed</groupId>
    <artifactId>tomcat-embed-jasper</artifactId>
    <scope>provided</scope>
</dependency>
```

```
                <!-- https://mvnrepository.cc
<dependency>
    <groupId>commons-io</groupId>
    <artifactId>commons-io</artifactId>
    <version>2.11.0</version>
</dependency>
```

step2) develop the following model class for Persistence

(Entity class for Persistence )

```
//JobSeekerInfo.java
package com.nt.entity;

import java.io.Serializable;

import javax.persistence.Column;
import javax.persistence.Entity;
import javax.persistence.GeneratedValue;
import javax.persistence.Id;
import javax.persistence.Table;

import lombok.Data;

@Entity
@Table(name="BOOT_JS_INFO")
@Data
public class JobSeekerInfo implements Serializable
    @Id
    @GeneratedValue
    private Integer jsId;
    @Column(length = 15)
    private String jsName;
    @Column(length = 15)
    private String jsAddrs;
    @Column(length = 20)
    private  String resumePath;
    @Column(length = 20)
    private  String photoPath;


}
```

step3) Develop seperate Model class for formPage data binding

```
package com.nt.entity;

import java.io.Serializable;

import org.springframework.web.multipart.MultipartFile;

import lombok.Data;


@Data
public class JobSeekerData implements Serializable {
    private Integer jsId;
    private String jsName;
    private String jsAddrs;
    private  MultipartFile resume;  //Input stream to hold content of uploded file
    private  MultipartFile photo;


}
```

step4) Develop the Repository Interface

```
package com.nt.repository;
import org.springframework.data.jpa.repository.JpaRepository;
import com.nt.entity.JobSeekerInfo;

public interface IJobSeekerRepo extends JpaRepository<JobSeekerInfo, Integer> {
}
```

step5) Develope service interface and service Impl class

service Interface

```
public interface IJobSeekerMgmtService {
    public  String registerJobSeeker(JobSeekerInfo info);
}
```

service impl class

```
@Service
public class JobSeekerMgmtServiceImpl implements IJobSeekerMgmtService {
    @Autowired
    private IJobSeekerRepo  jsRepo;

    @Override
    public String registerJobSeeker(JobSeekerInfo info) {

        return "Job seeker is saved with "+jsRepo.save(info).getJsId()+"  id value";
    }

}
```

step6) add entries in application.properties file having datasource cfg and jpa-hibernate entries

In application.properties

```
#Datasource cfg,jpa-hibernate cfg
spring.datasource.driver-class-name=oracle.jdbc.driver.OracleDriver
spring.datasource.url=jdbc:oracle:thin:@localhost:1521:xe
spring.datasource.username=system
spring.datasource.password=manager
#based in these details the HikariCP DataSource object will be created pointing to
#jdbc con pool for oracle as part autoconfiguration activity

#JPA-hibernate cfgs
spring.jpa.database-platform=org.hibernate.dialect.Oracle10gDialect
spring.jpa.show-sql=true
spring.jpa.hibernate.ddl-auto=update
```

step7) Cfg ViewResolver in application.properties file

In application.properites

```
#view Resolver cfg
spring.mvc.view.prefix=/WEB-INF/pages/
spring.mvc.view.suffix=.jsp
```

step7) add entries for embedded Tomcat server

```
#For Embedded server
server.port=4041
server.servlet.context-path=/JobSeekersApp
```

step8) Cfg CommonsMultipartResolver in main class as spring bean using @Bean method to activate file upload mechasim in spring mvc or spring boot mvc application,

```
                                    fixed bean id
@Bean(name="multipartResolver")
public CommonsMultipartResolver createCMResolver() {
        CommonsMultipartResolver resolver=new CommonsMultipartResolver();
        resolver.setMaxUploadSizePerFile(50*1024*1024);
        resolver.setMaxUploadSize(-1);  //all files togather how much size is allowed  -1 indicates no limit
        return resolver;
}
```

=>Resolvers are internally used to activate certain certain facilities in spring boot MVC application.. They are internally gathered by calling ctx.getBean(-) method with fixed bean ids .. So we must provide same bean ids while cfg them

For the following spring beans cfg , we need the fixed bean ids

| class | fixed bean id |
|---|---|
| ResourceBundleMessageSource ----------> | messageSource |
| SessionLocaleResolver ----------> | localeResolver |
| CommonsMultiPartResolver ----------> | multipartResolver |

step9)
Develop handler method in controller class to take implicit reuquest to return LVN for home page

```
@Controller
public class JobSeekerOperationsController {
      @Autowired
      private IJobSeekerMgmtService service;

      @GetMapping("/")
      public  String showHomePage() {
            return  "welcome";
      }

}
```

WEB-INF/pages/welcome.jsp

```
<%@ page  isELIgnored="false" %>


<h1 style="text-align:center"><a href="register">Register JobSeeker</a></h1>


<h1 style="text-align:center"><a href="list_js">List Jobseekers</a></h1>
```

*(For future file downloading operation)*

step10) place handler method in controller class to show Jobseeke registration form page

In controller class

```
@GetMapping("/register")
      public  String  showJSRegistrationForm(@ModelAttribute("js") JobSeekerData jsData) {
            //return LVN
            return "jobseeker_register";
      }
```

step 11) Develop form page

jobseeker_register.jsp

```
<%@ page language="java"  isELIgnored="false" %>
<%@taglib uri="http://www.springframework.org/tags/form"  prefix="frm"%>
```

```
<frm:form modelAttribute="js" enctype="multipart/form-data">
 <table border="0"  bgcolor="cyan" align="center">
  <tr>
     <td> Name :: </td>
    <td><frm:input path="jsName"/>  </td>
  </tr>
  <tr>
     <td> Address :: </td>
    <td><frm:input path="jsAddrs"/>  </td>
  </tr>
  <tr>
     <td> Select Resume :: </td>
    <td><frm:input type="file" path="resume"/>  </td>
  </tr>
  <tr>
     <td> Select  Photo :: </td>
    <td><frm:input type="file" path="photo"/>  </td>
  </tr>
  <tr>
     <td colspan="2"><input type="submit" value="register">  </td>
  </tr>
 </table>
</frm:form>
```

**step12)  Develop handler method  to process the form submission and  to complete file upload activity**

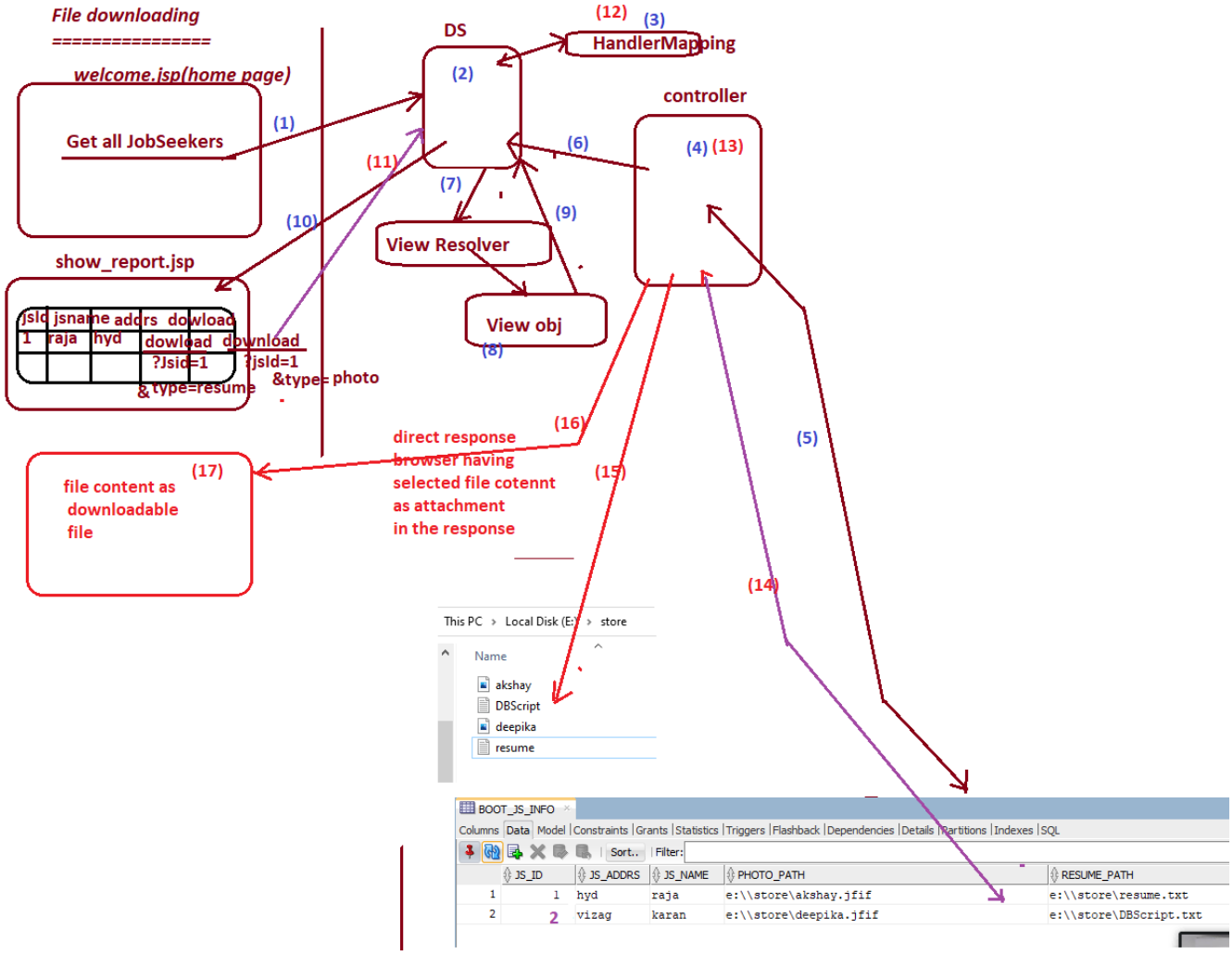
```
private Environment env;

    @PostMapping("/register")
    public  String  registerJSByUploadingFiles(@ModelAttribute("js") JobSeekerData jsData,
                                               Map<String,Object> map)throws Exception {
        //get Upload folder location from properties file
        String storeLocation=env.getRequiredProperty("upload.store");
        // if that not avaiable then create it
        File file=new File(storeLocation);
         if(!file.exists())
              file.mkdir();

// get InputStreams representin the upload files content
MultipartFile  resumeFile=jsData.getResume();
MultipartFile  photoFile=jsData.getPhoto();
InputStream isResume=resumeFile.getInputStream();
InputStream isPhoto=photoFile.getInputStream();
//get the names of the uploaded files
String resumeFileName=resumeFile.getOriginalFilename();
String photoFileName=photoFile.getOriginalFilename();
//create outstreams reprsenting empty destination files
OutputStream osResume=new FileOutputStream(file.getAbsolutePath()+"\\"+resumeFileName);
OutputStream osPhoto=new FileOutputStream(file.getAbsolutePath()+"\\"+photoFileName);
// perform file copy operation
IOUtils.copy(isResume,osResume);
IOUtils.copy(isPhoto,osPhoto);
//close streams
```

```
            //close stream
            isResume.close();
            osResume.close();
            isPhoto.close();
            osPhoto.close();
           //prepare  Entity class obj from Model class obj
            JobSeekerInfo jsInfo=new JobSeekerInfo();
             jsInfo.setJsName(jsData.getJsName());
             jsInfo.setJsAddrs(jsData.getJsAddrs());
             jsInfo.setResumePath(file.getAbsolutePath()+"/"+resumeFileName);
             jsInfo.setPhotoPath(file.getAbsolutePath()+"/"+photoFileName);
           //use  Service
             String msg=service.registerJobSeeker(jsInfo);
           //keep the uploaded file names and  location in model attributes
             map.put("file1", resumeFileName);
             map.put("file2", photoFileName);
             map.put("resultMsg",msg);
             //return LVN
          return "show_result";
    }
```

***step13)  develop the result page***

show_result.jsp

```
<%@page isELIgnored="false" %>

<h1 style="color:red;text-align:center">Result page</h1>

<b>
      Result is :: ${resultMsg} <br>
      The uploaded file names are ::  ${file1} , ${file2}
</b>

<br><br>
 <a href="./">home</a>
```




**Part1 Development steps (Displaying having donwload hyperlinks for files)**

**step1) add methods in service Interface and in service Impl class**

**In service Interface**

```
public List<JobSeekerInfo> fetchAllJobseekers();
```

**In service Impl class**

```
@Override
    public List<JobSeekerInfo> fetchAllJobseekers() {
        return jsRepo.findAll();
    }
```

**step3) Add the following handler method in controller class**

```
@GetMapping("/list_js")
public String showReport(Map<String,Object> map) {
    System.out.println("JobSeekerOperationsController.showReport()");
    //use service
    List<JobSeekerInfo> list=service.fetchAllJobseekers();
    System.out.println(list.size());
    //add result to model attrbutes
    map.put("jsList", list);
    //return LVN
    return "show_report";
}
```

***step4)*** develope show_report.jsp page in WEB-INF/pages folder as shown below

```
<%@ page isELIgnored="false" %>
<%@taglib uri="http://java.sun.com/jsp/jstl/core"  prefix="c"%>

<c:choose>
  <c:when test="${!empty  jsList}">
    <table border="1"  align="center" bgcolor="cyan">
      <tr>
        <th>JsId </th><th>JsName </th><th>JsAddrs </th><th>resume  </th><th>photo </th>
      </tr>
      <tr>
       <c:forEach  var="info" items="${jsList}">
         <tr>
          <td>${info.jsId } </td>
          <td>${info.jsName } </td>
          <td>${info.jsAddrs } </td>
          <td><a href="download?jsId=${info.jsId}&type=resume">download resume</a> </td>
          <td><a href="download?jsId=${info.jsId}&type=photo">download photo</a> </td>
         </tr>
       </c:forEach>
      </tr>
    </table>
  </c:when>
  <c:otherwise>
     <h1 style="color:red;text-align:center">Records not found </h1>
  </c:otherwise>
</c:choose>
```

---

**Standard process for file download activity**

a) create File obj having path of the file to be downloaded
   File file=new File("E:/store/resume.txt");
b) Get the length file to be downloaded
   long length =file.length();
c) make file content length as response content length
   response.setContentLength(length);

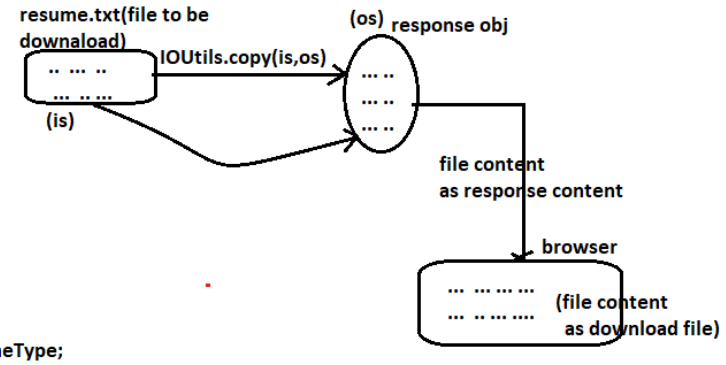
d) set file MIMEtype as response content type
   ServletContext sc=req.getServletContext();
   String mimeType=sc.getMimeType("E:/store/resume.txt");
   mimeType=mimeType==null?"application/octet-stream":mimeType;
   res.setContentType(mimeType);  generic /universal mimetype

e) create InputStream representing file to be downloded
   InputStream is=new FileInputStream(file);

f) create outputStream representing the response obj
   ServletOutputStream os=res.getOutputStream();

g) Give instruction to browser to make the recieved as the downloadable file
   res.setHeader("Content-Disposition","attachment;fileName="+file.getName());

note:: The default value of "Content-Disposition" header is "inline" i.e the recieved content will be displayed on the browser directly ..where as "attachment" instructs the browser to make recieved response content as the downloadable file with given name.




h) copy File content to response as the response content
   IOUtils.copy(is,os);
i) close streams
   is.close();
   os.close();

**Procedure to perform file donwloading using spring boot MVC App**

==========

step1) Write two @Query methods in Repository Interface to get resume path or photoPath based on given JobSeeker Id.

```
public interface IJobSeekerRepo extends JpaRepository<JobSeekerInfo, Integer> {
    @Query("select resumePath from JobSeekerInfo where jsId=:id")
    public String getResumePathByJsId(Integer id);
    @Query("select photoPath from JobSeekerInfo where jsId=:id")
    public String getPhotoPathByJsId(Integer id);

}
```

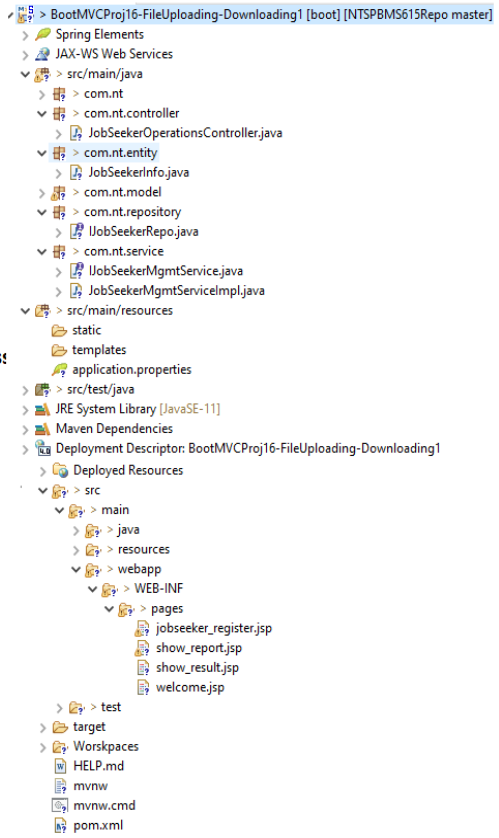
step2) write suporting methods repository methods in Service Interface and Service Impl class

In service Interface

```
public String fetchResumePathByJsId(Integer jsId);
    public String fetchPhotoPathByJsId(Integer jsId);
```

In service Impl class

```
@Override
    public String fetchResumePathByJsId(Integer jsId) {
        return jsRepo.getResumePathByJsId(jsId);
    }

    @Override
    public String fetchPhotoPathByJsId(Integer jsId) {
        return jsRepo.getPhotoPathByJsId(jsId);
    }
```




step3) Write Handler method in controller class to complete file downloaing activity

note:: if the handler method return type is "null" then it sends response directly to browser.

In controller class

```
@Autowired
    private ServletContext sc;
    @GetMapping("/download")
    public String fileDownload(HttpServletResponse res,
                               @RequestParam("jsId") Integer id,
                               @RequestParam("type") String type) throws Exception{
        // get path of the file to be downloaded
        String filePath=null;
        if(type.equalsIgnoreCase("resume"))
         filePath=service.fetchResumePathByJsId(id);
        else
            filePath=service.fetchPhotoPathByJsId(id);
        System.out.println(filePath);
        //create File object representing file to be downloaded
         File file=new File(filePath);
         //get the length of the file and make it as the response content length
         res.setContentLengthLong(file.length());

        //get MIME of the file and make it as the resposen content type
        String mimeType=sc.getMimeType(filePath);
        mimeType=mimeType==null?"application/octet-stream":mimeType;
        res.setContentType(mimeType);
        //create InputStream pointing to the file
        InputStream is=new FileInputStream(file);
        //create OutputStream pointing to response obj
        OutputStream os=res.getOutputStream();
```

```
        //instruct the browser to give file content as downloadble file
        res.setHeader("Content-Disposition","attachment;fileName="+file.getName());
        // write  file content to  response obj
         IOUtils.copy(is, os);
        //close streams
         is.close();
         os.close();
        return null;  //makes the handler method to send response directly to browser
    }
```

---

## *Different types ViewResolvers  in spring boot MVC*

=>ViewResolver resolves /identifies  physical view comp name , location and returns  View obj having that name and location To DS.

=>All ViewResolvers are the classes implementing  org.sf.web.servlet.ViewResolver(I).. The imp view resolvers are

a) InternalResourceViewResolver
b)  UrlBasedViewResolver
c)  ResourceBundleViewResolver
d) XmlViewResolver
e) TilesViewResolver
f)  BeanNameViewResolver
and etc..

note::  The default View resolver that will be activated in spring boot is  InternalResourceViewResolver

Diffent  ways  activating  ViewResolver  in spring boot mvc

---

a)  using application.properties

```
#view Resolver cfg
spring.mvc.view.prefix=/WEB-INF/pages/
spring.mvc.view.suffix=.jsp
```

=>Only for InternalResourceViewResolver

b)  By placing  @Bean method  in main class or @Configuration class.

(Works for any ViewResolver)

```
@Bean
    public  ViewResolver  createIRVR() {
        InternalResourceViewResolver resolver=new InternalResourceViewResolver();
        resolver.setPrefix("/WEB-INF/pages/");
        resolver.setSuffix(".jsp");
        return resolver;
    }
```

c)  Using  MVCConfigurer class  having the support of ViewResolverRegistry

(Works for all kinds of ViewResolvers)

```
// MyMVCConfigurer.java
package com.nt.config;

import org.springframework.stereotype.Component;
import org.springframework.web.servlet.config.annotation.ViewResolverRegistry;
import org.springframework.web.servlet.config.annotation.WebMvcConfigurer;
import org.springframework.web.servlet.view.InternalResourceViewResolver;

@Component
public class MyMVCConfigurer implements WebMvcConfigurer {
```

```
    @Override
    public void configureViewResolvers(ViewResolverRegistry registry) {

            InternalResourceViewResolver resolver=new InternalResourceViewResolver();
            resolver.setPrefix("/WEB-INF/pages/");
            resolver.setSuffix(".jsp");
    registry.viewResolver(resolver);

    }
}
```

**if all 3 approaches are used with different settings to register the same ViewResolver which settings will be taken?**

*Different types ViewResolvers in spring boot MVC*

=>ViewResolver resolves /identifies physical view comp name , location and returns View obj having that name and location To DS.

=>All ViewResolvers are the classes implementing org.sf.web.servlet.ViewResolver(I).. The imp view resolvers are

a) InternalResourceViewResolver
b) UrlBasedViewResolver
c) ResourceBundleViewResolver
d) XmlViewResolver
e) TilesViewResolver
f) BeanNameViewResolver
and etc..

note:: The default View resolver that will be activated in spring boot is InternalResourceViewResolver

Diffent ways activating ViewResolver in spring boot mvc

---

a) using application.properties

```
#view Resolver cfg
spring.mvc.view.prefix=/WEB-INF/pages/
spring.mvc.view.suffix=.jsp
```

=>Only for InternalResourceViewResolver
(For this entries InternalResourceViewResolver will be activated by taking InternalResourceView (or) JstlView as the default View class)

b) By placing @Bean method in main class or @Configuration class. (Works for any ViewResolver)

```
@Bean
public ViewResolver createIRVR() {
    InternalResourceViewResolver resolver=new InternalResourceViewResolver();
    resolver.setPrefix("/WEB-INF/pages/");
    resolver.setSuffix(".jsp");
    return resolver;
}
```

c) Using MVCConfigurer class having the support of ViewResolverRegistry (Works for all kinds of ViewResolvers)

```
// MyMVCConfigurer.java
package com.nt.config;

import org.springframework.stereotype.Component;
import org.springframework.web.servlet.config.annotation.ViewResolverRegistry;
import org.springframework.web.servlet.config.annotation.WebMvcConfigurer;
import org.springframework.web.servlet.view.InternalResourceViewResolver;
```

```
@Component
public class MyMVCConfigurer implements WebMvcConfigurer {

    @Override
    public void configureViewResolvers(ViewResolverRegistry registry) {

        InternalResourceViewResolver resolver=new InternalResourceViewResolver();
        resolver.setPrefix("/WEB-INF/pages/");
        resolver.setSuffix(".jsp");
    registry.viewResolver(resolver);

    }

}
```

**if all 3 approaches are used with different settings to register the same ViewResolver which settings will be taken?**

**Ans) The settings taken in the @Bean method approach takes place**

---

**UrlBasedViewResolver**

---

=> It is super class for InternalResourceViewResolver
=> Allows to configure any View class i.e View class configuration is mandatory
=> The physical View comp can be there in any technology like jsp , volocity ,freeemarket, tiles and etc.. becoz we need to cfg View class explicitly according to the View Technology we are using.
=>This ViewResolver gives View comp having prefix+LVN+suffix together as Physical view comp name and location.

```
AbstractAtomFeedView, AbstractFeedView, AbstractJackson2View, AbstractPdfStamperView, AbstractPdfView, AbstractRssFeedView, AbstractTemplateView,
AbstractUrlBasedView, AbstractView, AbstractXlsView, AbstractXlsxStreamingView, AbstractXlsxView, FreeMarkerView, GroovyMarkupView, InternalResourceView,
JstlView, MappingJackson2JsonView, MappingJackson2XmlView, MarshallingView, RedirectView, ScriptTemplateView, TilesView, XsltView
```

(Possible View classes implementing View(I))

**Example**

---

```
        In main class or @Configuration class
@Bean
    public ViewResolver createUBVResolver() {
        System.out.println("BootMvcProj02WishMessageAppApplication.createUBVResolver()");
        UrlBasedViewResolver resolver=new UrlBasedViewResolver();
        resolver.setPrefix("/WEB-INF/pages/");
        resolver.setSuffix(".jsp");
        resolver.setViewClass(InternalResourceView.class);
        return resolver;
    }
```

=> In UrlBasedViewResolver we need to use view classes as show below
=> if the view comps are servlet,jsp comps of private area then use JstlView or InternalResourceView
=> if the view comps are Tiles then use TilesView
=> if the view comps are Freemarker then use FreeMarkerView
=> if the view comps are GroovyMarkup then use GroovyMarkupView
and etc..

**What is the difference b/w InternalResorceView and JstlView?**

Ans) Both View classes are given to take the private area servlet,jsp comps as the view comps

=> if the View class InternalResourceView (Best), then we need to add jstl jar files only when jstl tags are used in the jsp pages otherwise not required.
=> if the View class JstlView , then we need to add jstl jar files in the jsp pages irrespective of the jstl tags that are used in the jsp pages.

**InternalResourceViewResolver**

---

=>Sub class for UrlBasedViewResolver having InternalResorceView or JstlView as the default view class .. if jstl tags are used takes JstlView otherwise takes InternalResourceView as the default View class

=> Given only for taking servlet,jsp comps as the view comps that are there in private area.

=> if view comps are private area view comps then prefer using this ViewResolver.

=>To activate this ViewResolver we can use application.properties entries(best) or @Bean method or MVCConfigurer class

In main class or @Configuration class

```
@Bean
public ViewResolver createIRVResolver() {
    System.out.println("BootMvcProj02WishMessageAppApplication.createUBVResolver()");
    InternalResourceViewResolver resolver=new InternalResourceViewResolver();
    resolver.setPrefix("/WEB-INF/pages/");
    resolver.setSuffix(".jsp");
    return resolver;
}
```

*Takes InteralResoruceView or JstlView as the default View class*

*What is difference b/w UrlBasedViewResolver and InternalResourceViewResolver?*

| *UrlBasedViewResolver* | *InternalResourceViewResolver* |
|---|---|
| *a) Super class to InternalResoruceViewResolver* | *a) sub class to UrlBasedViewResolver* |
| *b) Allows to take any view comps of any technology* | *b) Allows to take view comps of servlet,jsp technologies* |
| *c)Does not have default View class* | *c) It is having default View class (InternalResourceView or JstlView)* |
| *d) In spring boot MVC app we can activate this ViewResolver either either using @Bean method or using MVCConfigurer class* | *d) In spring boot MVC app we can activate this ViewResolver either using @Bean method or using MVCConfigurer class or application.properites file entries* |
| *e) Prefere this ViewResolver if u have other than servlet,jsp comps as the view comps* | *e) Prefere this ViewResolver if u have servlet,jsp comps as the view comps* |

*note:: Both ViewResolvers are giving tight coupling b/w LVN and Physical View name*

| LVN | physcial View comp name |
|---|---|
| display | /WEB-INF/pages/display.jsp (prefix: /WEB-INF/pages/, suffix: .jsp) |
| welcome | /WEB-INF/pages/welcome.jsp (prefix: /WEB-INF/pages/, suffix: .jsp) |

To achieve loosecoupling use other viewResolvers like ResourceBundleViewResolver or XmlViewResolver

## 21 NTSPBMS615- Spring Boot MVC -BeanNameViewResolver and Java Classses as Views -April 20th

**ResourceBundleViewResolver**

**==========**

**=> Allows to use properties file to write view comps configurations nothing but mapping logical view name with physical view comp name and location.**

**=> Gives loose coupling between lvn and physical view comp name**

**=> We must take seperate properties file views.properties in classpath folder .. if file name is changed or location is changed it must be cfg while creating the obj for ResourceBundleViewResolver class using setBaseName(-) method**

**example**

**---**

**note:: While working with this ViewResolver we can take our choice view class name , phsyical view comp name and location for every logical view name (lvn) i.e for each lvn we can have our choice technology view comp name and location.**

**step1)**

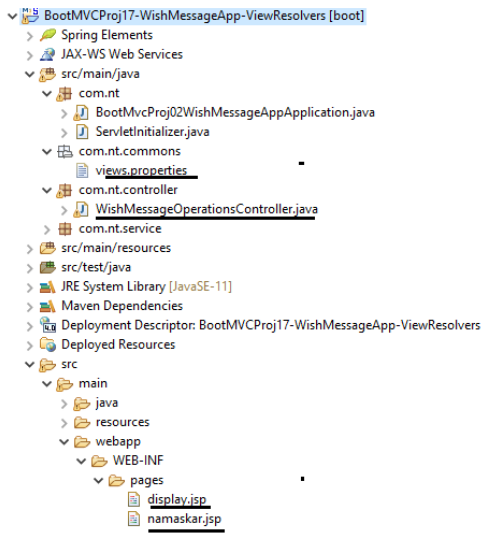
**In views.properties (com/nt/commons folder of src/main/java folder)**

```
#lvn.(class)=<pkg>.<view class>
welcome.(class)=org.springframework.web.servlet.view.JstlView
#lvn.url= <name of location of physical view comp)
welcome.url=/WEB-INF/pages/namaskar.jsp

#lvn.(class)=<pkg>.<view class>
show_result.(class)=org.springframework.web.servlet.view.InternalResourceView
#lvn.url= <name of location of physical view comp)
show_result.url=/WEB-INF/pages/display.jsp
```

**step2) Configure ResourceBundlerViewResolver as the spring bean in the @Bean method**

**In main class or @Configuration class**

```
@Bean
    public ViewResolver createRBVResolver() {
   System.out.println("BootMvcProj02WishMessageAppApplication.createRBVResolver()");
       ResourceBundleViewResolver resolver=new ResourceBundleViewResolver();
          resolver.setBasename("com/nt/commons/views");
          return resolver;
     }
```




**Controller class**

```
@Controller
public class WishMessageOperationsController {
      @Autowired
      private IWishService  service;


      @GetMapping("/")
      public  String  showHomePage() {
      System.out.println("WishMessageOperationsController.showHomePage()");
       return "welcome";
      }


      @GetMapping("/wish")
      public  String  fetchWishMessage(Map<String,Object> map) {
            //use service
            String  msg=service.generateWishMessage();
             //  keep  data in model attributes
            map.put("wMsg", msg);
            map.put("sysDate",new Date());
            //return MAV
            return "show_result";
      }

}
```

***ResourceBundleViewResolver and XmlViewResolver classes are deprecated from version 5.3***
**in favor of Spring's common view resolver variants * and/or custom resolver implementations**

***99% times we use application.properties file entries based***
***InternalResourceViewResolver for normal jsp pages as the view comps***

***XmlViewResolver***

---

***=>Allows us take seperate xml file (spring bean cfg file) whose default name "views.xml" in classpath folders to configure view class, url for every logical view name as spring bean cfg details.***
***=> if file name or location is different we need to confugure while creating object for XmlViewResolver class.***

***step1) develop spring bean cfg file having lvns mapped with view classes and physical view comp name and locations***

***=>LVN as the bean id***
***=>View class as spring bean class name***
***=> url property Injection :: having the name and location of physical view comp***

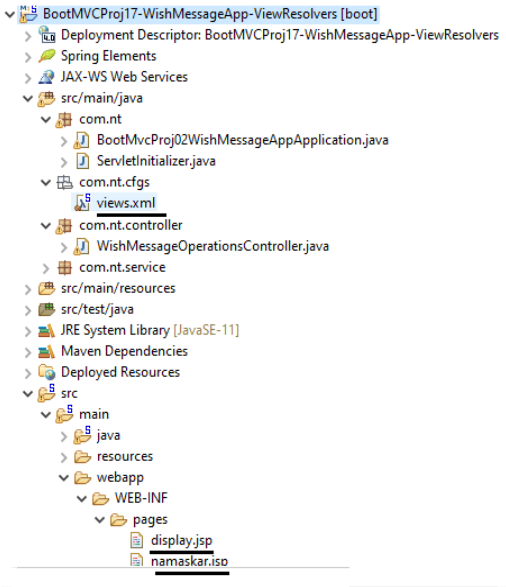
***views.xml***

---

```
<?xml version="1.0" encoding="UTF-8"?>
<beans xmlns="http://www.springframework.org/schema/beans"
       xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
       xsi:schemaLocation="http://www.springframework.org/schema/beans
                           http://www.springframework.org/schema/beans/spring-beans.xsd">
  <bean id="welcome"  class="org.springframework.web.servlet.view.InternalResourceView">
    <property name="url" value="/WEB-INF/pages/namaskar.jsp"/>
  </bean>
            LVN                    View class
  <bean id="show_result"  class="org.springframework.web.servlet.view.JstlView">
    <property name="url" value="/WEB-INF/pages/display.jsp"/>
  </bean>          property
                                  physical view comp name and location

</beans>
```

**step2) Cfg XmlViewResolver as the spring bean class using @Bean method**

```
@Bean
    public  ViewResolver  createXVResolver() {
   System.out.println("BootMvcProj02WishMessageAppApplication.createXVResolver()");
        XmlViewResolver resolver=new XmlViewResolver();
            resolver.setLocation(new ClassPathResource("com/nt/cfgs/views.xml"));
            return resolver;
        }
```




```
@Controller
public class WishMessageOperationsController {
    @Autowired
    private IWishService  service;

    @GetMapping("/")
    public  String  showHomePage() {
    System.out.println("WishMessageOperationsController.showHomePage()");
     return "welcome";
    }
    @GetMapping("/wish")
    public  String   fetchWishMessage(Map<String,Object> map) {
          //use service
          String  msg=service.generateWishMessage();
           //  keep  data in model attributes
          map.put("wMsg", msg);
          map.put("sysDate",new Date());
          //return MAV
          return "show_result";
    }
}
```

## ViewResolver Chaining

=>when multiple viewResolvers are configured if first view resolver fails to locate physical view comp and control going to next view resolver in the chain is called ViewResolver chaining.

=>InternalResourceViewResolver,UrlBasedViewResolver , XmlViewResolver , ResourceBundlerViewResolver do not support any kind of ViewReoslver chaining.. The TilesviewResolver ,BeanNameViewResolver supports view Resolver chaining.

==========

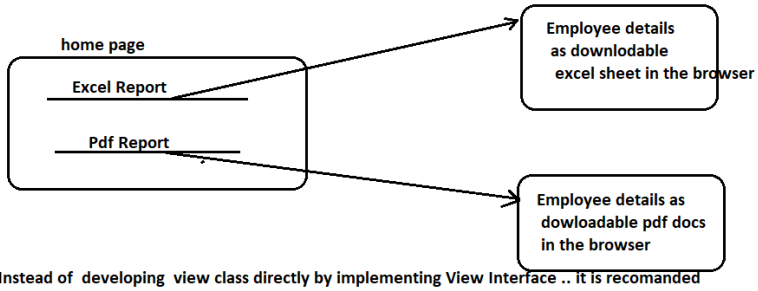
BeanNameViewResolver and taking JAva calsses as view comps

==========

=>some times we need generate Excel reports, pdf reports having model data . For this we need to use thrid party apis like iText api (for pdf reports) , POI api for Excel reports

=>Writing java code in jsp pages is not recomanded .. Since spring MVC allows us to take different technology view comps.. So we think about take java classes as the View comps (classes implementing View(I)) and we can add these third party apis in those View classes.

=>if want to take spring bean classes (view classes) as the view comps ..it is recomanded to Seperate ViewResolver called "BeanNameViewResolver".




=>Instead of developing view class directly by implementing View Interface .. it is recomanded to take the same class by extening AbstractXxxView class to simplify process like AbstractPdfView , AbstractExcelView and etc..

```
@Component("excel_report")
public class EmployeeExcelReport extends AbstractExcelView{

    public void buildExcelDocument(-,-,-,-,-){
      ...
      .. use poi api here to build excel sheet
      .. by getting data from model atttributes
      ..
    }

}
```

```
@Component(" pdf_report")
public class Employee Pdf Report extends Abstract Pdf View{

    public void build Pdf Document(-,-,-,-,-){
      ...
      .. use iText api here to build pdf
      .. by getting data from model atttributes
      ..
    }

}
```

To use java classes as the Views .. we need to take the support of BeanNameViewResolver by confiuring it in the main class using @BeanMethod

```
@Bean
public ViewResolver BeanNameViewResolver(){

 BeanNameViewResolver resolver=new
                BeanNameViewResolver();
 resolver.setOrder(Ordered.HIGHEST_PRECEDENCE);
 return resolver;
}
```

Becoz of this hight precence this resolver gets high priority in the view resolver chaining

Integer MAX value it holds

note:: The default priority vlaue is :: Ordered.LOWEST_PRECEDENCE (It holds Integer MIN value)

Example App

==========

step1) create Project adding the follwing dependencies

a) lombok api b) web c) spring data jpa d) oracle driver (e) itext 2.1.7 (f) poi 3.17 — (pdf docs) — (excel docs)

```
<!-- https://mvnrepository.com/artifact/com.lowagie/itext -->
<dependency>
    <groupId>com.lowagie</groupId>
    <artifactId>itext</artifactId>
    <version>2.1.7</version>
</dependency>

<!-- https://mvnrepository.com/artifact/org.apache.poi/poi -->
<dependency>
    <groupId>org.apache.poi</groupId>
    <artifactId>poi</artifactId>
    <version>3.17</version>
</dependency>
</dependencies>
```

collect from mvnrepository.com

step2) create Model class

Employee.java

```
package com.nt.model;

import javax.persistence.Entity;
import javax.persistence.GeneratedValue;
import javax.persistence.Id;
import javax.persistence.Table;

import lombok.Data;

@Entity
@Table(name="emp")
@Data
public class Employee {
    @Id
    @GeneratedValue
    private Integer empno;
    private String ename;
    private String job;
    private Long deptNo;
    private Double sal;

}
```

step3) Repository Interface

```
package com.nt.repo;
import org.springframework.data.jpa.repository.JpaRepository;
import com.nt.model.Employee;
public interface EmployeeRepository extends JpaRepository<Employee, Integer> {

}
```

step4) Develop service Interface and service Impl class

Service interface

```
package com.nt.service;
import java.util.List;
import com.nt.model.Employee;
public interface IEmployeeMgmtService {
        public  List<Employee> getAllEmployees();
}
```

Service Impl class

```
//EmployeeServiceImpl.java
package com.nt.service;
import java.util.List;
import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.stereotype.Service;
import com.nt.model.Employee;
import com.nt.repo.IEmployeeRepository;

@Service
public class EmployeeServiceImpl implements IEmployeeMgmtService {
        @Autowired
        private  IEmployeeRepository  empRepo;

        @Override                (w)
        public List<Employee> getAllEmployees() {
                return  empRepo.findAll();   (x)
        }

}
```

step4) add method in controller to reuturn lvn of home page

In controller class

```
@Controller
public class EmployeeOperationsController {
        @Autowired
        private IEmployeeMgmtService service;

(g)     @GetMapping("/")      (d?)
        public  String showHomePage() {
                //return LVN
                return "welcome";  (h)
        }
}
```

step5) add viewReolvers(InternalResourceviewResolver) , DataSource cfg in application.propperties file (server managed jdbc con pool)

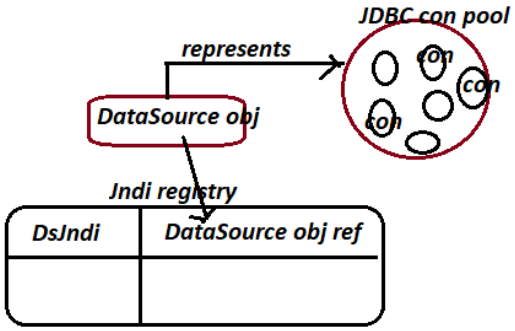
In application.properties

```
#View Resolvers configuration (IRVR)
spring.mvc.view.prefix=/WEB-INF/pages/   (k)
spring.mvc.view.suffix=.jsp
```

To create jdbc con pool for oracle in tomcat server add the following <Resource> tag in Context.xml file under <Context> tag.

```
<Resource name="DsJndi" auth="Container" type="javax.sql.DataSource"
          maxTotal="100" maxIdle="30" maxWaitMillis="10000"
          username="system" password="manager" driverClassName="oracle.jdbc.driver.OracleDriver"
          url="jdbc:oracle:thin:@localhost:1521:xe"/>
```

*(Collect from <Tomcat_home>/webapps/docs/jndi-datasource-examples-howto.html)*



*In appplication.properties*

```
#Server managed jdbc con pool configuration
spring.datasource.jndi-name=java:/comp/env/DsJndi
                            fixed prefix     jndi name given in <Resource>
```

step6) develop home page having hyperlinks as WEB-INF/pages/welcome.jsp

welcome.jsp (n)

```
<%@ page isELIgnored="false" %>

                                                    (o)
<h1 style="text-align:center"><a href="report?type=excel">Excel Report</a></h1>
<br><br>
<h1 style="text-align:center"><a href="report?type=pdf">PDF Report</a></h1>
```

*step6) Configure BeanNameViewResolver as spring bean using @Bean method in main class*

*In main class*

```
@Bean
public ViewResolver createBNVResolver() {
    BeanNameViewResolver resolver=new BeanNameViewResolver();
    resolver.setOrder(Ordered.HIGHEST_PRECEDENCE);
    return resolver;
}
```

(j) (b1)

note:: BeanNameViewResolver Supports ViewResolver Chaining i.e if this ViewResolver fails to locate the view comps the task will be passed next ViewResolver that is there in the chain .. In this example that ViewResolver name is InternalResourceViewResolver.

step7) Add another handler method in controller class to get Employees Data as the report data based on the hyperlink that is clicked.

```
@GetMapping("/report") (u)          (r?)
public String showReport(Map<String,Object> map,
                         @RequestParam("type") String type) {
    //use service                          (v)
(y) List<Employee> empsList=service.getAllEmployees();
    // add results to model attribute
    map.put("empsList", empsList);
    //return lvn based on the hyperlink that is clicked
    if(type.equalsIgnoreCase("excel"))
        return "excel_report"; (z)
    else
        return "pdf_report";

}
```

step8) Deveop the java classes as the view Classes having the above LVNS as the bean ids

note:: BeanNameViewResolver looks to map lvn with that spring bean acting view comp having lvn as the bean id.

ExcelReportView.java

```
package com.nt.view;

import java.util.List;
import java.util.Map;

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

import org.apache.poi.ss.usermodel.Row;
import org.apache.poi.ss.usermodel.Sheet;
import org.apache.poi.ss.usermodel.Workbook;
import org.springframework.stereotype.Component;
import org.springframework.web.servlet.view.document.AbstractXlsView;

import com.nt.model.Employee;
```

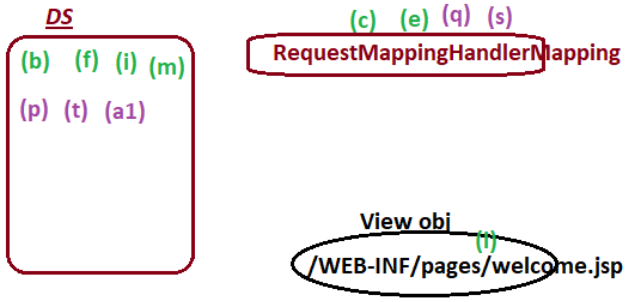
```
@Component("excel_report")   (c1)
public class ExcelReportView extends AbstractXlsView {
   private int i=1;
      @Override                    (d1)
      public  void buildExcelDocument(Map<String, Object> map, Workbook workbook,
                                          HttpServletRequest req,HttpServletResponse res) throws Exception {
            //get Model attributes data
            List<Employee> list=(List<Employee>)map.get("empsList");
            //create  excel sheet in work
            Sheet sheet1=workbook.createSheet("Employee");


            Row row1=sheet1.createRow(0);
            row1.createCell(0).setCellValue("EMPNO");
            row1.createCell(1).setCellValue("ENAME");
            row1.createCell(2).setCellValue("JOB");
            row1.createCell(3).setCellValue("SAL");
            row1.createCell(4).setCellValue("DEPTNO");

            list.forEach(emp->{
                  // add row to Excel sheet
                  Row row=sheet1.createRow(i);
                  //add cells to row
                  row.createCell(0).setCellValue(emp.getEmpno());
                  row.createCell(1).setCellValue(emp.getEname());
                  row.createCell(2).setCellValue(emp.getJob());
                  row.createCell(3).setCellValue(emp.getSal());
                  if(emp.getDeptno()!=null)
                    row.createCell(4).setCellValue(emp.getDeptno());
                  i++;
            });//forEach(-)

      }//method
}//class
```

(e1) :: Sends Model attributes data to browser excel response

PdfReportView.java

```
package com.nt.view;
import java.util.ArrayList;
import java.util.List;
import java.util.Map;
import javax.servlet.http.HttpServletRequest;
import javax.servlet.http.HttpServletResponse;
import org.springframework.stereotype.Component;
import org.springframework.web.servlet.view.document.AbstractPdfView;
import com.lowagie.text.Document;
import com.lowagie.text.Font;
import com.lowagie.text.Paragraph;
import com.lowagie.text.Table;
import com.lowagie.text.pdf.PdfWriter;
import com.nt.model.Employee;

@Component("pdf_report")
public class PdfReportView  extends AbstractPdfView {

      @Override
      public void buildPdfDocument(Map<String, Object> map, Document doc, PdfWriter writer,
                  HttpServletRequest req, HttpServletResponse res) throws Exception {
            //get Model attributes data
                  List<Employee> list=(List<Employee>)map.get("empsList");
                  // add Paragraph
                  Paragraph para=new Paragraph("Employee Report", new Font(Font.TIMES_ROMAN,
                                                                        Font.DEFAULTSIZE,
                                                                        Font.BOLDITALIC));
```

```
                doc.add(para);
                //add table content
                Table table=new  Table(5,((ArrayList) list).size());
                for(Employee emp:list) {
                        table.addCell(String.valueOf(emp.getEmpno()));
                        table.addCell(emp.getEname());
                        table.addCell(emp.getJob());
                        table.addCell(String.valueOf(emp.getSal()));
                        if(emp.getDeptno()!=null)
                          table.addCell(String.valueOf(emp.getDeptno()));
                        else
                                table.addCell("_____");

                }
                doc.add(table);
        }

}
```




http://localhost:2020/BootMVCProj18-ViewAsClass-BeanNameViewResolver/ (a)

## 22 NTSPBMS615- Spring Boot MVC -Tiles Framework -April 23rd

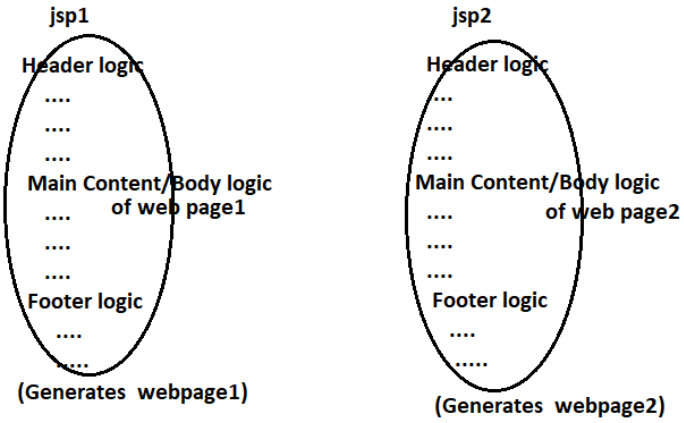
**Tiles Framework**

==========

=> Tiles framework is a pluggable framework that can linked any other mvc framerwork like struts, spring mvc,jsf and etc... to implement Composite View Design Pattern with Layout control support.

**Composite View Design Pattern**

**Problem::**

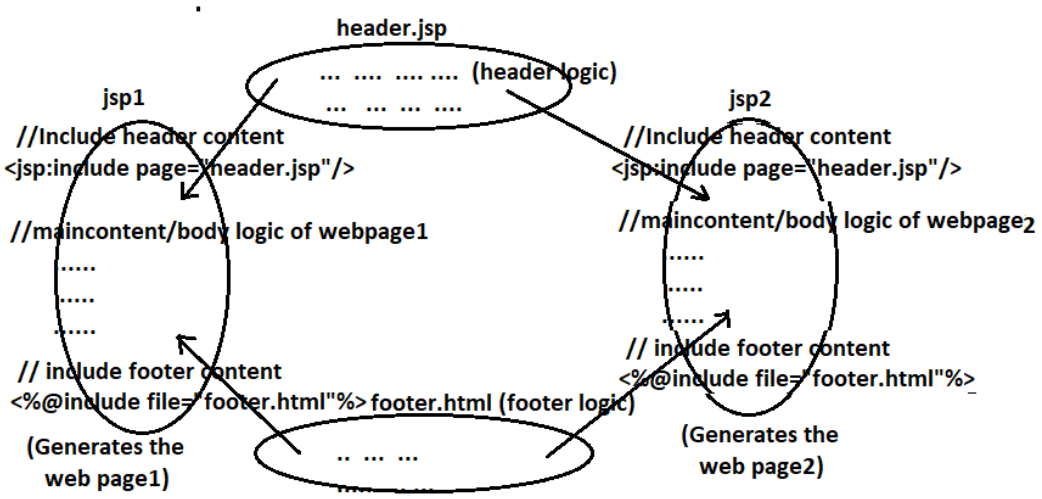



note:: Here header ,footer logics are not reusable logics though they are required in multiple web comps.

note: header,footer logics are looking like boilerplate code.

**Solution:: Implement Composite view Design pattern**

=>keep different common logics in diffent seperate web comps and include their output in main web comps either using <jsp:include> or <%@include>



note:: Header header ,footer logics have become reusable logics i.e bolerplate code problem is avoided.

=>Singular View :: web page generated by the single jsp page
=>composite view :: the view(web page) generated by multiple jsp comps togather

---

LayoutControl:: all the web pages of the web application will be developed based on the common template page. So all the web pages of the web application will be having uniform look. The modification done in layout /template page will reflect to all the web pages of the web application

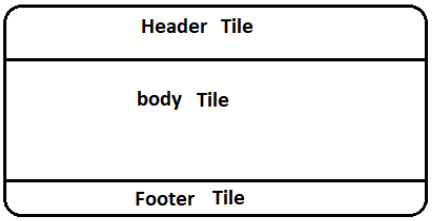
The popular layouts/ templates are

(a) Classic layout
(b) Two-Column Layout
(c) Three -Column Layout
(d) Circular Layout

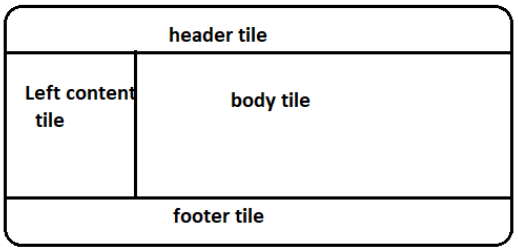
and etc..

=> a Tile is logical portion of web page i.e it represents certain portion of the webpage

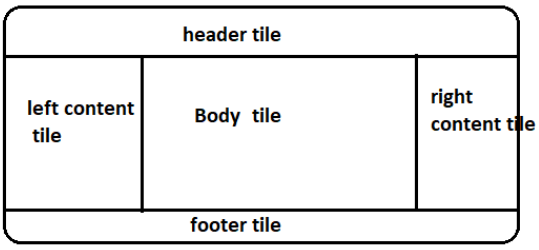
classic Layout



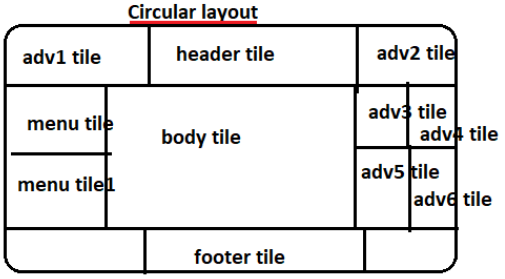

2 column layout




3 column layout




Circular layout




mvnrepository.com is given based three column layout.

By integrating Tiles framework with Spring MVC we can make every web page coming based on layout page having composite view pattern implementation

step1) Activate Tiles framework by creating TilesConfigurer as the spring bean in the main class.

In main class

```
@Bean
public TilesConfigurer createTilesConfigurer(){
  TilesConfigurer configurer=new TilesConfigurer();
  configurer.setDefinitation("/WEB-INF/tiles.xml"); //any xml file name of any location can be taken.. the default
                                                    //name is tiles.xml of WEB-INF folder
  return configurer;
}
```

step2) create Layout page as jsp page by importing tiles jsp taglibrary

WEB-INF/pages/layout.jsp (classic layout) (m)

```
%@ taglib prefix="tiles" uri="http://tiles.apache.org/tags-tiles" %>
<table border="0" width="100%" heigth="100%">
 <tr height="30%" width="100%">
  <td> <tiles:insertAttribute name="header"/> </td>  tile1
 </tr>
 <tr height="60%" width="100%">
  <td> <tiles:insertAttribute name="body"/> </td>  tile2
 </tr>
 <tr height="10%" width="100%">
  <td> <tiles:insertAttribute name="footer"/> </td> tile3
 </tr>
</table>
```

(z)

displays layout.jsp as the webpage having the following tile values
a) header tile:: /WEB-INF/pages/header.jsp
b) body tile :: /WEB-INF/pages/home.jsp
c) footer tile :: /WEB-INF/pages/footer.jsp

a) header tile:: /WEB-INF/pages/header.jsp
b) body tile :: /WEB-INF/pages/login .jsp
c) footer tile :: /WEB-INF/pages/footer.jsp

home.jsp (WEB-INF/pages/)

```
<a href="login">Login Page </a>
```
(n)

step3) Identity the no.of the webpages that u want to develop based on the layout page

(a) home page(page1) (b) login page (c) registration page

step4) develop WEB-INF/tiles.xml file having tiles definitations on 1 per web page basis

WEB-INF/tiles.xml

```
<?xml version="1.0" encoding="ISO-8859-1" ?>
<!DOCTYPE tiles-definitions PUBLIC
    "-//Apache Software Foundation//DTD Tiles Configuration 2.0//EN"
    "http://tiles.apache.org/dtds/tiles-config_2_0.dtd">

<tiles-definitions>
   <!-- tile definitation for page --!>
  <definition name="homePageDef" template="/WEB-INF/pages/layout.jsp">
    <put-attribute name="header" value="/WEB-INF/pages/header.jsp" />
    <put-attribute name="body" value="/WEB-INF/pages/home .jsp" />
    <put-attribute name="footer" value="/WEB-INF/pages/footer.jsp" />
  </definition>
   <!-- tile definitation for page2 --!>
    <definition name="loginPageDef" template="/WEB-INF/pages/layout.jsp">
      <put-attribute name="header" value="/WEB-INF/pages/header.jsp" />
      <put-attribute name="body" value="/WEB-INF/pages/login.jsp" />
      <put-attribute name="footer" value="/WEB-INF/pages/footer.jsp" />
    </definition>

   <!-- tile definitation for page  --!>
    <definition name= " reg PageDef" template="/WEB-INF/pages/layout.jsp">
      <put-attribute name="header" value="/WEB-INF/pages/header.jsp" />
      <put-attribute name="body" value="/WEB-INF/pages/registration.jsp"/>
      <put-attribute name="footer" value="/WEB-INF/pages/footer.jsp" />
    </definition>
</tile-definitations>
```

WEB-INF/tiles.xml (improved using tiles-inheritence)

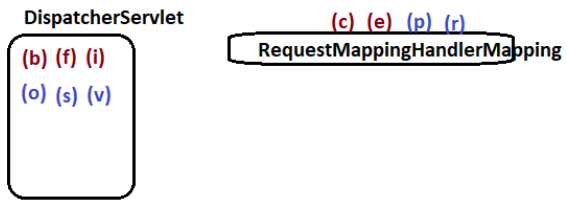
```
<?xml version="1.0" encoding="ISO-8859-1" ?>
<!DOCTYPE tiles-definitions PUBLIC
      "-//Apache Software Foundation//DTD Tiles Configuration 2.0//EN"
      "http://tiles.apache.org/dtds/tiles-config_2_0.dtd">

<tiles-definitions>

  <!-- BaseDef -->
 <definition name="baseDef" template="/WEB-INF/pages/layout.jsp">
(l)   <put-attribute name="header" value="/WEB-INF/  pages /header.jsp" />
(y)   <put-attribute name="body" value="" />
      <put-attribute name="footer" value="/WEB-INF/  pages   /footer.jsp" />
 </definition>
 <definition name="homePageDef" extends="baseDef">
(k)      <put-attribute name="body" value="/WEB-INF/pages/home.jsp" />
  </definition>
 <definition name="loginPageDef" extends="baseDef">
(x)      <put-attribute name="body" value="/WEB-INF/pages/login.jsp" />
  </definition>
  <definition name="regPageDef" extends="baseDef">
       <put-attribute name="body" value="/WEB-INF/pages/registration.jsp" />
  </definition>
</tiles-definitations>
```

step5) Configure TilesViewResolver as spring bean in main class using @Bean method

```
in Main class
-----------------
@Bean                  (j) (w)
public  TilesViewResolver  createTVResolver(){
  TilesViewResolver  resolver=new TilesViewResolver();
  return resolver;
 }
```

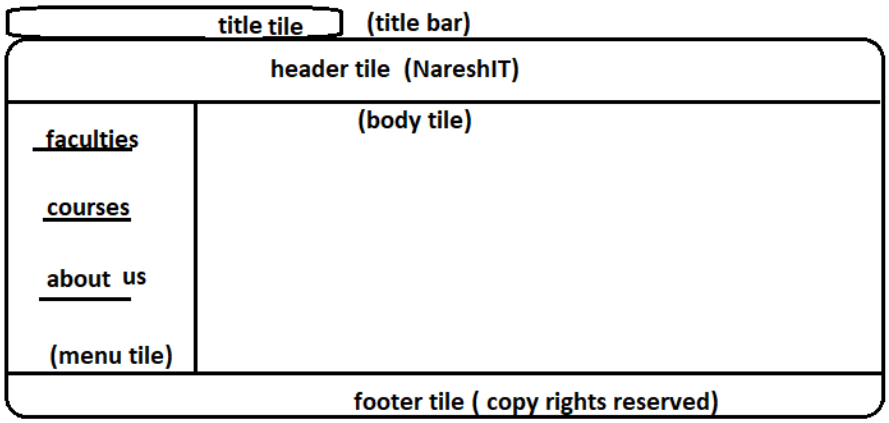
step 6) Develope controller class having handler methods returning tile definitation names as the LVNs

```
@Controller
public  WebOperationsController{

 @GetMapping("/")   (g)                (d?)
 public  String showHomePage(){
     return "homePageDef";
 }      (h) ------------------------>Tile definitation name as lvn

        (t)
 @GetMapping("/login")                (q?)
 public String  showLoginPage(){
   return "loginPageDef"; (u)
 }                        ------------------>Tile definitation name as lvn

 @GetMapping("/register")
 public String  showRegisterPage(){
   return "regPageDef";
  }                       ------------------>Tile definitation name as lvn

 }
```




http://localhost:2525/TilesApp1/ (a)

==========
Tiles framework Implementation
==========




no.of pages :: 4 no.of tiles in web page is :: 5

1) home page (header tile:: header.jsp
footer tile :: footer.jsp
body tile :: home.jsp
menu tile :: menu.jsp )
tiltle tile :: home page

2) faculties page (header tile:: header.jsp
footer tile :: footer.jsp
body tile :: faculties.jsp
menu tile :: menu.jsp )
tiltile tile :: faculties page

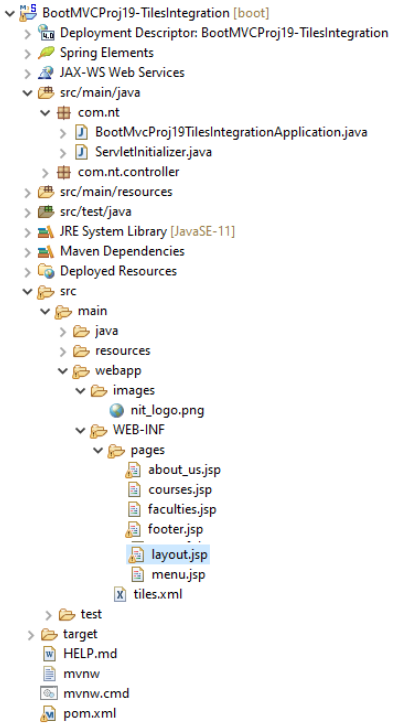
3) courses page (header tile:: header.jsp
footer tile :: footer.jsp
body tile :: courses.jsp
menu tile :: menu.jsp
titile tile :: courses page )

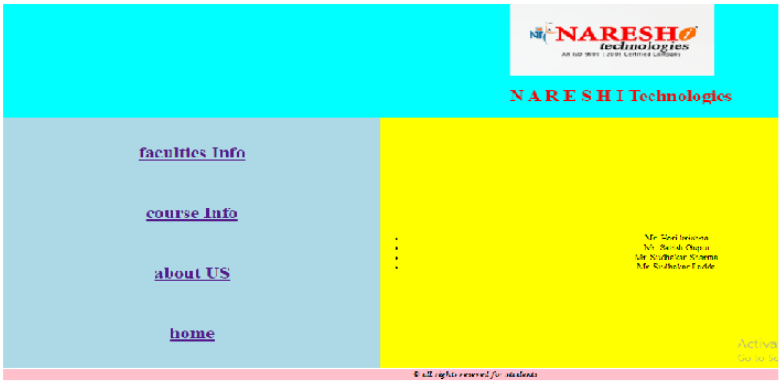
4) about us page (header tile:: header.jsp
footer tile :: footer.jsp
body tile :: aboutUs.jsp
menu tile :: menu.jsp
titile tile :: AboutUs page )

dependecies to add in pom.xml file are

spring web, lombok, tiles-core ,tiles-jsp ,jstl

```
<!-- https://mvnrepository.com/artifact/org.apache.tiles/tiles-core -->
<dependency>
   <groupId>org.apache.tiles</groupId>
   <artifactId>tiles-core</artifactId>
   <version>3.0.8</version>
</dependency>

<!-- https://mvnrepository.com/artifact/org.apache.tiles/tiles-jsp -->
<dependency>
   <groupId>org.apache.tiles</groupId>
   <artifactId>tiles-jsp</artifactId>
   <version>3.0.8</version>
</dependency>

<!-- https://mvnrepository.com/artifact/javax.servlet/jstl -->
<dependency>
   <groupId>javax.servlet</groupId>
   <artifactId>jstl</artifactId>
   <version>1.2</version>
</dependency>
```




**Thymeleaf (As alternate to jsp pages)**

==========

=> Another UI Technology that is build on the top of html for dynamic web pages

=> only html gives static web pages .. html tags+ thymeleaf tags gives dynamic webpages . It is light weight alternate to heavy weight jsp pages..

=> In the execution of jsp page lot of memory and lot of cpu time is required becoz interanlly translates a jsp to equalent servlet comp and creates multiple implicit objs (9) if used or not used.. for all these things lot of memory and cpu time required.

=>To overcome the above problems of jsp pages use thymeleaf as lightweight alternate for rendering dynamic webpages...

=> We need to write thymeleaf tags in html tags.. by importing thymeleaf namespace by specifying its namespace uri..

```
<html  xmlns:th="https://www.thymeleaf.org">
  ...
</html>
```

=>Thymeleaf can be used only in java env..

=>thymeleaf file extension must be .html file

=>Spring boot gives built-in support of thymeleaf UI by giving

default prefix is <classpath>/templates/ (classpath here is src/main/resources folder)

default suffix is .html

note:: we can not mixup thymeleaf and jsp UI togather in a single spring MVC or spring Boot MVC web application.

=> To use thymeleaf in spring boot add this starter to pom.xml

```
<!-- https://mvnrepository.com/artifact/org.springframework.boot/spring-boot-starter-thymeleaf -->
<dependency>
  <groupId>org.springframework.boot</groupId>
  <artifactId>spring-boot-starter-thymeleaf</artifactId>
  <version>2.3.4.RELEASE</version>
</dependency>
```

=>To execute thymeleaf code Thymeleaf engine is required which will come becoz this jar file.. This engine converts thymeleaf tags to html code.. and sends to browser as response..

=> Standard jsp tags identified with fixed prefix called <jsp: xxxx> and similary thymeleaf tags are indentified with <th: xxx> prefix

=> Popular symbols in thymeleaf programming

@ --->to specify Location ( /<globalpath>/<request path>) (useful in href, action urls)

$ ---> To read data from container managed scopes like model attributes

* ---> To bind/link data to form comps (useful only in thymeleaf forms) (model properties, ref data)

a. To read data from model attributes/container managed scopes

-> for primitive/wrapper/String type model attrbutes th:text="${<attribute name>}" (eg: <span th:text="${wMsg}"/>)

-> for Object type model attrbutes th:text="${<objectName>}" eg<span th:text="${emp}"/> )

-> for getting property values from Object type model attrbutes th:text="${<objectName>.<property name>}" (eg: <span th:text="${emp.ename}"/>)

-> for looping through arrays/collection th:each="<counter variable>:${<collection/array type attribute>}"

```
(eg:  <table>
        <tr th:each="cust:${custList}" >
            <td>  <span  th:text="${cust.cno}"/>  </td>
            <td>  <span  th:text="${cust.cname}"/> </td>
            ......
        </tr> )
```

b. To display images (To link image file to <img> tag )

```
<img  th:src="@{/path}">
```

c. To Link/map with hyperlink

```
<a  th:href="@{/path}"> xxxx </a>
```

d.To Link /map css file

```
<link rel="stylesheet"  th:href="@{/path}">
```

e. To Link /map java script fle

```
<script type="text/javascript"  th:src="@{/path}">
    ....
</script>
```

while working with thymeleaf , we must take controller having class level global path using @RequestMapping("/...") annotation. (Global path)

f) Thymeleaf forms are birectional forms i.e they support DataBinding( writing form data to model class obj) and DataRendering (writing handler methods supplied model attributes/model class obj data to form comps)

=> To specify action url <form th:action="@{global path/request path}" >

= > For binding model class obj data/model attributes data to form comps (for form backing object operation)

-> <form th:object="${model attribute name/object name of model clas}"> (alternate to <frm:from modelAttribute="....">)

=> For binding model class obj data /model attributes data to form comps

<input type="text" th:field="*{<model class property name/model attrobute name>}"> (alternate to <frm:input path="..."/>)

(ref data)

What is the difference b/w <th:text> and <th:field> tags in thymeleaf

th:text is given to read data from different scopes and to display them on browser.. like reading and displaying model class obj data and model attrbutes data..

th:field is given to bind model class obj property values /model attribute values(reference data) to form comps (text boxes)

---

Converting MiniProject to Thymeleaf UI based Application

step1) add thymeleaf starter to pom.xml file

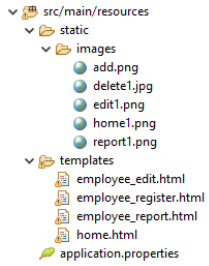
```
<dependency>
    <groupId>org.springframework.boot</groupId>
    <artifactId>spring-boot-starter-thymeleaf</artifactId>
</dependency>
```

* we can remove JSTL jar files from pom.xml

step2) Provide global path to controller class

```
@Controller
@RequestMapping("/employee") //global path
public class EmployeeController {
  ...
  ...
  ...
  }
```

step3) copy js,images folders of webapp/webcontent to "static" folder of src/main/resources folder and WEB-INF/pages folder jsp files to template folder of "src/main/resources" folder , change .jsp extension to .html




we can comment view resolver cfg in application.properties

```
##View Resolver
#spring.mvc.view.prefix=/WEB-INF/pages/
#spring.mvc.view.suffix=.jsp
```

refer BootMVCProj20-MiniProject-CURD-Thymeleaf [boot]

note:: we can delete images, js folders of src/main/webapp folder and src/main/webapp/WEB-INF/pages folder

step4) modify "template" folder .html files code thymeleaf code from jsp code.

step5) Rum the Application...

home.html

```
<html xmlns:th="https://thymeleaf.org">

<h1 style="text-align: center"><a th:href="@{/employee/emp_report}"><img th:src="@{/images/report1.jpeg}"/></a></h1>
```

employee_report.html

```
<html xmlns:th="https://thymeleaf.org">

<div th:if="${!empsList.empty}">
  <table border="1" bgcolor="cyan" align="center">
    <tr bgcolor="pink">
      <th>eno </th> <th>ename </th> <th>desg</th> <th>salary </th> <th>deptNo </th> <th>operations </th>
    </tr>
```

```
        <tr th:each="emp:${empsList}">
            <td><span th:text="${emp.empno}"/> </td>
            <td><span th:text="${emp.ename}"/> </td>
            <td><span th:text="${emp.job}"/> </td>
            <td><span th:text="${emp.sal}"/> </td>
            <td><span th:text="${emp.deptno}"/> </td>
            <td><a th:href="@{/employee/edit_employee(eno=${emp.empno})}"><img th:src="@{/images/edit1.png}" width="50" height="50">   </a>
                <a th:href="@{/employee/delete_employee(eno=${emp.empno})}" onclick="confirm('Do u want to delete')"><img th:src="@{/images/delete1.jpg}" width="50" height="50"></a>
            </td>
        </tr>
    </table>
    </div>
 <div th:if="${empsList.empty}">
     <h1 style="color:red;text-align:center"> Records  not  found </h1>
 </div>
        <blink><h1 style="color:green;text-align:center" th:text="${resultMsg}"/> </blink>
<br>
 <h1 style="text-align:center"><a th:href="@{/employee/insert_employee}">Add Employee <img th:src="@{/images/add.png}"/></a> </h1>

<br>
<br>
 <h1 style="text-align:center"><a th:href="@{/employee/}">home  <img th:src="@{/images/home1.png}"/> </a></h1>
```

**modify_employee.html**

```
<html xmlns:th="https://thymeleaf.org">

<h1 style="color:blue;text-align:center">Edit Employee </h1>

<form th:action="@{/employee/edit_employee}"  th:object="${emp}"  method="POST">
  <table border="0" bgcolor="cyan" align="center">
  <tr>
      <td>  Employee eno :: </td>
      <td>  <input type="text" th:field="*{empno}"  readonly="true"/> </td>
    </tr>
    <tr>
      <td>  Employee name :: </td>
      <td>  <input type="text" th:field="*{ename}"/>  </td>
    </tr>
    <tr>
      <td>  Employee Desg :: </td>
      <td>  <input type="text" th:field="*{job}"/> </td>
    </tr>
    <tr>
      <td>  Employee Salary :: </td>
      <td>  <input type="text" th:field="*{sal}"/> </td>
    </tr>
    <tr>
      <td>  Employee Dept no :: </td>
      <td>  <input type="text" th:field="*{deptno}"/> </td>
    </tr>
    <tr>
      <td> <input type="submit"  value="Edit Employee" > </td>
      <td> <button  type="reset" > Cancel</button>  </td>
    </tr>
  </table>
</form>
```

## 23 NtSpbms615- Spring Boot MVC -Error-ExceptionHandling -April27th

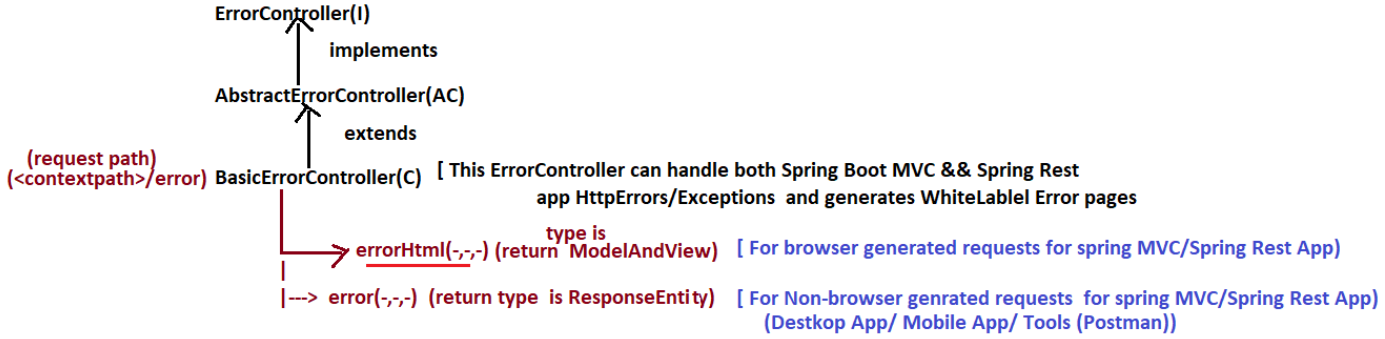
**Error or Exception handling in spring MVC/spring Boot MVC**

**Http status/response status codes**

101 -199 / 1xx :: Information (The happenings in the server will be displayed)
200- 299 /2xx :: success ( for given request , the response has come successfully with out error /exception)
300-399 / 3xx :: Redirection (The given request to one website will be redirected to another website)
400-499/4xx :: Incomplete (Some problem in the locating and executing web comp) (Client side errors) | (these codes will come when there is a problem in the execution of web applicaiton)
500-599 / 5xx :: Server Error (For exceptions raised in web comps or in underlying server/container ) |

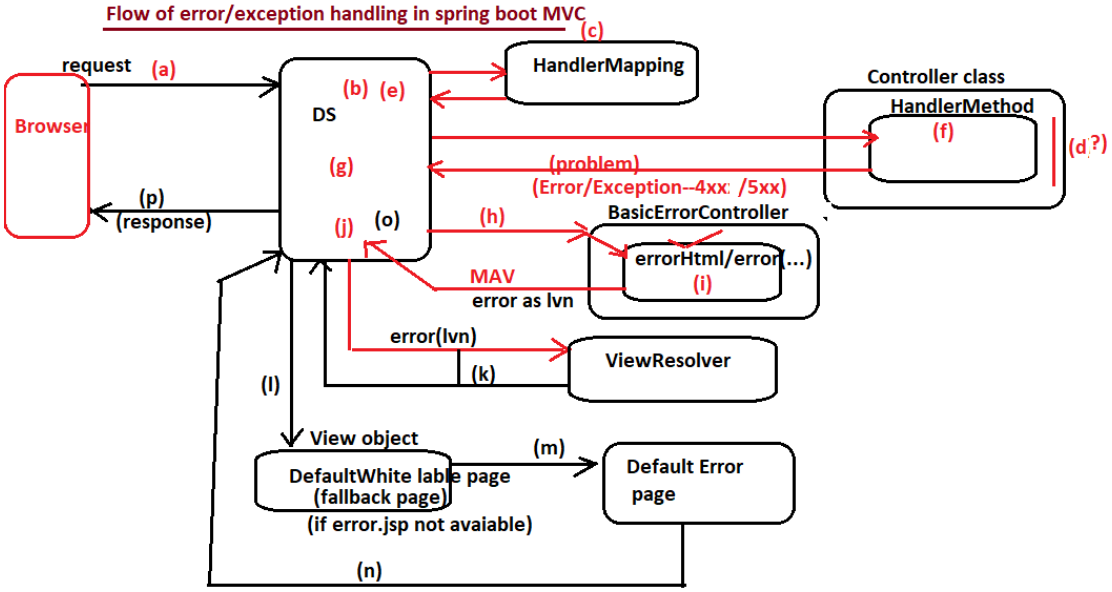
400-499 /4xx :: Http Errors
500-599/5xx :: Http Errors( becoz of exceptions raised in web comps/ in underlying server/container)

=> Spring Boot MVC is having pre-defined Controller to handle these HttpErrors/exceptions and give default Spring Rest/ whiteLabel Error pages

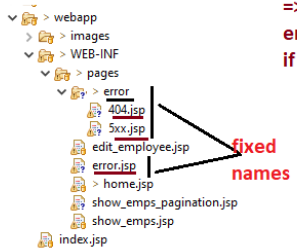



---

**Flow of error/exception handling in spring boot MVC**




=>Instead of whiteLabel error page which is fallback error page for diffent problems we can configure custom Error Pages for different Http Errors/ Exceptions (4xx and 5xx problems)




=>we configure error.jsp in WEB-INF/pages folder as global Error page i.e these error page executes for 4xx and 5xx error/exceptions raised in web application..
if specific error code based error pages not found..

***WEB-INF/pages/error.jsp***

```
<%@ page isELIgnored="false" %>
<html>
<head>
<meta charset="ISO-8859-1">
<title>Insert title here</title>
</head>
<body>
  <h1 style="color:red;text-align:center"> Some Internal problem --Inconvience is regratted </h1>
  <hr>
   <table border="1" bgcolor="cyan" align="center">
    <tr>
     <td>status </td>
     <td>${status}</td>
    </tr>
```

```
<tr>
  <td>timestamp </td>
  <td>${timestamp}</td>
</tr>
 <tr>
  <td>message </td>
  <td>${message}</td>
</tr>
<tr>
  <td>type </td>
  <td>${type}</td>
</tr>
  <tr>
  <td>path </td>
  <td>${path}</td>
</tr>

<tr>
  <td>trace</td>
  <td>${trace}</td>
</tr>
</table>
</body>
</html>
```

---

**we can cfg error page for each error code like 404,405, 500,501,502 and etc.. for that we need to take <errorcode>.jsp as the file name in WEB-INF/pages/error folder.**
**or we can also take error page for spefic serries error codes like 4xx.jsp for 400-499 error codes and similarly 5xx.jsp for all 500-599 errors/exceptions..**
**we should also these pages in WEBE-INF/pages/error folder.**

5xx.jsp

```
<%@ page language="java" contentType="text/html; charset=ISO-8859-1"
   pageEncoding="ISO-8859-1"%>
<!DOCTYPE html>
<html>
<head>
<meta charset="ISO-8859-1">
<title>Insert title here</title>
</head>
<body>
    <h1 style="color:red;text-align:center">Server Internal Problem (5xx)</h1>
    <p style="text-align:center"><img  src="images/500_error.jfif"/> </p>
</body>
```

404.jsp

```
<%@ page language="java" contentType="text/html; charset=ISO-8859-1"
   pageEncoding="ISO-8859-1"%>
<!DOCTYPE html>
<html>
<head>
<meta charset="ISO-8859-1">
<title>Insert title here</title>
</head>
<body>
    <h1 style="color:red;text-align:center">Requested Resource not found (404)</h1>
    <p style="text-align:center"><img  src="images/404_error.jfif"/> </p>
</body>
</html>
```

**We can also make Custom Exceptions generating our choice error codes (4xx or 5xx) by using @ResponseStatus annotation on the top of Custom Exception class**

EmployeeNotFoundException.java

```
package com.nt.exception;

import org.springframework.http.HttpStatus;
import org.springframework.web.bind.annotation.ResponseStatus;
                                    502 error
@ResponseStatus(code = HttpStatus.BAD_GATEWAY)
public class EmployeeNotFoundException extends RuntimeException {
      public EmployeeNotFoundException() {
          super();
      }


      public EmployeeNotFoundException(String msg) {
          super(msg);
      }

}
```

In Service class

```
@Override
    public Employee fetchEmployeeByEno(int eno) {
        //use repo
     Optional<Employee> opt=empRepo.findById(eno);
      if(opt.isPresent())
        return opt.get();  //returns  Employee
      else
        throw new  EmployeeNotFoundException("Problem in getting employee");
      //throw new RuntimeException("Problem in fetching record");
    }
```

alternate code

```
return empRepo.findById(eno).orElseThrow(()->new
EmployeeNotFoundException("emp not found"));
```

Problem in handler method
↓
specific error code page (like 404.jsp ,500.jsp,501.jsp and etc..)
↓ if not found
specific error series page ( 4xx.jsp , 5xx.jsp)
↓ if not found
error.jsp (Glogal error page)
↓ if not found
DefaultWhite Lablel page

## 24 NtSpbms615- Spring Boot MVC -Servers and DevTools -April28th

### Servers in spring boot MVC web applications

==========

The spring boot mvc / spring boot rest applications can be deployed and executed in two types of servers

a) spring boot web Embedded servers
   i) apache Tomcat (default) (popular) (1)
   ii) Eclipse Jetty
   iii) Jboss undertow

=>These are generally used in the dev ,test env.. of the Project

b) external servers
   i) apache tomcat (3)
   ii) jetty
   iii) wildfly (1)
   iv) glassfish (2)
   v) undertow
   vi) weblogic
   vii) webshpere
   viii) jboss
   and etc... (In fact any java based web server or application server can be used)

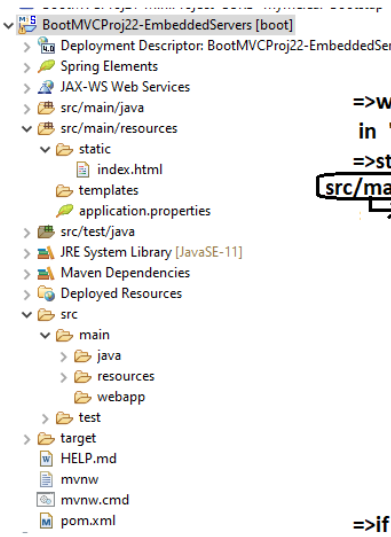
=>These are used in "uat" , "prod" env.. of the Project

=>web server gives only ServeltContainer ,Jsp Container where as App server gives Servlet container, jsp container and EJB container

=> spring boot is not given to develop EJB comps .. So we do not need EJB container for spring boot applications
=> Spring boot is given to develop standalone Apps, web applications, Distributed Apps (restfull-web based) which are generally packaged as jar files/war files .. So to deploy and execute spring boot MVC Apps/ Spring rest apps there is no need of java based application servers.. we can manage with Java based web servers .. For this reason they have not given any Application server as embedded server in spring boot .

=> EAR file (Enterpirse Application archieve)
ear file = jar file (ejb comp) +war file (web application)
=> spring boot does not support ear files deployment.. generally we need application server to deploy and execute ear files ...
So to deploy and execute spring boot mvc /spring rest app we just need web servers like tomcat, jetty ,undertow and etc..

=>In order to work with other embedded servers in spring boot mvc applications we need to disable spring-boot-tomcat-starter dependency from pom.xml file and we need to add other embedded servers starter dependencies to the pom.xml file




=>we can place static content in spring boot mvc application in "static" folder of src/main/resources folder.
=>static content means "css" ,"js","images", "html","audio","video" and etc.. files.

src/main/resources
  -> static
    |---> images
        |---> *.jpg or *.png or etc..
    |---> html
        |---> *.html
    |---> css
        |---> *.css
    |---> js
        |---> *.js

In Most of servers the index.html placed in "static" folder of "src/main/resources" folder will be taken as default welcome file..

=>if we add spring- boot-web-starter by selecting "spring web" towards creating spring boot project then the spring -boot-tomcat-starter dependency will be coming automatically.. which gives embedded tomcat server.

In recent version of spring boot .. it is coming an independent and seperate starter.. earlier it used come as dependent jar file for spring-boot-web-starter dependency

```
<dependency>
        <groupId>org.springframework.boot</groupId>
        <artifactId>spring-boot-starter-tomcat</artifactId>
        <scope>provided</scope>
</dependency>
```

**To work with jetty server as the embedded server**

==========

**step1) dissable spring-boot-starter-tomcat dependency from pom.xml file**

```
<!-- <dependency>
        <groupId>org.springframework.boot</groupId>
        <artifactId>spring-boot-starter-tomcat</artifactId>
        <scope>provided</scope>
    </dependency> -->
```

```
<dependency>
    <groupId>org.springframework.boot</groupId>
    <artifactId>spring-boot-starter-web</artifactId>
    <exclusions>
        <exclusion>
            <groupId>org.springframework.boot</groupId>
            <artifactId>spring-boot-starter-tomcat</artifactId>
        </exclusion>
    </exclusions>
</dependency>
```

**Go to dependecy hierarchy tab in pom.xml file , search for spring-boot-starter-tomcat jar and execlude that jar file by using right click exclude option.**

**step2) add spring-boot-starter-jetty dependency to pom.xml**

```
<!-- https://mvnrepository.com/artifact/org.springframework.boot/spring-boot-starter-jetty -->
<dependency>
  <groupId>org.springframework.boot</groupId>
  <artifactId>spring-boot-starter-jetty</artifactId>
</dependency>
```

**step3) Run the application as standalone App**

**Right click on the Project --->run as ---> spring boot App**

**step4) Test the Application..**

**url in browser :: http://localhost:4041/ServersApp/**

**application.properties**

```
server.port=4041
server.servlet.context-path=/ServersApp
```

**index.html**

```
<!DOCTYPE html>
<html>
<head>
<meta charset="ISO-8859-1">
<title>Insert title here</title>
</head>
<body>
   <h1 style="color:blue;text-align:center"> welcome to spring boot MVC </h1>
</body>
</html>
```

---

**Procedure to use the "JBOSS undertow" server as the embedded server in spring boot MVC**

==========

**step1) same as above do it even for jetty server**

**step2) add "spring-boot-starter-underow" to pom.xml**

```
<!-- https://mvnrepository.com/artifact/org.springframework.boot/spring-boot-starter-undertow -->
<dependency>
  <groupId>org.springframework.boot</groupId>
  <artifactId>spring-boot-starter-undertow</artifactId>
</dependency>
```

**step3 & step4 ) same as above...**

---

**if we add all the 3 embedded server's dependency starters to pom.xml file then the spring boot mvc app chooses the embedded server in the following order**

**a) tomcat**

**b) jetty (if tomcat dependency is not avaialbe)**

**c) undertow ( (if tomcat,jetty dependencies are not avaialbe)**

## Adding "Dev Tools" support to spring boot web MVC /spring rest Project

=>generally when we do source code changes (especially java code) in spring boot web mvc , spring rest applications we need to restart server to reflect that changes.. Some IDEs like eclipse automatically reloads the web application for code changes but that is not so effective some times.. which again forces us to go for clean project ,restart ide and etc.. addtional activities.

[Some times these IDEs will not recognize the changes done static content especially css files , js files ]

=>To overcome this problem and simplify code modifications in the development mode of the project , it is recomanded to add " spring-boot -devtools" dependency to pom.xml for

in pom.xml

---

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

add

we can this stater as the dependency while creating the project or after creating project using (right click on project --->spring--->add devtools)

devtools :: Developer Tools

note: the moment if we try to save chanages done in .java files using "save" button or ctrl+s key the dev tools recognizes the changes in .class files (byte code) and internally uses some live parellel server to reflect changes .. by restarting servers and reloading the apps..

## 25 NTSPBMS615- Spring Boot scheduling -may2nd

Spring Boot Scheduling
==========

Scheduling
==========

=>It is the process of executing given task or job either for 1 time or in a loop (for multiple times) based on given PERIOD OF TIME or POINT OF TIME

PERIOD OF TIME :: specifies the gap b/w two sucessive (back to back) executions of the given task /job

or

POINT OF TIME :: executing the task at certain date time or date and time

=> The task/job that is enabled with scheduling will be executed automatically with out any human intervention... and the taks/job executes for multiple times until the underlying application / server is stopped.

examples for PERIOD OF TIME Scheduled JOBS/TASKS (The task/job executes in a loop having certain time gap between succesive executions)

-> Every month payslip generation
-> Every month salary creding to account
-> every month bank statement generation
-> every day /every week/ every month sales report generation
-> sending emi remainders every month
-> sending insurance payment remainders every month
and etc..

These are repeately executing tasks

example for POINT OF TIME Scheduled JOBS/TASKS — One time execution of task at certain date and time

note:: It is like executing job/task at specific second or minute or hour or day

->Upload docs to certain website at specific night hour
->release of project at specific Date and time
->Converting certain form data (like csv data) to another form data (DB data) at specific date and time
-> Releasing Entrance exam results at specific hour of sepcific date
-> Starting certain moive ticket advance booking process on certain date and time
-> starting certain product sales booking at certain date and time
-> Releasing youtube vedio to the channel at certain date and time.
and etc..

These are one time executing tasks..

=>In Jdk api we have TimerTask and Timer classes of java.util package to perform scheduling based executions.
=> Once we add "spring-boot-starter" dependency we automatically get scheduling support..

```
<!-- https://mvnrepository.com/artifact/org.springframework.boot/spring-boot-starter
-->
<dependency>
  <groupId>org.springframework.boot</groupId>
  <artifactId>spring-boot-starter</artifactId>
  <version>2.5.6</version>
</dependency>
```

"spring-boot-starter" jar file/dependency gives AutoConfiguration + spring jars + logging jars + scheduling + yml processing+ .....

=> In Spring boot Apps we enable scheduling
a) By adding @EnableScheduling annotation on the top of main class /stater class along with @SpringBootApplication Annotation
b) In any spring bean class (annotation with stereo type annotation) place b.methods having @Scheduled annotation

In @Scheduled Application we can specify

initialDelay (Specifices after starting app how much delay should be there to execute the sheduled job/task for 1st time)
fixedDelay | (supports only PERIOD OF TIME)
fixedRate
cron (Supports both PERID OF TIME and POINT OF TIME)

Example App
==========

1) create spring Boot project with out adding any staraters

2) place @EnableScheduling on the top of main class

//main class
==========

```
package com.nt;

import java.util.Date;

import org.springframework.boot.SpringApplication;
import org.springframework.boot.autoconfigure.SpringBootApplication;
import org.springframework.scheduling.annotation.EnableScheduling;

@SpringBootApplication
@EnableScheduling
public class SpringBootScheduling01Application {

	public static void main(String[] args) {
		SpringApplication.run(SpringBootScheduling01Application.class, args);
		System.out.println("App started at::"+new Date());
	}

}
```

3) Develop spring bean having b.method enabled with Scheduling..

```
package com.nt.service;

import java.util.Date;

import org.springframework.scheduling.annotation.Scheduled;
import org.springframework.stereotype.Service;

@Service("task1")
public class Task1 {

	@Scheduled(initialDelay = 10000,fixedDelay = 3000)
	public  void   doTask() {
		System.out.println("task1 ...."+new Date());
	}

}
```

//1000ms = 1sec

The IOC container takes object for this spring bean and calls this @Scheduled method repeatedly for multiple times having initialDelay and fixedDelay as specified.. until we stop the application ..

4) Run the Application...

```
BootSchedulingProj1Application.main():: App started At::Sat Apr 30 20:44:37 IST 2022
	task1 ....Sat Apr 30 20:44:48 IST 2022
	task1 ....Sat Apr 30 20:44:51 IST 2022
	task1 ....Sat Apr 30 20:44:54 IST 2022
	task1 ....Sat Apr 30 20:44:57 IST 2022
	task1 ....Sat Apr 30 20:45:00 IST 2022
```

initital delay of 10 secs

fixed delay of 3 seconds

note:: if PERIOD of job/task is there in standalone App ... To stop that we need to stop the App (ctrl +c)
note:: if PERIOD of job/task is there in web appliation ... To stop that we need to stop the Server (ctrl +c)

if initialDay not specified the scheduled method trigger for execution along with App startup

```
@Scheduled(fixedDelay = 3000)
public  void  generateSalesReport() {
	System.out.println("SalesReport on::"+new Date());
}
```

```
App started At::Mon May 02 19:46:48 IST 2022
task1 ....Mon May 02 19:46:49 IST 2022
task1 ....Mon May 02 19:46:52 IST 2022
task1 ....Mon May 02 19:46:55 IST 2022
task1 ....Mon May 02 19:46:58 IST 2022
task1 ....Mon May 02 19:47:01 IST 2022
task1 ....Mon May 02 19:47:04 IST 2022
task1 ....Mon May 02 19:47:07 IST 2022
```

*App startup time and secheuld method trigging time is same*

=>we can specify fixedDelay time as stirng value as shown below

```
@Scheduled(fixedDelayString =  "3000")
public  void  generateSalesReport() {
	System.out.println("SalesReport on::"+new Date());
}
```

Q) can we place @Scheduled Annotation with out parameters/attributes..

Ans) No ,we must place cron or fixedDelay or fixedRate parameters in the @Scheduled annotation otherwise exception will be raised

org.springframework.beans.factory.BeanCreationException: Error creating bean with name 'report' defined in file [G:\Worskpaces\Spring\NTSPBMS714-BOOT\SpringBootScheduling01\target\classes\com\nt\report\ReportGenerator.class]: Initialization of bean failed; nested exception is java.lang.IllegalStateException: Encountered invalid @Scheduled method 'generateSalesReport': Exactly one of the 'cron', 'fixedDelay(String)', or 'fixedRate(String)' attributes is required

fixedDealy

=>executes the task/job back to back having given time gap irrespective wheather task/job is completed fastly or slowly..

case1:: fixedDelay=3000 (3secs)

task1/job1 takes 15 secs time to complete

task1/job1 execution for 15 secs
3secs gap/break
taks1/job1 execution form 15 secs
3 secs gap/break
taks1/job1 execution form 15 secs
3 secs gap/break
.
.
.

case2:: fixedDelay=3000 (3secs)

task1/job1 takes 1 sec time to complete

task1/job1 execution for 1sec
3 secs gap/break
task1/job1 execution for 1sec
3 secs gap/break
task1/job1 execution for 1sec
3 secs gap/break
.
.
.

---

example code

```
@Component("report")
public class ReportGenerator {

    @Scheduled(fixedDelayString = "3000")
  public void generateSalesReport() {
        try {
            Thread.sleep(5000);
        }
        catch(Exception e) { e.printStackTrace(); }
        System.out.println("SalesReport on::"+new Date());
    }

}
```

```
task1 ....Mon May 02 19:55:37 IST 2022
task1 ....Mon May 02 19:55:45 IST 2022
task1 ....Mon May 02 19:55:53 IST 2022
.
.
.
.
```

*When scheduling is enabled main thread represnets main app and sub threds/child threads represents the scheduled jobs on 1 child thread per each scheduled job*

---

## fixedRate

=>specifies the max time that the task /job should take to complete the execution..

*case1:: fixedRate: 10000 (10 secs)*

*task1/job1 is taking 5 secs to complete*

*=>task1/job1 executin for 5secs*
*10-5 = 5secs break/g ap*
*=>task1/job1 execution for 5secs*
*10-5 = 5secs break/g ap*
*=>task1/job1 execution for 5secs*
*10-5 = 5secs break/g ap*
..
..
...

```
task1 ....(start)Mon May 02 20:03:10 IST 2022
2022-05-02 20:03:10.080  INFO 3100 --- [           main] com.nt.BootSchedulingProj1Application    : Started
BootSchedulingProj1Application in 0.88 seconds (JVM running for 1.741)
task1 ....(end)Mon May 02 20:03:15 IST 2022
task1 ....(start)Mon May 02 20:03:20 IST 2022
task1 ....(end)Mon May 02 20:03:25 IST 2022
task1 ....(start)Mon May 02 20:03:30 IST 2022
task1 ....(end)Mon May 02 20:03:35 IST 2022
task1 ....(start)Mon May 02 20:03:40 IST 2022
task1 ....(end)Mon May 02 20:03:45 IST 2022
task1 ....(start)Mon May 02 20:03:50 IST 2022
task1 ....(end)Mon May 02 20:03:55 IST 2022
task1 ....(start)Mon May 02 20:04:00 IST 2022
```

*case2 :: fixedRate: 10000 (10 secs)*

*task1/job1 is taking15 secs to complete*

*=>task1/job1 executin for15secs*
*no break/gap/waiting*
*=>task1/job1 executin for15secs*
*no break/gap/waiting*
*=>task1/job1 executin for15secs*
*no break/gap/waiting*
.
.
.

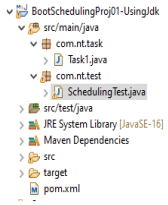
```
task1 ....(end)Mon May 02 20:04:59 IST 2022
task1 ....(start)Mon May 02 20:04:59 IST 2022
task1 ....(end)Mon May 02 20:05:14 IST 2022
task1 ....(start)Mon May 02 20:05:14 IST 2022
task1 ....(end)Mon May 02 20:05:29 IST 2022
task1 ....(start)Mon May 02 20:05:29 IST 2022
```

***What is the difference fixedDelay and fixedRate?***

*=>fixedDelay specifies the time gap/break time/wait time b/w to succesive/back to back executions is So irrepspective of wheather task/job execution is completed fastly or slowly that time gap between successive execution will be maintained..*
*=>fixedReate specifies the max time that is given to complete the execution of job/task .. if job/task execution is completed before the specified time the remaining will be used as the break time/gap time otherwise job/task executes back to back with out any gap/break time,*

---

Scheduling using JDK
==========




Task1.java
---

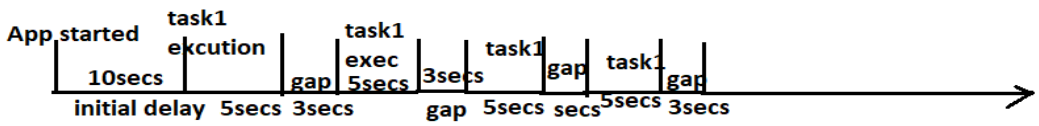
```
package com.nt.task;

import java.util.Date;
import java.util.TimerTask;

public class Task1 extends TimerTask {

    @Override
    public void run() {
        System.out.println("-------------");
        System.out.println("from task1:::::"+new Date());
    System.out.println("-------------");
    }

}
```

```
package com.nt.test;

import java.util.Date;
import java.util.Timer;

import com.nt.task.Task1;

public class SchedulingTest {

    public static void main(String[] args) {
        System.out.println("Start of the App ::"+new Date());
        Timer timer=new Timer();
        //timer.schedule(new Task1(),5000, 3000 );   // Period of Time  execution
        //timer.schedule(new Task1(), 5000);   // Point of time execution
        timer.schedule(new Task1(), new Date((2022-1900),03,30,20,32,50));  //point of time


    }

}
```

## Diagramatic representations "fixedDelay" based PERIOD OF TIME scheduling

---

**case1:: fixedDelay=3000**
**initialDelay=10000**
**task1/job1 is taking 5 secs (5000 ms) to complete the task**



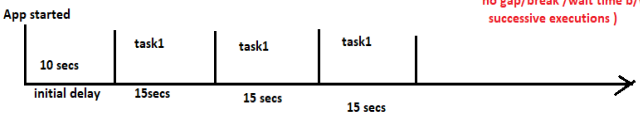

**Case2 :: fixedDelay =3000**
**initialDealy =10000**
**task/job1 is taking 2secs to complte the task**

Diagramatic representation of "fixedRate " based PERIOD OF TIME scheduling

---

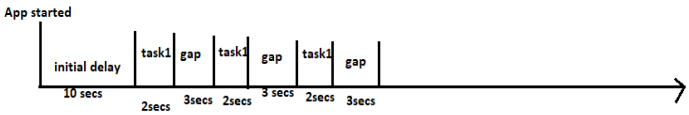
case1: initialDelay :: 10000
fixedRate :: 5000
task1/job1 is taking 15 secs to comple the task

time time
( task/job exeution> fixedRate then
no gap/break /wait time b/w back to back
successive executions )




Case2: initialDelay : 10000
fixedRate :: 5000
task1/job1 is taking 2 secs to comple the task

( if task/job execution time <fixedRate time then
fixedRate-task/job execution time gap will be there
between successive executions of the task/job)




What happens if we specify both fixedDelay and fixedRate at a time?

```
@Service("task1")
public class Task1 {

    @Scheduled(initialDelay = 5000 , fixedDelay= 3000,fixedRate = 4000)
    public  void   doTask() {
          System.out.println("task1 ....(start)"+new Date());
          try {
                Thread.sleep(15000);
          }
          catch(Exception e) {
                e.printStackTrace();
          }
          System.out.println("task1 ....(end)"+new Date());
    }

}
```

*invalid*

*we can place only one of three (cron or fixedDelay or fixedRate) attributes in @Scheduled annotation i.e we can not place all the three or any two at a time.*

Caused by: java.lang.IllegalStateException: Encountered invalid @Scheduled method 'doTask': Exactly one of the 'cron', 'fixedDelay(String)', or 'fixedRate(String)' attributes is required

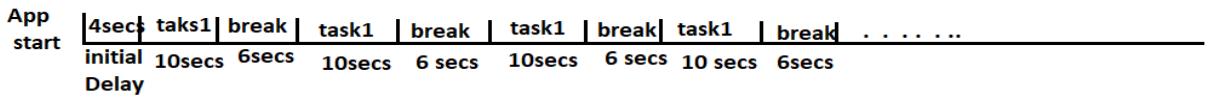
## 26 NTSPBMS615- Spring Boot scheduling -May4th

**Spring boot scheduling**

**What are the differences among initialDelay , fixedDelay and fixedRate?**

**case1:: fixedDelay with initialDelay (PERIOD OF TIME)**

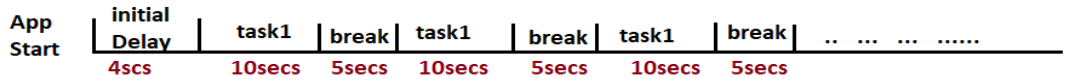
task1/job1 execution time : 10 sec
initialDelay : 4secs
fixedDelay : 6secs




**case2: fixedRate with initialDelay where task execution time < fixedRate**

task1/job1 execution time : 10 secs
initialDelay : 4secs
fixedRate : 15 secs

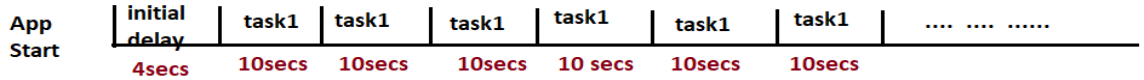
waiting time/breaktime :: fixedRate- task1 exeution time
(15secs - 10 secs) = 5 secs




**case3: fixedRate with initialDealy where task execution time >=fixedRate time**

task1/job1 execution time : 10 secs
initialDelay : 4secs
fixedRate : 8 secs

no waitingtime /breaktime
becoz fixedRate- task1 execution (8sec-10sec) gives
-2 (negetive numbers)




```
@Component("report")
public class ReportGenerator {

    //@Scheduled(initialDelay = 2000,fixedDelay = 3000)                    //1000ms = 1sec
    //@Scheduled(fixedDelay = 3000)
    //@Scheduled(fixedDelayString =  "3000")
    @Scheduled(initialDelay =2000 ,fixedRate= 5000)
 public  void  generateSalesReport() {
        System.out.println("thread(task1) name ::"+Thread.currentThread().getName());
        System.out.println("thread(task1) hashCode::"+Thread.currentThread().hashCode());
        System.out.println("Report Data on"+new Date());
    }

    @Scheduled(fixedDelay =3000,initialDelay = 2000)
 public  void  generateSalesReport1() {
        System.out.println("thred (task2) name ::"+Thread.currentThread().getName());
        System.out.println("thread(task2) hashCode::"+Thread.currentThread().hashCode());
        System.out.println("Report Data1 on"+new Date());
    }
```

*// main class runs with main thread and all scheduled tasks will trigger using same child thread by defaut becoz thread pool size for scheduling is "1" by default.*

*To increase that thread pool size use the following entry in application.properties*

spring.task.scheduling.pool.size=20
*(default is 1)*

## Spring boot scheduling with Cron Expressions

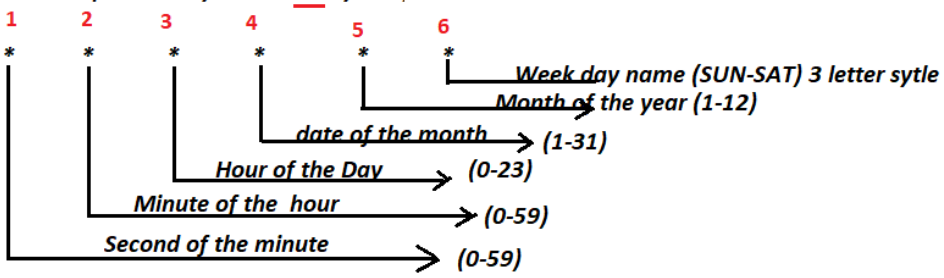
==========

=> supports both PERIOD OF TIME and POINT OF TIME providing

=>Inspired from unix /linux env.. way of date and time values

=>Most regulary used scheduling process in spring /spring boot env..

=> The cron expression syntax is 6* syntax




Allowed symbols are :: * / , ? - L W @ #

In all versions from sprng 5.3 onwords

* ---> any/ all /every

/ --> To specify PERIOD OF TIME

, --> To specify the possible list of values

- --> To specify range of values

? ---> any (can be used only with date and week day when month is specified)

L ---> To specify Last days info (can be used only Date and Weeek day filelds)

W --> To specify Week Day Info (can be used only Date and Weeek day filelds)

@ ---> To work with macros @yearly , @hourly , @monthly , @daily and etc..

# --> As a combination symbol

To specify cron expression we need to use "cron" attribute of @Sheduled Annotation

Examples POINT OF TIME

==========

eg1: `@Scheduled(cron = "15 * * * * *")`

It is not executing task for every 15 secs ..

It is executing task on every 15 sec of every minute

```
task1 ....Wed May 04 19:55:15 IST 2022
task1 ....Wed May 04 19:56:15 IST 2022
task1 ....Wed May 04 19:57:15 IST 2022
task1 ....Wed May 04 19:58:15 IST 2022
 ...
 ...
```

```
@Component("report")
public class ReportGenerator {

    @Scheduled(cron = "15 * * * * *")
    public void generateSalesReport() {
        System.out.println("task1 ...."+new Date());
    }
}
```

*=>Execute task every minute 31 secs*

*@Scheduled(31 * * * * *)*

....

eg2: @Scheduled(cron="0 0 9 * * *")

execute

->The task will every day 9:00 am like

9:00am today

9:00 am tommorrow

9:00 am day after tommorrow

.

.

*=>Execute Task for every one hour*

*@Scheduled( 0 0 0-23 * * *)*

*(or)*

*@Scheduled( 0 0 * * * *)*

*=>Execute the task every one minute*

*@Scheduled( 0 0-59 * * * *)*

*(or)*

*@Scheduled( 0 * * * * *)*

eg3: @Scheduled(cron="1 2 20 * * *")

The task will execute every day at 8pm 02 minute 01 sec.

today at 8:02:01 pm

tommorrow at 8:02:01 pm

day after tommorrow at 8:02:01 pm

..

...

...

*Execute task in 4,6,8 minute of every hour*

*@Scheduled(0 4,6,8 * * * *)*

eg4: @Scheduled(cron="0 2 8,10 * * *)

The task will execute every day at 8: 02 am and 10:02 am

today at 8:02 am and 10:02 am

tommorrow at 8:02 am and 10:02 am

day after tommorrow at 8:02 am and 10:02 am

....

....

8,10 --> "," indicates possible values

eg5: @Scheduled(cron="10 20 9-14 * * *)

The task will execute every day at

9:20:10 am

10:20:10 am

11:20:10 am

12: 20:10 am

1:20 :10 pm

2:20: 10 pm

After * symbols we can not keep numbers

eg6: Task should be executed every day 4pm

@Scheduled(cron="0 0 16 * * *)

eg7 :: @Scheduled(" 1 2 5 6 * *)

The task will execute every month 6 date 5:02:01 am

jan 6th 5:02:01 am

fed 6th 5:02:01 am

march 6th 5:02:01 am

..

..

..

*Every month 1st 10 : 15 am salary should deposited.*

*@Scheduled (0 15 10 1* * )*

*=> Given me account statement every 3rd month with respect to january*

*@Scheduled(cron="0 0 0 1 4,7,10,1 *")*

***Wish me "Happy independece day on aug 15th of every year"***

***Wish me "Happy Repulic day on jan25th of every year"***

***Wish me "Happy Birth day on oct 20th of every year"***

## 27 NTSPBMS615- Spring Boot scheduling -May 6th

Cron Expression for POINT OF TIME Assingments

---

=> Wish me happy independence day for aug 15th every year

@Scheduled(cron=" 0 0 0 15 8 * )

=> Wish me happy republic day for aug 15th every year

@Scheduled(cron="0 0 0 26 1 *")

=> Wish me happy new year on january 1st 00:00:00 hours

@Scheduled(corn="0 0 0 1 1 *")

==========

Spring Boot Scheduling using cron expressions (PERIOD OF TIME)

==========

=>For this we need to place "/" symbol in every part of cron expression except in week day place.

(last place)

eg1:: @Scheduled(cron="0/20 * * * * *")

=>execute the given task having 20 sec gap

task1 ....Fri May 06 19:47:40 IST 2022

task1 ....Fri May 06 19:48:00 IST 2022

task1 ....Fri May 06 19:48:20 IST 2022

eg2:: @Scheduled(cron=" 10 0/15 * * * *")

start

gap

=>execute given task having 15 minutes gap at 10 sec

eg3: @Scheduled(cron="20 0/2 10 * * *")

=>execute given task at the following time slots

10:00: 20am

10:02 : 20 am

10:04: 20 am

10:06: 20 am

eg4:: Execute the task every minute starting from 4pm at 30 sec.

@Scheduled(cron="30 0/1 16 * * *")

start minute

gap in mintues

eg5:: @Scheduled(cron="30 20/1 9 * * *")

executes the task in the followin timings

9:20:30 am

9:21:30 am

9:22:30 am

and etc..

eg6: @Scheduled(cron="0/20 0/30 10 * * *")

executes the task in the followin timings

10:00:00 am

10:00:20 am

10: 00:40 am

10:30:00 am

10:30 :20 am

10:30: 40 am

.. .. ...

eg6: @Scheduled(cron="4/5 9/10 10 * * *")

excutes the task in the following timings

10:9:4 secs

10:9:9 secs

10:9:14 secs

.

.

.

10:19:04 sec

10:19:09 secs

.

.

.

10:29:04 sec

10:29:09 secs

.

.

.

POINT OF TIME :: Execution at specific month or date or hour or min or sec

PERIOD OF TIME :: Successive executions having time gap.

weekday range in cron Expression

MON- SUN (or)

0 -7

where 7 or 0 indicates SunDay

Task should execute for 5 minutes starting 6pm

@Scheduled(0 0/5 18 * * *)

Execute the given task at 9pm for every 5 secs of every 5th minute.

@Scheduled (cron="0/5 0/5 21 * * *")

@Scheduled(cron="10/10 8/2 20 * * *") --> explain this

execute the given task at 8pm 8min having 2 minutes gap .. In that minute execute the task for every 10 secs starting from 10 sec.

task1 ....Fri May 06 20:08:10 IST 2022

task1 ....Fri May 06 20:08:20 IST 2022

task1 ....Fri May 06 20:08:30 IST 2022

task1 ....Fri May 06 20:08:40 IST 2022

task1 ....Fri May 06 20:08:50 IST 2022

task1 ....Fri May 06 20:10:10 IST 2022

task1 ....Fri May 06 20:10:20 IST 2022

task1 ....Fri May 06 20:10:30 IST 2022

task1 ....Fri May 06 20:10:40 IST 2022

task1 ....Fri May 06 20:10:50 IST 2022

task1 ....Fri May 06 20:12:10 IST 2022

@Scheduled( 1/10 2/20 3/5 4/3 10/1 * )

=>10th month 4 date 3am 2:01 secs

=>10th month 4 date 3am 2:11 secs

=>10th month 4 date 3am 2:21 secs

secs gap

..... ..... .....

=>10th month 4 date 3am 22:01 secs

=>10th month 4 date 3am 22:01 secs

minutes gap

**new Features of cron expressions added from spring 5.3 and spring boot 2.4**

==========

a) macros (@<....>)
b) LastDays (L)
c) Week days (W)
d) Nth week day (<weekday>#<n>)

Period of time
+
point of time

....
...
=> 10th month 4 date 8am 2:01 secs | hours gap
... ... ..... ........
... .... ... | days gap
... ..... ..... | months gap

**a) macros (@<....>)**

=>Instread of six * cron expression to repeat the task hourly or weekly or daily or monthly or yearly and etc..
we can use marcros diectly

### Macros

Expressions such as `0 0 * * * *` are hard for humans to parse and are, therefore, hard to fix in case of bugs. To improve readability, Spring now supports the following macros, which represent commonly used sequences. You can use these macros instead of the six-digit value, thus: `@Scheduled(cron = "@hourly")`.

| Macro | Meaning |
|---|---|
| `@yearly` (or `@annually`) | once a year (`0 0 0 1 1 *`) |
| `@monthly` | once a month (`0 0 0 1 * *`) |
| `@weekly` | once a week (`0 0 0 * * 0`) |
| `@daily` (or `@midnight`) | once a day (`0 0 0 * * *`), or |
| `@hourly` | once an hour, (`0 0 * * * *`) |

```
@Scheduled(cron="@hourly")
```

### Last Days

The day-of-month and day-of-week fields can contain a `L` character, which has a different meaning in each field. In the day-of-month field, `L` stands for *the last day of the month*. If followed by a negative offset (that is, `L-n`), it means *`n`th-to-last day of the month*.

In the day-of-week field, `L` stands for *the last day of the week*. If prefixed by a number or three-letter name (`dL` or `DDDL`), it means *the last day of week (`d` or `DDD`) in the month*.

Here are some examples:

| Cron Expression | Meaning |
|---|---|
| `0 0 0 L * *` | last day of the month at midnight |
| `0 0 0 L-3 * *` | third-to-last day of the month at midnight |
| `0 0 0 * * 5L` | last Friday of the month at midnight |
| `0 0 0 * * THUL` | last Thursday of the month at midnight |

```
@Scheduled(cron="0 2 11 L* *")
```

### Second Friday of the Month

The day-of-week field can be `d#n` (or `DDD#n`), which stands for *the `n`th day of week `d` (or `DDD`) in the month*.

Here are some examples:

| Cron Expression | Meaning |
|---|---|
| `0 0 0 ? * 5#2` | the second Friday in the month at midnight |
| `0 0 0 ? * MON#1` | the first Monday in the month at midnight |

```
@Scheduled(cron="0 9 11 * * 7#2")
```

## Weekdays

### Weekdays

The day-of-month field can be `nW`, which stands for *the nearest weekday to day of the month* `n`. If `n` falls on Saturday, this yields the Friday before it. If `n` falls on Sunday, this yields the Monday after, which also happens if `n` is `1` and falls on a Saturday (that is: `1W` stands for *the first weekday of the month*).

If the day-of-month field is `LW`, it means *the last weekday of the month*.

Here are some examples:

| Cron Expression | Meaning |
|---|---|
| `0 0 0 1W * *` | first weekday of the month at midnight |
| `0 0 0 LW * *` | last weekday of the month at midnight |

**Mon -Fri are called weekdays**
**Sat- Sun are called weeends**

**@Scheduled(cron="0 11 7 LW * *") (setup: chanage nov 30 which is to tuesday)**

**@Scheduled(cron="0 15 7 1W * *") (setup :: chanage to nov1st which is monday)**

**note:: while working NW and LW concepts manual date chanages are not going to recognize. (middle of app execution.. if data,times are changed they will not recongnized)**

## 28 NTSPBMS615- Spring Batch Intro - May 7th

Spring Batch (or) Spring Batch Processing (or) Spring Boot Batch
==========  ==========

Spring Batch is given extension module of spring framework by pivotal team(spring team) +accenture

What is Batch Processing
==========

=> It is the process of handling huge amount of data( chunks of data ) batch by batch by reading the from one source and processing data with changes by executing logics and writing data to another Destination.

=>Spring batch + spring scheduling is great combination to perform batching activities in automated env.. either on "PERIOD OF TIME" or "POINT OF TIME"

usecases ::

a) Collecting Sensus Data (population count) and storing into DB s/w
teacher collects family info on paper --> feeds to excel sheets --->uploads excel sheets
GOVT App ---> Govt App validates the data , filters data , cateroize data ------> writes to DB s/w

b) Collecting Log Messages from ATM Machines ---> categorinizing them -----> wrting to Db s/w

c) Collecting Insurance policy holders of LIC from DB s/w ----->
indentifying the Policy matured people ---> Sending that info to branches accordingly.

d) HDFC collecting Loan Holders Info --------> processing and sending
from DB s/w every monthg EMI Payment Remainder messsages/mails

e) Collecting Bank Loan customers Info ------> finding Defaulters and sending notices them

and etc..

While doing batch processing
=>Collect data from different sources in different formats like csv , pdf , db tables and etc..
=> Processs Data for filtering data or modifying data or categornizing data or ordering data and etc..
=>Write data to different destinations in different fromats.. like csv , pdf , db tables and etc..

=>converting DB data to Xml data after processing
=>Converting one DB s/w data to another Db s/w data after procesing
=> Converting JSON Data to CSV (comma seperate data )/Excel Data after processing
=> Converting DB s/w data to JSON data after processing
and etc... (All convertions are possible in all angels)

=> if Data of the Project is MBs and GBs , then store data in DB s/w and manipulate it by using jdbc or spring jdbc or spring data jpa (best) or spring orm or hibernate ...
eg:: College or university Students Info

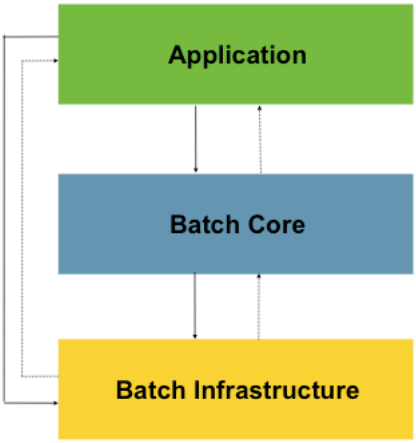
=> if Data of the Project is GBs and TBs, then store data in DB s/w and manipulate it through batch Processing (batch by batch processing) with the support of plain JDBC or spring JDBC or Spring Batch (best)
eg:: Bank Data or Financial organization data , census , ATM log info and etc..

=> if the data of the Project is TBs , PBs ,XBs,yBs and etc.. (very huge beyond storing and processing capacity of DB s/w -which is BigData) then store and proccess that data using BigData frameworks(like hadoop or spark)
eg: Facebook , Google , twitter , youtube videos location data ,goolge maps and etc..

=>In All these places we can use NoSQL DB s/w if schema/format of data is unstructed and growing dynamically.
(MongoDB, cassendra, graphQL and etc..)

note: FB kind of Apps uses multiple Storage technologies at a time in a single Project.

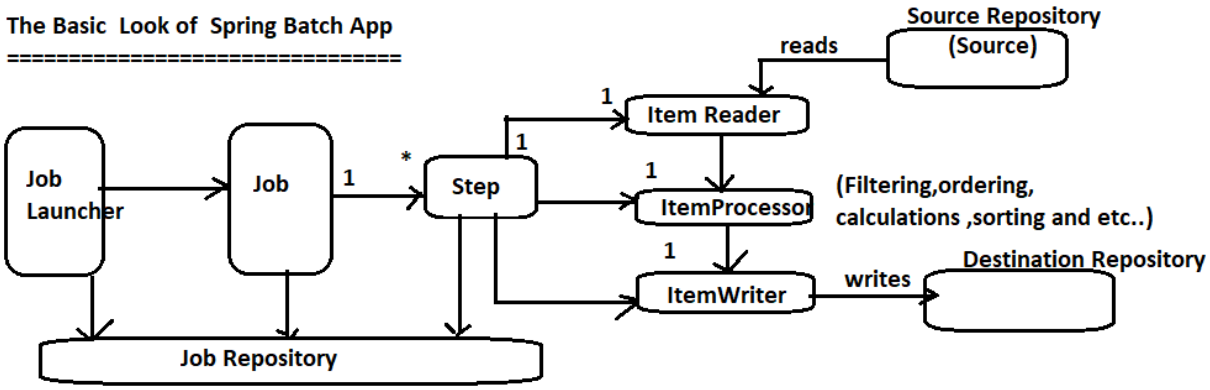
Spring Batch High Level Architecture
==========




Spring Batch Layered Architecture

---

The Basic Look of Spring Batch App
==========




=>Job Launcher laucher launches the Job
=> Every Job can contain 1 or more steps
=> Every Step contains 1 ItemReader , 1 ItemWriter and 1 ItemProcessor
=>Item Reader reads each Item (primitive /object ) from Source Repository and gives that item
to Item Processor for Processing and at end processed items will written to destination repository using Item Writer.
=>All activities of Job Launcher , JOB, Step will be kept tracked by JobRepository which is InMemory Repository by default.

**org.springframework.batch.item pkg** of

**=> All Item Readers are implementation classes ItemReader<T> (I)**

**=>All Item Processors are implementation classes of ItemProcessor<I,O> (I)**

**=> All Item Writers are implementation classes of ItemWriter<T> (I)**

**=>Generally we work with Pre-defined ItemWriter classes and pre-fined ItemReader becoz they are designed to deal with different types source /Destination repositories and with different types of data formats.. But we always develop ItemProcessor manually..**

**=>Pre-defined ItemReaders are**

---

| Reader | Purpose |
|---|---|
| FlatFIleItemReader | To read data from flat files. (text files like csv files) |
| StaxEventItemReader | To read data from XML files. |
| StoredProcedureItemReader | To read data from the stored procedures of a database. |
| JDBCPagingItemReader | To read data from relational databases database. |
| MongoItemReader | To read data from MongoDB. |
| Neo4jItemReader | To read data from Neo4j |

**and etc..**

**=>Pre-defined ItemWriters are**

**==========**

| Writer | Purpose |
|---|---|
| FlatFIleItemWriter | To write data into flat files. |
| StaxEventItemWriter | To write data into XML files. |
| StoredProcedureItemWriter | To write data into the stored procedures of a database. |
| JDBCPagingItemWriter | To write data into relational databases database. |
| MongoItemWriter | To write data into MongoDB. |
| Neo4jItemWriter | To write data into Neo4j. |

**and etc...**

**org.sf.batch.item.ItemReader<T> (I)**

**|----> <T> read() throws java.lang.Exception, UnexpectedInputException, ParseException, NonTransientResourceException**

**org.sf.batch.item.ItemWriter<T> (I)**

**|--->void write(java.util.List<? extends T> items)**

**org.sf.batch.item.ItemProcessor<I,O> (I)**

**|--->O process(@NonNull I item) throws java.lang.Exception**

**=>The <T> of ItemReader must match with <I> of ItemProcessor and similarly the <O> of Item Processor must match with <T> of ItemWriter**

**note: The <I> and <O> ItemProcessor can be same or can be different.**

**=>After Processing the recived item from ItemReader the ItemProcessor can give either same object with modified data /unmodified data or different object with same data or modifidata to ItemWriter to write to the Destinations**

**Case1::** (<I> and <O> Of ItemProcessor are different)

**=> ItemReders gets Student object from Soruce (college DB)**

**=>ItemProcessor conducts interview and converts eglible Student object to Employee object**

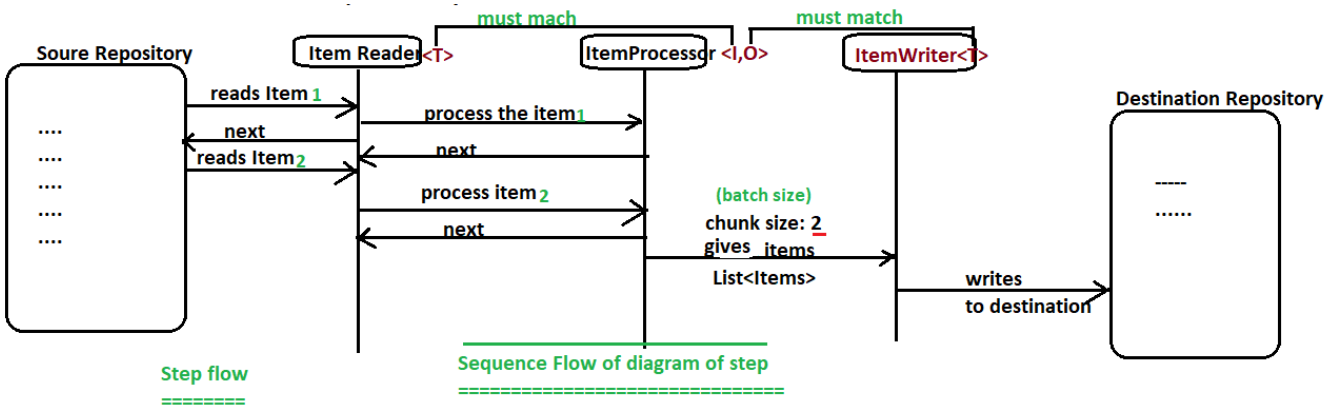
**=> ItemWrites gets List <Employee> objs to write to Destination (Company DB)**

**Case2::** (the <I> and <O> of ItemProcessor are same here)

**=> ItemReders gets PolicyHolder object from Soruce (LIC DB)**

**=>ItemProcessor checks payment schedule of policy holder is there in the current month or not if not there give nothing to ItemWriter otherwise gives same PolicyHolder object to ItemWriter**

**=> ItemWrites writes of List <PolicyHolder> objs to Destination (Excel sheet /another db table)**




Sequence Flow of diagram of step

Step flow

=>ItemReader reads 1st item from source and gives that Item to ItemProcessor for processing

=>ItemReder reads 2nd item from source and gives that Item to ItemProcessor for processing

....

....

=>Once chunk size items are processed ,.. the ItemProcessor gives chunk size processed items will be to ItemWriter and they written to desintation by ItemWriter..

## 29 NTSPBMS615- Spring Batch Programming - May 8th

**Job**

**===**

**=>Job represents work to be completed .. Each Job contains 1 or more steps (Minimum 1 step will be there)**

**=>Step object means it is the object of java class that implements <pkg>.Step(I). org.springframework.batch.core.Step)**

**=>Job object means it is the object of java class that implenetns pkg.Job(I) (org.springframework.batch.core.Job )**

**=> Job represents total work to be completed where as step represents task/sub task of the Job**

**in month**

**eg : Job ( Finding the Customers who are having due date this to renew polocies and trigging SMS messages)**

**=>step1 (sub task1)**

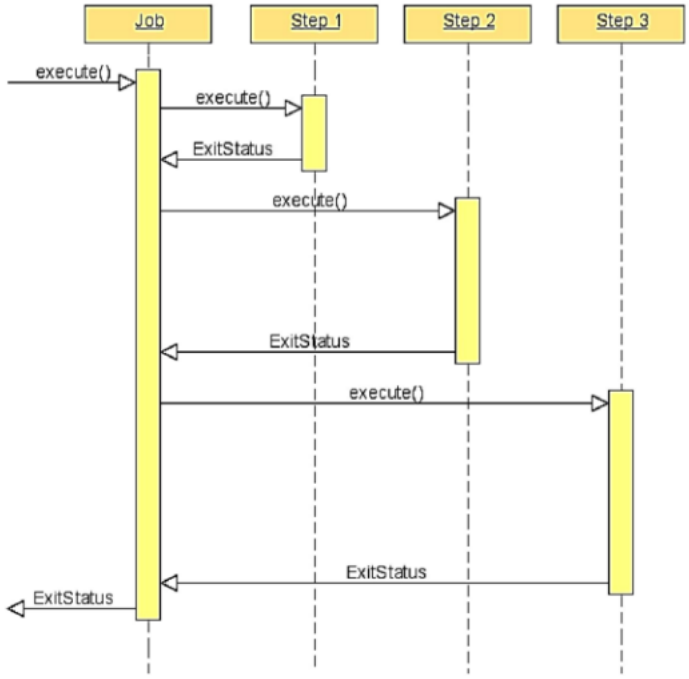
**=> Get all customer having due date in this method from DB s/w to Excel sheet**

**=>step2) Convert Excel sheet data to mysql DB table data**

**(becoz SMS Trigger app expeceting details in Mysql Db table)**

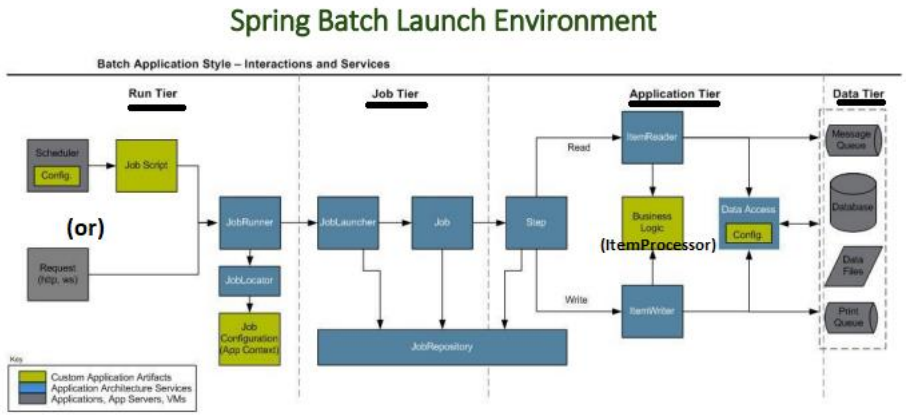
**=>step3) Trigger SMS messages ..**

**(Read from mysql Db and trigger SMS messages)**




**Job with steps sequence flow diagram**

---



The application style is organized into four logical tiers, which include **Run, Job, Application, and Data** tiers. The primary goal for organizing an application according to the tiers is to embed what is known as "**separation of concerns**" within the system. Effective separation of concerns results in reducing the impact of change to the system.

- **Run Tier:** The Run Tier is concerned with the scheduling and launching of the application. A vendor product is typically used in this tier to allow time-based and interdependent scheduling of batch jobs as well as providing parallel processing capabilities.
- **Job Tier:** The Job Tier is responsible for the overall execution of a batch job. It sequentially executes batch steps, ensuring that all steps are in the correct state and all appropriate policies are enforced.
- **Application Tier:** The Application Tier contains components required to execute the program. It contains specific modules that address the required batch functionality and enforces policies around a module execution (e.g., commit intervals, capture of statistics, etc.)
- **Data Tier:** The Data Tier provides the integration with the physical data sources that might include databases, files, or queues. Note: In some cases the Job tier can be completely missing and in other cases one job script can start several batch job instances.

---

**Once we add "spring-boot-starter-batch" to the spring boot projects we GET multiple objects related TO spring batch processing through Autoconfiguraiton like**

**a)StepBuildFactory (required to create Step object)**
**b)JobBuilderFactory (required to create Job object)**
**c)JobLauncher (requred to run the Job )**
**and etc..**

**ItemReader**
**==========**

**=> All Item Reader classes in spring batch are the implementation classes of org.springframework.batch.item.ItemReader<T>**

**=> We generally do not implement ItemReader(I) i.e we do not need to develop Custom ItemReaders .. becoz spring batch has provided multiple pre-defined ItemReaders**

**=>The read() of Each ItemReader reads info from source repository (like file, DB and etc ...) and gives either String object or Model class object representing each record of the Info.**

**=>The readymade ItemReaders are**
**==========**

**AvroItemReader, FlatFileItemReader, HibernateCursorItemReader, HibernatePagingItemReader, ItemReaderAdapter, ItemReaderAdapter, IteratorItemReader, JdbcCursorItemReader, JdbcPagingItemReader, JmsItemReader, JpaCursorItemReader, JpaPagingItemReader, JsonItemReader, KafkaItemReader, LdifReader, ListItemReader, MappingLdifReader, MongoItemReader, MultiResourceItemReader, Neo4jItemReader, RepositoryItemReader, ResourcesItemReader, SingleItemPeekableItemReader, StaxEventItemReader, StoredProcedureItemReader, SynchronizedItemStreamReader and etc..**

**=>Since all ItemReaders are pre-defined classes we cfg them as spring beans using @Bean methods of @Configuration class /Main class (which internally @Configuration class)**

In AppConfig.java (Configuraiton class)
==========

```
@Bean(name="ffIReader")
public ItemReader   createReader(){
    FlatFileItemReader reader=new FlatFileItemReader<String>();
     .....
     ....
  return reader;
 }
```

ItemWriter
=========
=>It is given to write given chunk/batch of information to Destination ..
=> Generally we do not develop ItemWrites .. becoz there are multiple readyMade ItemWriters to use
=>All ItemWriters are impl classes of org.springframework.batch.itemItemWriter<T>.

The ready made ItemWriters are
==========

AmqpItemWriter, AsyncItemWriter, AvroItemWriter, ChunkMessageChannelItemWriter, ClassifierCompositeItemWriter, CompositeItemWriter, FlatFileItemWriter, GemfireItemWriter, HibernateItemWriter, ItemWriterAdapter, ItemWriterAdapter, JdbcBatchItemWriter, JmsItemWriter, JpaItemWriter, JsonFileItemWriter, KafkaItemWriter, KeyValueItemWriter, ListItemWriter, MimeMessageItemWriter, MongoItemWriter, MultiResourceItemWriter, Neo4jItemWriter, PropertyExtractingDelegatingItemWriter, RepositoryItemWriter, SimpleMailMessageItemWriter, SpELMappingGemfireItemWriter, StaxEventItemWriter, SynchronizedItemStreamWriter

=>since all the ItemWrites are pre-defined classes , we generally configure them using @Bean methods of @Configuration class or main class..

In AppConfig.java (Configuration class)
==========

```
@Bean(name="jbiwriter")
public   ItemWriter   createWriter(){
  JdbcBatchItemWriter<Customer> writer=new JdbcBatchItemWriter();
    ....
    ....
    ...
  return writer;
 }
```

Convert CSV file(Flat) data to DB table records after filter the records based on bill amount.

ItemProcessor
==========
=> It is impl class of org.springframework.batch.item.ItemProcessor<I,O>
=> Very Limited ready made ItemProcessors are avaiable.. So we generally develop custom Item Processors.

ready made ItemProcessor are
==========

AsyncItemProcessor, BeanValidatingItemProcessor, ClassifierCompositeItemProcessor, CompositeItemProcessor, FunctionItemProcessor, ItemProcessorAdapter, ItemProcessorAdapter, PassThroughItemProcessor, ScriptItemProcessor, ValidatingItemProcessor

=> The <I> if ItemProcessor must match <T> of ItemReader and similary the <O> of ItemProcessor must match with <T> of ItemWriter

CustomerFilterItemProcessor.java
---

```
package com.nt.processor;
@Component ("processor")
public class CustomerFilterItemProcessor implements ItemProcessor<String,Customer>{

    public   Customer   process(String info){

        ....
        ....  //logic for convertion and filtering  based on the
        ....                                        bill amount >5k
        return  Customer object;

    }
}
```

Step
====
=> It is impl class object of org.springframework.batch.core.Step (I)
=> Each Step object represents one task/sub task of a Job
=> Every Step object must be linked with 1 reader object ,1 writer object and 1 processor object.
=> We generally create Step object by Using the StepBuilderFactory object that comes spring boot App throrugh AutoConfiguration.
=>every Step object must contain the following 5 details
a)step name
b) <Input type, output type> + chunksize
c) reader obj
d) writer obj
e) processor obj
=>We generally use @Bean method in @Configuration class to create Step object with StepBuilderFactory object and poviding the above 5 details..

In AppConfig.java (Confiuration class)
==========

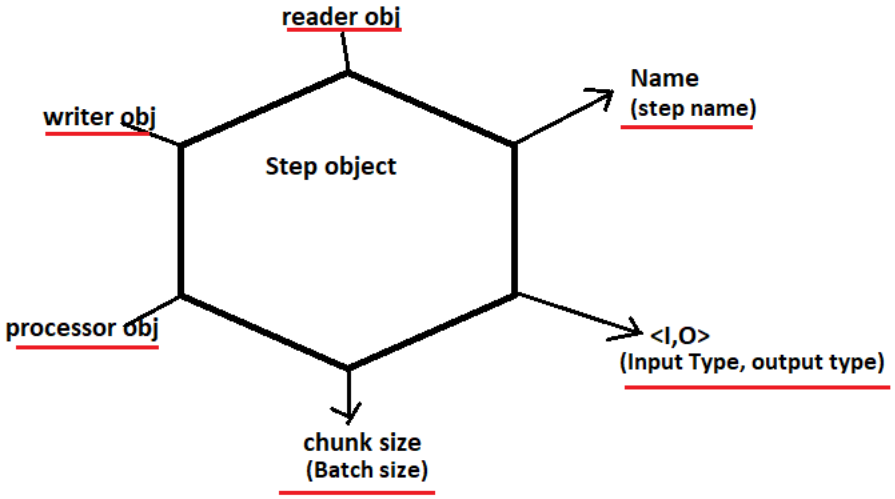
```
@Configuration
@ComponentScan(basePackages="com.nt")
 public class AppConfig{
      @Autowired
     private StepBuilderFactory sbFactory;
      @Autowired
    private  JobBuilderFactory  jbFactory;
    @Autowired
    private  CustomerFilterItemProcessor custProcessor;


     @Bean(name="ffIReader")
     public  ItemReader   createReader(){
         FlatFileItemReader reader=new FlatFileItemReader<...>();
          .....
          ....
       return reader;
      }

        @Bean(name="jbiwriter")
        public   ItemWriter   createWriter(){
          JdbcBatchItemWriter<Customer> writer=new JdbcBatchItemWriter();
            ....
            ....
            ...
           return writer;
         }
                          step name
        @Bean(name="step1")
        public  Step  createStep() {
            return   sbFactory.get("step1")    //step name
                             .<String,Customer>chunk(10)  //chunk size  + Input, output types
                             .reader(createReader())  //reader obj
                             .processor(custProcessor)  //processor obj
                             .writer(createWriter())  //writer obj
                             .build();  //  build() method builds the Step obj
          }

          ....
          ....  // job configuration
          ....

    }
```

String

method chaining
==========
calling method().method().method()... is called
Method Chaining i.e The returned object of
1 method will be used as base object to call another method.

Builder DP

Spring Batch Configurations
==========




JobExecutionListener (I)
==========

=>By implementing this interface , we can perform event handling on job activities like when Job is started , when job is completed, what is status of job completion (Success or failure) and etc..
=> In creation Job object we need JobListener object.

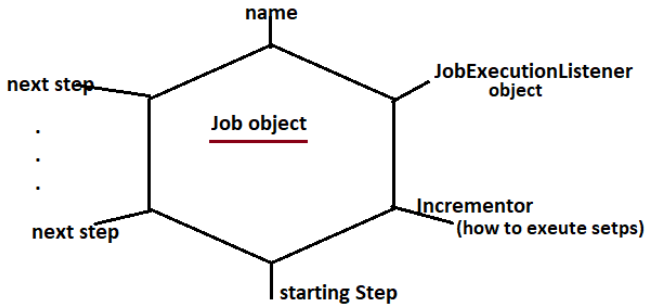
org.springframework.batch.core.JobExecutionListener(I)

Example Listener
==========

```
@Component("jmListener")
public JobMonitoringListener implements JobExecutionListener{
    class
      public void beforeJob(JobExecution execution){
         ....    //get start time
         ...
       }
      public void afterJob(JobExecution execution){
         ....
         ...      //get end time
       }
}
```

Job object
==========

=>It is the obejct of class that implements org.springframework.batch.core.Job(I)
=> Job defines the work to be completed..
=> Generally one Application contains one Job object with 1 or more Step objects(tasks/sub tasks)
=> To create Job object we use JobBuilderFactory that comes to spring batch app through AutoConfiguration processs.
=> Job object creation needs multiple details like
name , listener , incrementor (specifies the order executing setps),
starting step ,next step, next next step , ....



Sample code
==========

//BatchConfig.java

```
@Configuration
@EnableBatchProcessing
public class BatchConfig {
```

mandatory
(Enable Spring Batch features and provide a base configuration for setting up batch jobs in an @Configuration class)

```
    @Autowired
    private StepBuildFactory sbFactory;
    @Autowired
    private JobBuilderFactory jobFactory;
```

comes through AutoConfiguration based based Autowiring

```
    @Autowired
    private JobExecutionListener listener;

    @Autowired
    private CustomerItemProcessor processor
```

User-defined spring beans injection through Autowiring.

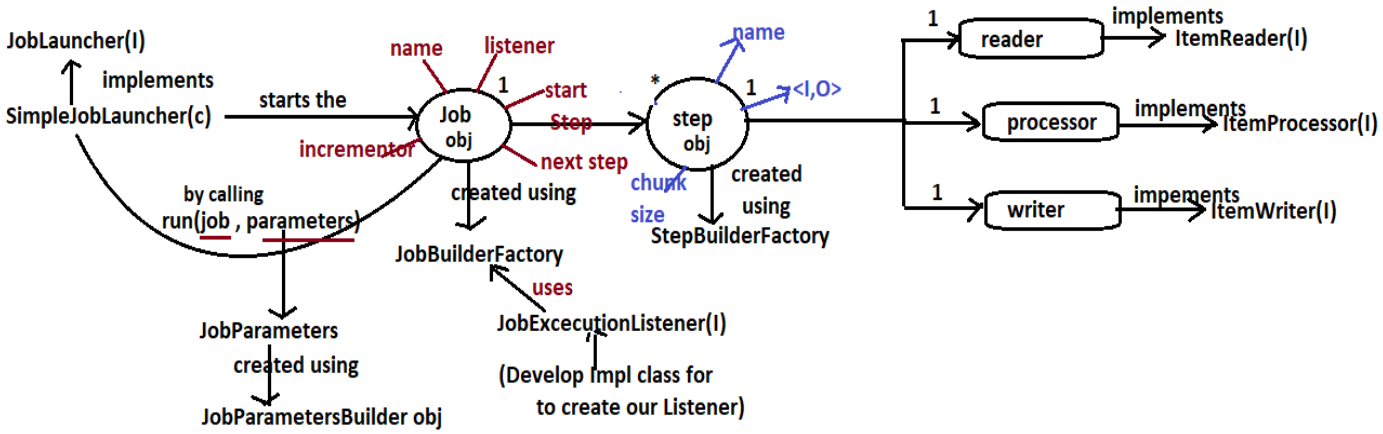
```
    @Bean(name="ffIReader")
    public ItemReader createReader(){
        FlatFileItemReader reader=new FlatFileItemReader<...>();
         .....
         ....
     return reader;
     }

       @Bean(name="jbiwriter")
       public ItemWriter createWriter(){
         JdbcBatchItemWriter<Customer> writer=new JdbcBatchItemWriter();
           ....
           ....
           ...
          return writer;
        }

        //step cfg
           @Bean(name="step1")
           public Step createStep1() {
               return sbFactory.get("step1")    //step name
                               .<String,Customer>chunk(10)  //chunk size  + Input, output types
                               .reader(createReader())  //reader obj
                               .processor(custProcessor)  //processor obj
                               .writer(createWriter())  //writer obj
                               .build();  //  build() method builds the step
             }

        // Job cfg
        @Bean(name="job1")
        public Job createJob1(){
            return jobFactory.get("job1")  // job name
                             .incrementor(new RunIdIncrementor()) //  speficies the order executing given steps
                             .listener(listener)  //specifices the listener object
                             .start(createStep1())  //starting step
                             //.next(createStep2())  //next step
                             //.next(createStep3())  //next step
                               ...
                               ...
                             .build();  //builds the Job object
          }
    }
```

String

Gives JobBuilder obj

(By default in given order of steps)

End to End Technical View /flow of Spring Batch App




Client App in spring batch App

=>Here we inject JobLancher object given by AutoConfiguration and also Job object cfg in the Cfg file using @Autowired annotation.
=> We build JobParameters (optional) using JobParametersBuilder obj
=> we call run(job, paramters) on JobLaucher object to run the job.

```
public class BatchProcessingTest{
   @Autowired                          | AutoConfiguration based
   private JobLauncher launcher;       | Autowiring
    @Autowired
   private Job job;                    | @Bean method created
                                       | Job object injection

    p s v main(String args[]){
     JobParameters params= new JobParameterBuilder()
                          .addLong("jobId",new Random().nextInt(10000)).toJobParameters();

        launcher.run(job,params);
     }//main
    }//class
```

---

POC (Proof of Cocept on Spring batch processing)

=>Custom ItemReader
=>Custom ItemWriter
=>Custom ItemProcessor
=> JobExecution Listeners
=>BatchConfig class (enable Bathch Processing)
-> JobBuilderFactory | AutoConfiguration based @Autowired
-> StepBuilderFactory
-> Listener
-> reader
->writer
->processor
@Autowiring
(or) using @Bean methods

==========
Add spring -boot-starter-batch
==========

-> @Bean method for Step obj | Using @Bean methods
-> @Bean method for Job obj

=>Client App
->JobLauncher | AutoConfiguration based @Autowired
-> Job | @Autowired
-> prepare JobParameters (optional)
->Run the job (lanucher.run(job,parameters)

## 31 NTSPBMS615- Spring Batch POC Application - May 11th

POC (Proof of Cocept on Spring batch processing)
==========

=>Custom ItemReader
=>Custom ItemWriter
=>Custom ItemProcessor
=> JobExecution Listener
=>BatchConfig class (enable Bathch Processing)
-> JobBuilderFactory | AutoConfiguration based @Autowired
-> StepBuilderFactory
-> Listener
-> reader | @Autowiring
->writer
->processor
-> @Bean method for Step obj
-> @Bean method for Job obj

=>Client App (Runner class)
->JobLauncher | AutoConfiguration based @Autowired
-> Job | @Autowiring
-> prepare JobParameters (optional)
->Run the job

==========
Add spring -boot-starter-batch , h2 starter
========== (InMemory DB)

⇩

All the details written to JobRepository will be recorded in the DB tables of H2 DB .

---

```
//Listener
=========
package com.nt.listener;

import java.util.Date;

import org.springframework.batch.core.JobExecution;
import org.springframework.batch.core.JobExecutionListener;
import org.springframework.stereotype.Component;

@Component("jmListener")
public class JobMonitoringListener implements JobExecutionListener {
  private long startTime, endTime;

  public JobMonitoringListener() {
       System.out.println("JobMonitoringListener:: 0-param constructor");
   }

       @Override
       public void beforeJob(JobExecution jobExecution) {
        System.out.println("Job is about to beging at::"+new Date());
        startTime=System.currentTimeMillis();
        System.out.println("Job Status ::"+jobExecution.getStatus());
       }

       @Override
       public void afterJob(JobExecution jobExecution) {
                System.out.println("Job completed at::"+new Date());
                endTime=System.currentTimeMillis();
                System.out.println("Job Status ::"+jobExecution.getStatus());
                System.out.println("Job Exection time ::"+(endTime-startTime));
                System.out.println("Job Exit Status ::"+jobExecution.getExitStatus());

       }

}
```

```
  //Reader

package com.nt.reader;

import java.io.Serializable;

import org.springframework.batch.item.ItemReader;
import org.springframework.batch.item.NonTransientResourceException;
import org.springframework.batch.item.ParseException;
import org.springframework.batch.item.UnexpectedInputException;
import org.springframework.stereotype.Component;


@Component("bdReader")
public class BookDetailsReader implements ItemReader<String> {
        String  books[]=new String[] {"CRJ","TIJ","HFJ","EJ","BBJ"};   //Source
        int count=0;

        public BookDetailsReader() {
            System.out.println("BookDetailsReader:: 0-param consturctor");
       }

       @Override
       public String read() throws Exception, UnexpectedInputException, ParseException, NonTransientResourceException {
            System.out.println("BookDetailsReader.read()");
              if(count<books.length) {
                   return books[count++];
              }
              else {
                  return null;
              }
       }

}

        //Processor
        ===========
```

```
package com.nt.processor;

import org.springframework.batch.item.ItemProcessor;
import org.springframework.stereotype.Component;

@Component("bdProcessor")
public class BookDetailsProcessor implements ItemProcessor<String,String> {

      public BookDetailsProcessor() {
            System.out.println("BookDetailsProcessor:: 0-param constructor");
      }
      @Override
      public String process(String item) throws Exception {
            System.out.println("BookDetailsProcessor.process()");
              String bookWithTitle=null;
             if(item.equalsIgnoreCase("CRJ"))
                    bookWithTitle=item+" by HS and PN";
             else if(item.equalsIgnoreCase("TIJ"))
                    bookWithTitle=item+" by BE";
             else if(item.equalsIgnoreCase("HFJ"))
                    bookWithTitle=item+" by KS";
             else if(item.equalsIgnoreCase("EJ"))
                    bookWithTitle=item+" by JB";
             else if(item.equalsIgnoreCase("BBJ"))
                    bookWithTitle=item+" by RNR";
             return bookWithTitle;
      }
}
```

```
//writer
package com.nt.writer;

import java.util.List;

import org.springframework.batch.item.ItemWriter;
import org.springframework.stereotype.Component;

@Component("bdWriter")
public class BookDetailsWriter implements ItemWriter<String> {

	@Override
	public void write(List<? extends String> items) throws Exception {
		System.out.println("BookDetailsWriter.write()");
		items.forEach(System.out::println);

	}

}
```

**BatchCofig.java**

```
package com.nt.config;
import org.springframework.batch.core.Job;
import org.springframework.batch.core.Step;
import org.springframework.batch.core.configuration.annotation.EnableBatchProcessing;
import org.springframework.batch.core.configuration.annotation.JobBuilderFactory;
import org.springframework.batch.core.configuration.annotation.StepBuilderFactory;
import org.springframework.batch.core.launch.support.RunIdIncrementer;
import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.context.annotation.Bean;
import org.springframework.context.annotation.Configuration;
import com.nt.listener.JobMonitoringListener;
import com.nt.processor.BookDetailsProcessor;
import com.nt.reader.BookDetailsReader;
import com.nt.writer.BookDetailsWriter;

@Configuration
@EnableBatchProcessing  // Gives spring batch features through  autoConfiguration
                        // like giving InMemoryJobRepository, JobBuilderFactory,StepBuildFactory
                        // and etc..
public class BatchConfig {
	@Autowired
	private  JobBuilderFactory  jobFactory;
	@Autowired
	private  StepBuilderFactory  stepFactory;
	@Autowired
	private  BookDetailsWriter bdWriter;

	@Autowired
	private  BookDetailsReader bdReader;
	@Autowired
	private  BookDetailsProcessor bdProcessor;
	@Autowired
	private  JobMonitoringListener  jobListener;
```

```
//create step object using StepBuilderFactory
@Bean(name="step1")
 public Step  createStep1() {
      System.out.println("BatchConfig.createStep1()");
          return  stepFactory.get("step1")
                                  .<String,String>chunk(1)
                                  .reader(bdReader)
                                  .writer(bdWriter)
                                  .processor(bdProcessor)
                                  .build();
 }

//create Job  using JobBuilderFactory
@Bean(name="job1")
public  Job createJob() {
      System.out.println("BatchConfig.createJob()");
      return  jobFactory.get("job1")
                                 .incrementer(new RunIdIncrementer())
                                 .listener(jobListener)
                                 .start(createStep1())
                                 .build();
       }
 }
```

BatchConfig.java

```
 package com.nt.runner;

 import java.util.Random;
 import org.springframework.batch.core.Job;
 import org.springframework.batch.core.JobExecution;
 import org.springframework.batch.core.JobParameters;
 import org.springframework.batch.core.JobParametersBuilder;
 import org.springframework.batch.core.launch.JobLauncher;
 import org.springframework.beans.factory.annotation.Autowired;
 import org.springframework.boot.CommandLineRunner;
 import org.springframework.stereotype.Component;

 @Component
 public class BatchProcessingTestRunner implements CommandLineRunner {
       @Autowired
       private  JobLauncher launcher;
       @Autowired
       private  Job job;

       @Override
       public void run(String... args) throws Exception {
            //prepare  Job Parameters
            JobParameters params=new JobParametersBuilder()
                                          .addLong("time",System.currentTimeMillis()).toJobParameters();
            //run the job
       JobExecution exeution=launcher.run(job, params);
            /*System.out.println("Job execution status ::"+exeution.getStatus());
            System.out.println("Exit Status ::"+exeution.getExitStatus());
            System.out.println(" Job Id"+exeution.getJobId());*/
       }
 }
```

//application.properties

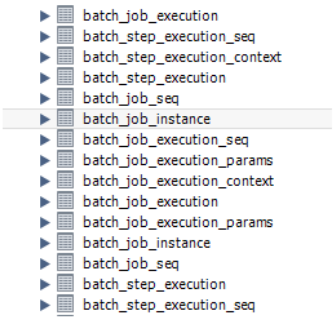
---

spring.batch.job.enabled=false  # Indicates wheater batch code should execute on the app startup or on demand

spring.batch.jdbc.initialize-schema=always

(true(default) :: on the app startup)
(false :: on demand when lanucher.run(-) is called)

It use underlying Db s/w to create lots db tables to track of job execution related operations..



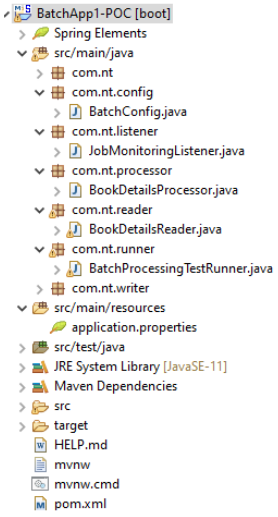

possible values ::
never , always
embedded

**Another way of writing BatchConfig class**

==========

```
package com.nt.config;

import org.springframework.batch.core.Job;
import org.springframework.batch.core.Step;
import org.springframework.batch.core.configuration.annotation.EnableBatchProcessing;
import org.springframework.batch.core.configuration.annotation.JobBuilderFactory;
import org.springframework.batch.core.configuration.annotation.StepBuilderFactory;
import org.springframework.batch.core.launch.support.RunIdIncrementer;
import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.context.annotation.Bean;
import org.springframework.context.annotation.Configuration;
import com.nt.listener.JobMonitoringListener;
import com.nt.processor.BookDetailsProcessor;
import com.nt.reader.BookDetailsReader;
import com.nt.writer.BookDetailsWriter;

@Configuration
@EnableBatchProcessing  // Gives spring batch features through  autoConfiguration
                        // like giving InMemoryJobRepository, JobBuilderFactory,StepBuildFactory
                        // and etc..
public class BatchConfig1 {
    @Autowired
    private  JobBuilderFactory  jobFactory;
    @Autowired
    private  StepBuilderFactory  stepFactory;

    @Bean
    public  JobMonitoringListener createListener() {
        return  new JobMonitoringListener();
    }

    @Bean
    public  BookDetailsWriter createWriter() {
        return new BookDetailsWriter();
    }
    @Bean
    public  BookDetailsProcessor createProcessor() {
        return new BookDetailsProcessor();
    }
```

```
@Bean
public BookDetailsReader  createReader() {
      return new BookDetailsReader();
}
//create step object using StepBuilderFactory
@Bean(name="step1")
 public Step  createStep1() {
      System.out.println("BatchConfig.createStep1()");
          return  stepFactory.get("step1")
                                  .<String,String>chunk(1)
                                  .reader(createReader())
                                  .writer(createWriter())
                                  .processor(createProcessor())
                                  .build();
 }

//create Job  using JobBuilderFactory
@Bean(name="job1")
public   Job createJob() {
      System.out.println("BatchConfig.createJob()");
      return   jobFactory.get("job1")
                                  .incrementer(new RunIdIncrementer())
                                  .listener(createListener())
                                  .start(createStep1())
                                  .build();
}
}
```




=> Types  of inner classes in java
=>  types  of  blocks  java class
=> what is difference b/w  instance block  and static block
=> When we have constructor to write initialziation logic, then why do need instance block?

## 32 NTSPBMS615- Spring Batch CSV to DB Application - May 12th

**Core java recap**
**==========**

**( About instance block)**

**How many special blocks can be placed in a java class ?**

**=> instance block , static block**

**=>We generally uses static block to intialize static memeber vairables of a class and instance block to initialize non-static member variables of class..**

**=> static block is class level one-time executing block where as instance block,constructor is object level one-time executing block**

**When constructor is there to initialize non-static member vairables then why should we take instance block?**

**a) instead of placing same initialization logic in muliple overloaded constructors think about placing it in single instance block { .. }**

**b) while creating anonymous classes or anonymous inner classes we can not place consturctor in them becoz they do not have name .. so we can use instance block support to place initialization logics.**

**This is very important in batch programming**

**app**
**regular blocks in java are { } -- block**

- method blocks
- try blocks
- catch blocks
- finally blocks
- constructor blocks
- if blocks
- loop blocks
- and etc..

```
class Test{
  public void m1(){
    ...
    }
}
```

```
case1:: Test t=new Test();
        t.m1(); //valid

case2:: Test t1=new Test(){ };
        t1.m1();
    S.o.p(t1.getClass());
```

Here anonymous sub class is created for Test class and that object is refered by supert class (Test class) reference variable t1.

```
case3:: Test t1= new Test(){
    //constructor can not be defined here
    {
        m1();
    }
};
```

instance block in anonymous sub class of Test and calling m1()method in it.

This anonymous sub clss definitation not for Test ..where constructor can be defined

**//Sample code to excute**
**==========**

```
package com.nt.basics;
public class Test {
    public Test() {
        System.out.println("Test: 0-param constuctir");
    }
    public void m1() {
        System.out.println("Test::m1()");
    }
    public static void main(String[] args) {
        Test t=new Test();
        t.m1();
        System.out.println("t obj class name::"+t.getClass()+" super class::"+t.getClass().getSuperclass());
        System.out.println("=======================");
        Test t1=new Test() { };
        t1.m1();
        System.out.println("t1 obj class name::"+t1.getClass()+"super class::"+t1.getClass().getSuperclass());
        System.out.println("=======================");
        Test t2=new Test() {
            // consturctor can not be defined here , so go for instance block
            {
                m1();
            }
        };
        System.out.println("t2 object class name::"+t2.getClass()+" super class::"+t2.getClass().getSuperclass());
    }
```

Spring batch /spring batch processing can collect data from various sources /source repositories in different formats and can process them for modification or filtering or sorting .... lasty writes that processed data to various destination/ destination repositories

=>Spring batch can dealwith different types data to read from soruces and process and also to write destinations.

## => Reading CSV File Data (Excel Data) , Processing data and writing oracle Db table using Spring batch

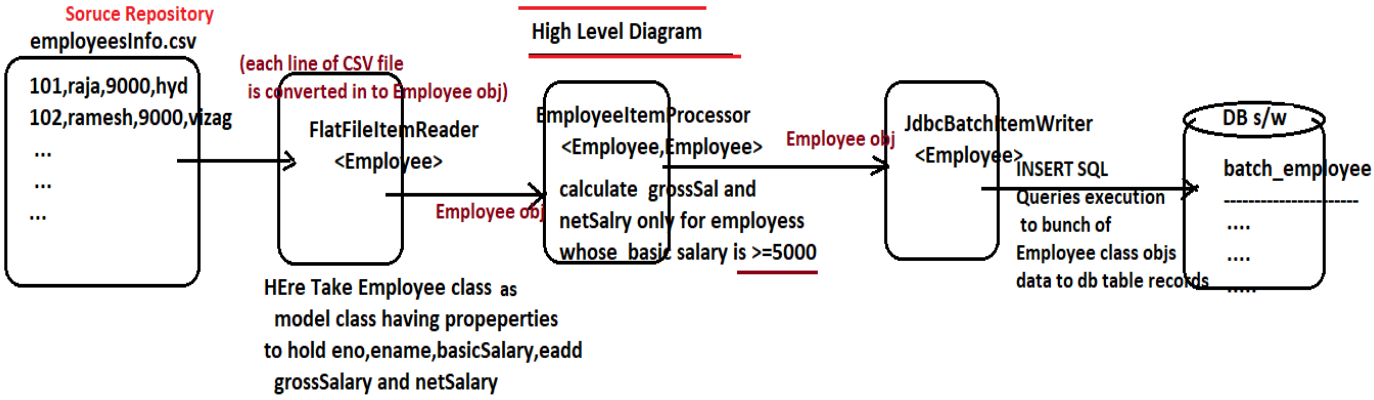
usecase1 :: census info comes to Central ministry form every village/town/city in the form of csv files (excel files) So the Batch app of central ministry should process data by categoringizing and validating before writing to oracle db tables

usecase2: While conducting election survery the filed workers gets people's pluse in the form of excel sheets so we should process and store in db table to generate certains report or graphs

=>To read data from csv file or excel file or json file or formatted text file we can take support of FlatFileItemReader<T> as reader class

=>To Write processed data to db table as records batch by batch by executing SQL queries in batch we can use JdbcBatchItemWriter<T> class.

=> To process data always prefer custom Item Processor.




File FlatItemReader <T>

1. create object for FlatFileItemReader specifying Model class name (eg: Employee)
2. specify name and location of the csv file from where it has to read data

empoyeesinfo.csv

3. specify LineMapper to read each line from csv file

obj

101,raja,9000,hyd

4. Specify LineTokenizer to tokenize /split content of the line in to values based on given delimeter (",")

101 raja 9000 hyd

5. specify FiledSetMapper to map the vaues of each line to the propertes/variables of Model class and set each Line content to one Model class obj

Employee class obj
eno:101
ename:raja
eadd:hyd
basicSalary: 90000
grossSalary: null
netSalary: null

JdbcBatchItemWriter <T>
==========

=>It gets inputs from ItemProcessor as List<T> (In our case it List<Employee>)

1. create Object for JdbcBatchItemWriter specifying the <Employee> as the generic type

2. Link DataSource object to writer (For Db Connectivity)

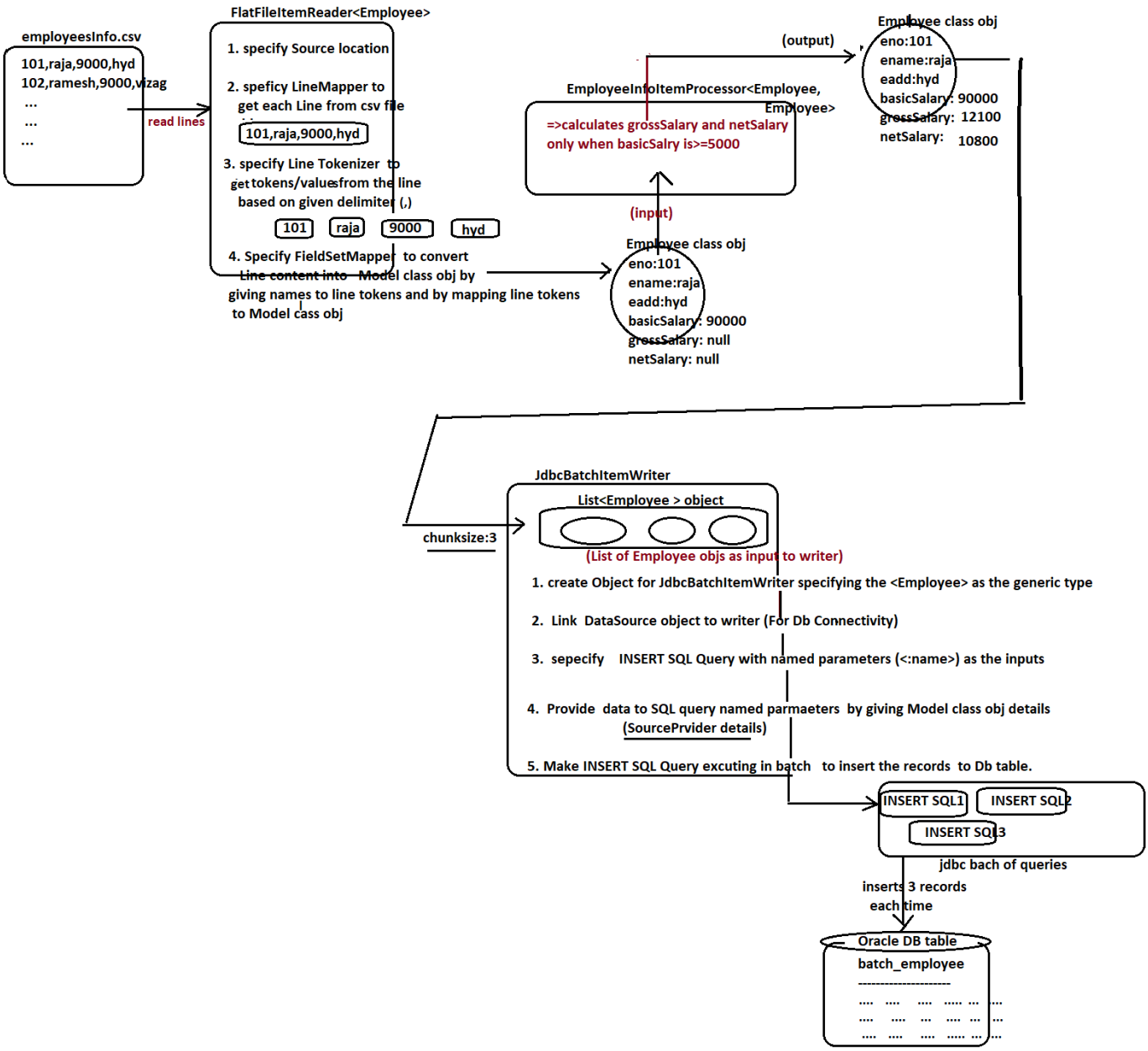
3. sepecify INSERT SQL Query with named parameters (<:name>) as the inputs

INSERT INTO BATCH_EMPLOYEE VALUES(:eno,:ename,:eadd,:bsal,:grossSal,:netSal)

4. Provide data to SQL query named parmaeters by giving Model class obj details (SourcePrvider details)

(It is better to match the names of named params of SQL Query with Model class obj property names)

5. Make INSERT SQL Query excuting in batch to insert the records to Db table.



## 33 NTSPBMS615- Spring Batch CSV to DB Application - May 13th-14th-15th

grossSalary: null
netSalary: null

**While Working With FlatFileItemReader<T>**
use
we following classes as the supporting classes

a)DefaultLineReader :: To read each line from csv file having enterkey as Line Seperator
b)DelimitedLineTokenizer :: To split each Line content to values having names based on the given delimiter(generally ",")
c) BeanWrapperFieldSetMapper :: To map each line tokens to given Model class obj (here tokens and model class property names must match)

**While working with JdbcBatchItemWriter<T>**
we use the following classes as the supporting classes

a) DataSource (HikariDataSource)
b) BeanPropertyItemSqlParameterSourceProidver :: To provid given java bean class obj/Model class obj property values as the Sql query named param values (Here the named param names and model class property names must match)

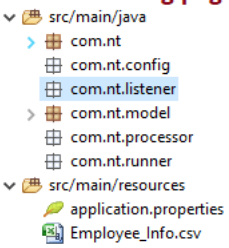
**Example App**
==========

step1) create spring boot starter Project adding following starters..
spring batch , oracle driver , lombok api , JDBC api

step2) place csv file (source file) in main/src/resources folder

we can genernate csv file with mock /example data
using https://www.mockaroo.com/

step3) create the fllowing pkgs in src/main/java folder

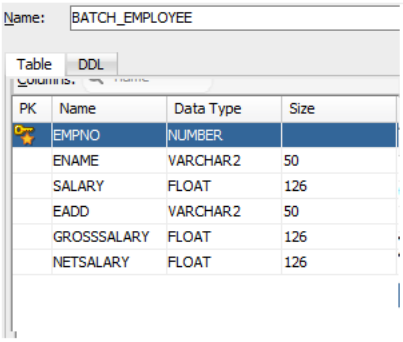



step4) add DataSource , spring batch cfg in application.properties file

application.properties
---

```
# spring batch cfg
spring.batch.job.enabled=false
spring.batch.jdbc.initialize-schema=always

# datasource cfgs
spring.datasource.driver-class-name=oracle.jdbc.driver.OracleDriver
spring.datasource.url=jdbc:oracle:thin:@localhost:1521:xe
spring.datasource.username=system
spring.datasource.password=manager
```

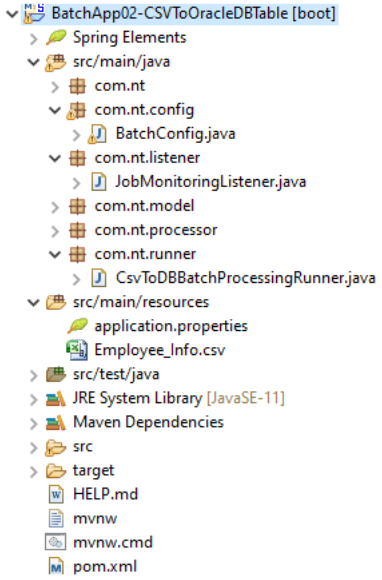
**step3) make sure that db table is created  oracle Db s/w**



Name: BATCH_EMPLOYEE

Table | DDL

| PK | Name | Data Type | Size |
|---|---|---|---|
| 🔑 | EMPNO | NUMBER | |
| | ENAME | VARCHAR2 | 50 |
| | SALARY | FLOAT | 126 |
| | EADD | VARCHAR2 | 50 |
| | GROSSSALARY | FLOAT | 126 |
| | NETSALARY | FLOAT | 126 |




**step4)  devleop the Model class  "Employee"**

**Employee.java**

```
package com.nt.model;

import lombok.Data;

@Data
public class Employee  {
  private Integer empno;
    private String  empname;
    private  String empaddrs;
    private  Float salary;
    private  Float grossSalary;
     private  Float netSalary;

}
```

**step5) Develop  JobExecutionListener**

```
//Listener class

 package com.nt.listener;

 import java.util.Date;
 import org.springframework.batch.core.JobExecution;
 import org.springframework.batch.core.JobExecutionListener;

public class JobMonitoringListener implements JobExecutionListener {
  private long start,end;
      @Override
      public void beforeJob(JobExecution jobExecution) {
            start=System.currentTimeMillis();
            System.out.println("Job is about to Start @"+new Date());
      }
      @Override
      public void afterJob(JobExecution jobExecution) {
        end=System.currentTimeMillis();
        System.out.println("Job completed at::"+new Date());
        System.out.println("Job Exection time::"+(end-start)+" ms");
        System.out.println("Job completion status ::"+jobExecution.getStatus());

      }
}
```

**step5) Develope ItemProcessor**

**//ItemProcessor**
**==========**

**The Null objects given by ItemProcessor will not go to ItemWriter..**

```
package com.nt.processor;

import org.springframework.batch.item.ItemProcessor;

import com.nt.model.Employee;

public class EmployeeInfoItemProcessor implements ItemProcessor<Employee,Employee> {

    @Override
    public Employee process(Employee emp) throws Exception {
        if(emp.getSalary()>=100000) {
            emp.setGrossSalary(Math.round(emp.getSalary()+ emp.getSalary()*0.4f));
            emp.setNetSalary(Math.round(emp.getGrossSalary()-emp.getGrossSalary()*0.2f));
            return emp;
        }
        else {
            return null;  //other employees will be filtered here.
        }
        /* else {
            emp.setGrossSalary(emp.getSalary());
            emp.setNetSalary(emp.getSalary());
            return emp;
        }*/
    }
}
```

**step6) Cfg Reader in Batch Config class using @Bean method**

**In BatchCofing.java**
**==========**

```
@Bean (name="reader")
public ItemReader<Employee> createReader(){
    //create object for FlatFileItemReader
    FlatFileItemReader<Employee> reader=new FlatFileItemReader<Employee>();
    // set source csv file location
    reader.setResource(new ClassPathResource("Employee_Info.csv"));
    //reader.setResource(new FileSystemResource("e:\\abc\\Employee_Info.csv");
    //reader.setResource(new UrlResource("http://nit.com/csv/Employee_Info.csv")
```

**Recomanded**

```
    // set LineMapper
    reader.setLineMapper(new DefaultLineMapper<Employee>(){{
        //set LineTokenizer
        setLineTokenizer(new DelimitedLineTokenizer() {{
            setDelimiter(",");
            setNames("empno","ename","salary","eadd");
        }});
        //set FiledsetMapper to write each Line content to Model obj
        setFieldSetMapper(new BeanWrapperFieldSetMapper<Employee>() {{
            setTargetType(Employee.class);
        }});
    }});

    return reader;
}
```

(or)

```
@Bean(name="reader")
public ItemReader<Employee> createReader(){
  //create object for FlatFileItemReader
    FlatFileItemReader<Employee> reader=new FlatFileItemReader<Employee>();
    // set source csv file location
    reader.setResource(new ClassPathResource("Employee_Info.csv"));
    //reader.setResource(new FileSystemResource("e:\\abc\\Employee_Info.csv");
    //reader.setResource(new UrlResource("http://nit.com/csv/Employee_Info.csv")
    //Line Mapper
    DefaultLineMapper<Employee>  lineMapper=new DefaultLineMapper<Employee>();
    //Line Tokenizer
    DelimitedLineTokenizer lineTokenizer=new DelimitedLineTokenizer();
    lineTokenizer.setDelimiter(",");
    lineTokenizer.setNames("empno","ename","salary","eadd");
    //FiledSet mapper
    BeanWrapperFieldSetMapper<Employee> mapper=new BeanWrapperFieldSetMapper<Employee>();
    mapper.setTargetType(Employee.class);
    //add LineTokenizer,FieldSetMapper to LineMapper
    lineMapper.setLineTokenizer(lineTokenizer);
    lineMapper.setFieldSetMapper(mapper);
    //add LineMapper to Reader
    reader.setLineMapper(lineMapper);
  return reader;
}
```

(or)

```
@Bean(name="reader")
    public ItemReader<Employee> createReader(){
      return new FlatFileItemReaderBuilder<Employee>()
                        .name("file-reader")
                       .resource(new ClassPathResource("Employee_Info.csv"))
                       .delimited().delimiter(",")
                       .names("empno","ename","salary","eadd")
                       .targetType(Employee.class)
                       .build();
    }
```

**step7) Cfg ItemProcessor in BatchConfig using @Bean method**

In BatchConfig.java

---

```
@Bean
  public  ItemProcessor<Employee, Employee> createProcessor(){
        return new EmployeeInfoItemProcessor();
    }
```

step8) Inject JobBuilderFactory ,stepBuilderFactory to BatchConfig cass using @Autowired

In BatchConfig.java

```
@Configuration
@EnableBatchProcessing
public class BatchConfig {
    @Autowired
    private DataSource ds;
    @Autowired
    private JobBuilderFactory jobFactory;
    @Autowired
    private StepBuilderFactory stepFactory;

      ...
      ...
      ..
```

step9) Cfg JobExecutionListener as spring bean in BatchConfig class using @Bean method

In BatchConfig.java

```
// listener
    @Bean
    public JobExecutionListener createListener() {
        return new JobMonitoringListener();
    }
```

step10) cfg JdbcBatchItemWriter in BatchConfig class using @Bean method

```
//writer
@Bean(name="writer")
public ItemWriter<Employee> createWriter(){
    JdbcBatchItemWriter<Employee> writer=new JdbcBatchItemWriter();
    //set DataSource
    writer.setDataSource(ds);
    //set SQL query with named params
    writer.setSql("INSERT INTO BATCH_EMPLOYEE VALUES(:empno,:ename,:salary,:eadd,:grossSalary,:netSalary)");
    //set Model class obj as SqParameterSourceProvider (here named param names and model class obj property names must match)
    writer.setItemSqlParameterSourceProvider(new BeanPropertyItemSqlParameterSourceProvider<Employee>());
    return writer;
}
```

(or)

```
@Bean(name="writer")
    public ItemWriter<Employee> createWriter(){
        return new JdbcBatchItemWriterBuilder<Employee>()
                    .dataSource(ds)
                    .sql("INSERT INTO BATCH_EMPLOYEE VALUES(:empno,:ename,:salary,:eadd,:grossSalary,:netSalary)")
                    .beanMapped()   // makes to use BeanProperyItemSqlParmaeterSourceProvider internally
                    .build();

}
```

step11) create Step obj, Job obj as spring beans in BatchConfig class using @Bean methods

In BatchConfig.java

```
@Bean(name="step1")
    public Step createStep1() {
        return stepFactory.get("step1")
                    .<Employee,Employee>chunk(3)
                    .reader(createReader())
                    .writer(createWriter())
                    .processor(createProcessor())
                    .build();
    }
```

```
@Bean(name="job1")
public Job createJob1() {
        return jobFactory.get("job1")
                        .incrementer(new RunIdIncrementer())
                        .listener(createListener())
                        .start(createStep1())
                        .build();
    }
```

step12) Develop the runner class having code to run the job using JobLaucher object

Runner class
==========

```
package com.nt.runner;

import org.springframework.batch.core.Job;
import org.springframework.batch.core.JobExecution;
import org.springframework.batch.core.JobParameters;
import org.springframework.batch.core.JobParametersBuilder;
import org.springframework.batch.core.launch.JobLauncher;
import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.boot.CommandLineRunner;
import org.springframework.stereotype.Component;

@Component
public class CsvToDBBatchProcessingRunner implements CommandLineRunner {
    @Autowired
    private JobLauncher launcher;
    @Autowired
    private  Job  job;

    @Override
    public void run(String... args) throws Exception {
    JobParameters params=new JobParametersBuilder()
                        .addLong("sysTime", System.currentTimeMillis())
                        .toJobParameters();
    JobExecution execution=launcher.run(job, params);
    System.out.println("Job Completion status::"+execution.getStatus());

    }

}
```

*step13) run the application...*

---

**How to enable Scheduling on BatchProcessing?**

Ans) Since @Scheduled can not be applied on method with args ...so we can not add Scheduling on run(-) of Runner class .. For this we need to seperate Service class having one no arg b.method to apply @Scheduled on the top of b.method

step1) place @EnableScheduling on top of main class or Configuration class

```
@SpringBootApplication
@EnableScheduling
public class BootBatchProj03CsVtoDbBatchProcessingApplication {

    public static void main(String[] args) {
        SpringApplication.run(BootBatchProj03CsVtoDbBatchProcessingApplication.class, args);
    }
}
```

*step2) develop service class having @Scheduled method*

```
@Service
public class BatchTestRunner {
	@Autowired
	private JobLauncher launcher;
	@Autowired
	private Job job;

	@Scheduled(cron="0 11 10 * * * ")
	public void runBatch() throws Exception {
		//prepare job parameter
		JobParameters params=new JobParametersBuilder().addDate("sysDate",new Date()).toJobParameters();
		// run the job
		JobExecution execution=launcher.run(job, params);
		System.out.println("Job Execution status ::"+execution.getExitStatus());

	}
}
```

## 34 NTSPBMS615- May 16th 17th-2022-Spring Batch Db table to CSV Application

Spring Batch App converting DB table records into CSV file (Excel file)

usecase ::: Sending Bank Account statement to customer from db table in the form of excel sheet/csv file
Giving VotersList of PS(poling station) to the Leader as csv file by collecting information from db table
University publishing selected students for different companies
Publishing list of students who have not fees
publishing list of customers in a societey showing their power bill details
and etc..

=>For reading from Db table we can use JdbcCursorItemReader<T>
and for writing processed data to csv file/json file/text file we can use FlatFileItemWriter<T>

DB script creating huge number of random records in mysql Db table

Step-1(Create Database)

```
create Database EXAM_DATA;
```

Step-2(Use Database)

```
use EXAM_DATA;
```

Step-3 (Create Table)

```
CREATE TABLE `EXAM_RESULT`
(
  `id`              bigint(20) NOT NULL     AUTO_INCREMENT,
  `dob`                   timestamp  NOT NULL     DEFAULT CURRENT_TIMESTAMP,
  `Semester`      int(11)              DEFAULT NULL,
  `percentage`    float                       DEFAULT NULL,

  PRIMARY KEY (`id`)
);
```

Step-4 (Create Procedure to Insert )

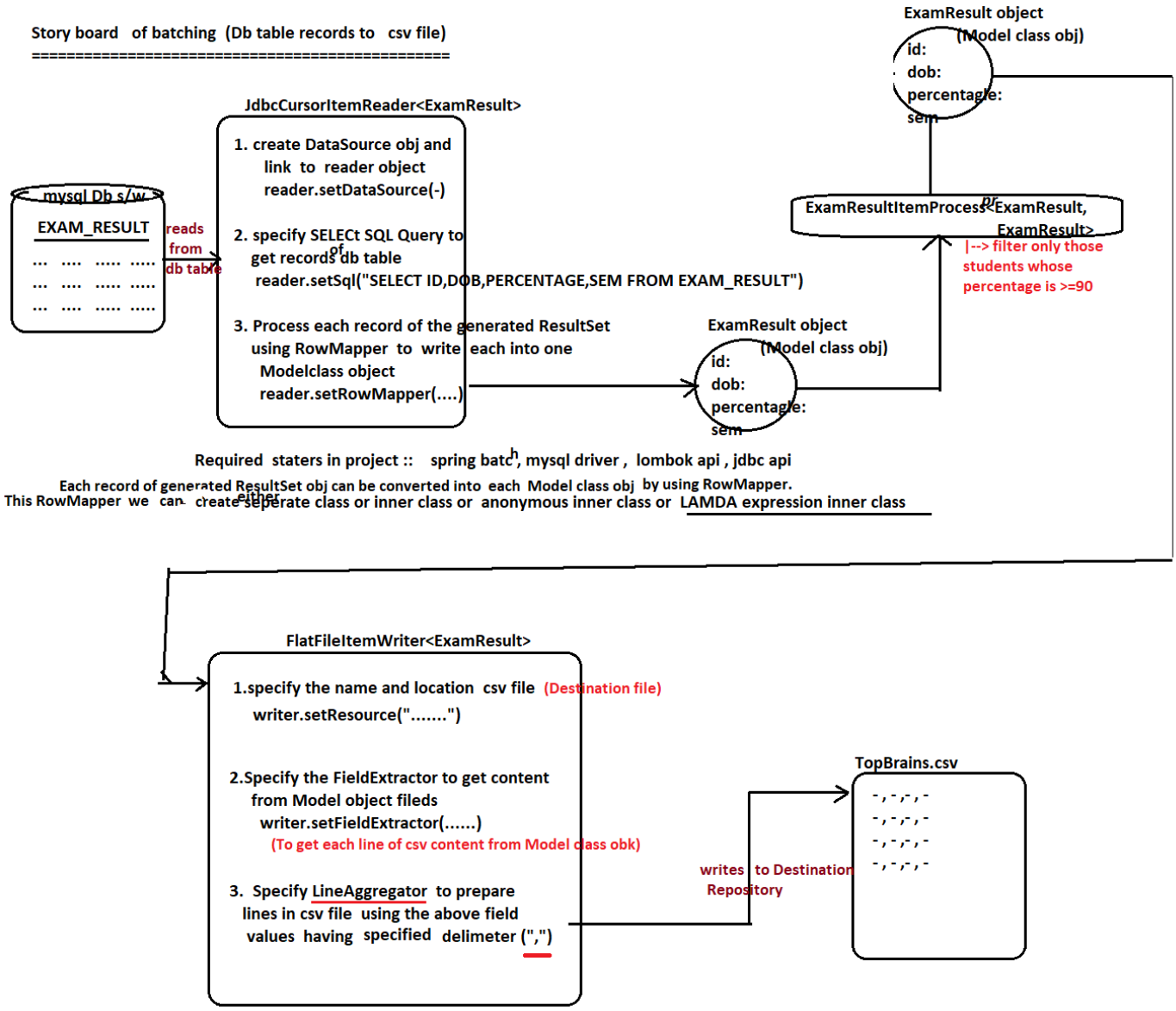
```
DELIMITER $$
CREATE PROCEDURE generate_EXAM_RESULT()
BEGIN
 DECLARE i INT DEFAULT 0;


WHILE i < 500000 DO
   INSERT INTO `EXAM_RESULT` (`dob`,`percentage`,`Semester`) VALUES (
    FROM_UNIXTIME(UNIX_TIMESTAMP('2000-01-01 01:00:00')+FLOOR(RAND()*31536000)),
    ROUND(RAND()*100,2),    1   );
   SET i = i + 1;
 END WHILE;
END$$
DELIMITER ;
```

Step-5 (Call Procedure to Insert 50K Data )=> Takes Least 30-45 Min to Insert the records

```
CALL generate_EXAM_RESULT();
```

Step-6 (Check the Records )

```
select * from EXAM_RESULT;
```




```
// ExamResultRowMapper .java     (As Seperate class)
package com.nt.mapper;                                          (best)

import java.sql.ResultSet;
import java.sql.SQLException;
import org.springframework.jdbc.core.RowMapper;

import com.nt.model.ExamResult;

public class ExamResultRowMapper implements RowMapper<ExamResult> {

    @Override
    public ExamResult mapRow(ResultSet rs, int rowNum) throws SQLExceptio
                                                                    n {
        return new ExamResult(rs.getInt(1),
                              rs.getDate(2),
                              rs.getDouble(3),
                              rs.getInt(4));
    }
}
```

for

syntax lamda based Interface implementation class obj creation

<interface name> ref= (<params>)-> { body of the method }

RowMapper<T>
|---> public <T> mapRow(ResultSet rs,
int rowNum)thorw SQLExcepption

(Functional interface becoz it is having only one method delcaration)

Lamda based Anonymous inner class

```
RowMapper<ExamResult> mapper= (rs,rowNum)->{
        return new ExamResult(rs.getInt(1),
                              rs.getDate(2),
                              rs.getDouble(3),
                              rs.getInt(4));
        }
```

or

```
RowMapper<ExamResult> mapper= (rs,rowNum)->
        new ExamResult(rs.getInt(1),
                       rs.getDate(2),
                       rs.getDouble(3),
                       rs.getInt(4));
```

Linking with JdbcCursorItemReader object

```
reader.setRowMapper((rs,rowNumber)->new ExamResult(rs.getInt(1),
                                                   rs.getDate(2),
                                                   rs.getDouble(3),
                                                   rs.getInt(4)));
```

In this code following operations are performed

a) Anonymous inner class is created implementing RowMapper<T>

(b) In that inner class mapRow(rs,rowNumber) is implemented having logic to copy ResultSet(rs) record to Model class object

(c) Anonymous inner class object is created and passed to reader.setRowMapper(-)as argument value.

JdbcCursorItemReader<T> sample code

In BatchConfig.java (verson1)

```
@Bean
public JdbcCursorItemReader<ExamResult> createReader(){
    //create object
    JdbcCursorItemReader<ExamResult> reader=new JdbcCursorItemReader<>();
    // specify DataSoruce
    reader.setDataSource(ds);
    // specify SQL Query
    reader.setSql("SELECT ID,DOB,PERCENTAGE,SEMESTER FROM EXAM_RESULT");
    //specify RowMapper
    //reader.setRowMapper(new ExamResultRowMapper());
    reader.setRowMapper((rs,rowNumber)->new ExamResult(rs.getInt(1),
                                                       rs.getDate(2),
                                                       rs.getDouble(3),
                                                       rs.getInt(4)));
```

```
        return reader;
 }
                (or)    (verson2)
 public  JdbcCursorItemReader<ExamResult>  createReader(){
        //create and return object
        return  new JdbcCursorItemReaderBuilder<ExamResult>()
                        .dataSource(ds)
                        .sql("SELECT ID,DOB,PERCENTAGE,SEMESTER FROM EXAM_RESULT")
                        .beanRowMapper(ExamResult.class)  // Internally use BeanPropertyRowMapper
                                                          // to covert the record of RS to given Model class obj
                                                          // but  db table col names  and  model class properties
                        .build();                                                    names must match
 }

//writer (version1)
       @Bean
       public  FlatFileItemWriter<ExamResult> createWriter(){
              //create Writer class obj
              FlatFileItemWriter<ExamResult> writer=new FlatFileItemWriter<ExamResult>();
              //specify the location of destination file
              writer.setResource(new FileSystemResource("e:\\csvs\\TopBrains.csv"));
              //  create FiledExractor object
              BeanWrapperFieldExtractor<ExamResult> extractor=new BeanWrapperFieldExtractor<ExamResult>();
              extractor.setNames(new String[]{"id","dob","semester","percentage"});
              // create LineAggregator  that builds the having Model class obj data
              DelimitedLineAggregator<ExamResult>  lineAggregator=new DelimitedLineAggregator<ExamResult>();
              lineAggregator.setDelimiter(",");
              lineAggregator.setFieldExtractor(extractor);
              //set LineAggregator to Writer obj
              writer.setLineAggregator(lineAggregator);
              return writer;
       }
```

---

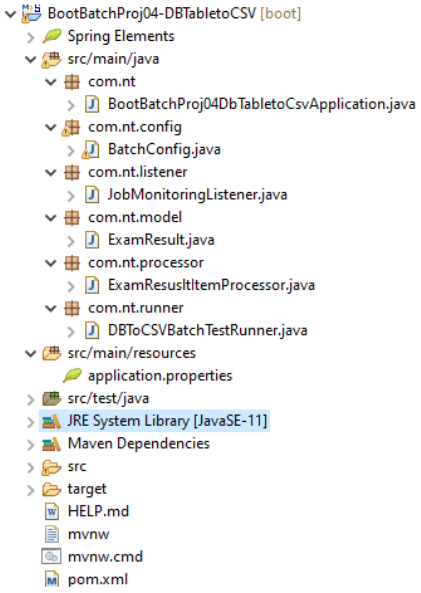
```
//writer                    (version1)
       @Bean
       public   FlatFileItemWriter<ExamResult> createWriter(){
              FlatFileItemWriter<ExamResult> writer=new FlatFileItemWriter<>();
              //set logical name
              // writer.setName("writer-csv");
              //specify the destination csv file location
              //writer.setResource(new ClassPathResource("classpath:topbrains.csv"));
              writer.setResource(new FileSystemResource("e:\\csvs\\topbrains.csv"));
              // specify  LineAggregator by  supplying  delimeter and FieldExtractor
              writer.setLineAggregator(new DelimitedLineAggregator<>() {{
                     //delimeter
                      setDelimiter(",");
                      //field extractor
                      setFieldExtractor(new BeanWrapperFieldExtractor<>() {{
                             //specify  names to extracted field values.
                            setNames(new String[] {"id","dob","percentage","semester"});
                      }});
              }});
              return writer;
       }

//writer Version2              )verson2)
              @Bean
              public  FlatFileItemWriter<ExamResult> createWriter(){
                     return   new FlatFileItemWriterBuilder<ExamResult>()
                                    .resource(new FileSystemResource("e:\\csvs\\TopBrains.csv"))
                                    .delimited().delimiter(",")
                                    .names("id","dob","semester","percentage")
                                    .build();

               } //method
```

```
                    // Setup creation

@Bean(name="step1")
        public Step createStep1() {
              return  sbFactory.get("step1")
                                .<ExamResult,ExamResult>chunk(10)
                                .reader(createReader())
                                .writer(createWriter())
                                .processor(processor)
                                .build();
        }
                          //Job Creation
    @Bean(name="job1")
            public Job createJob1() {
                  return  jbFactory.get("job1")
                                    .incrementer(new RunIdIncrementer())
                                    .listener(listener)
                                    .start(createStep1())
                                    .build();

            }
```

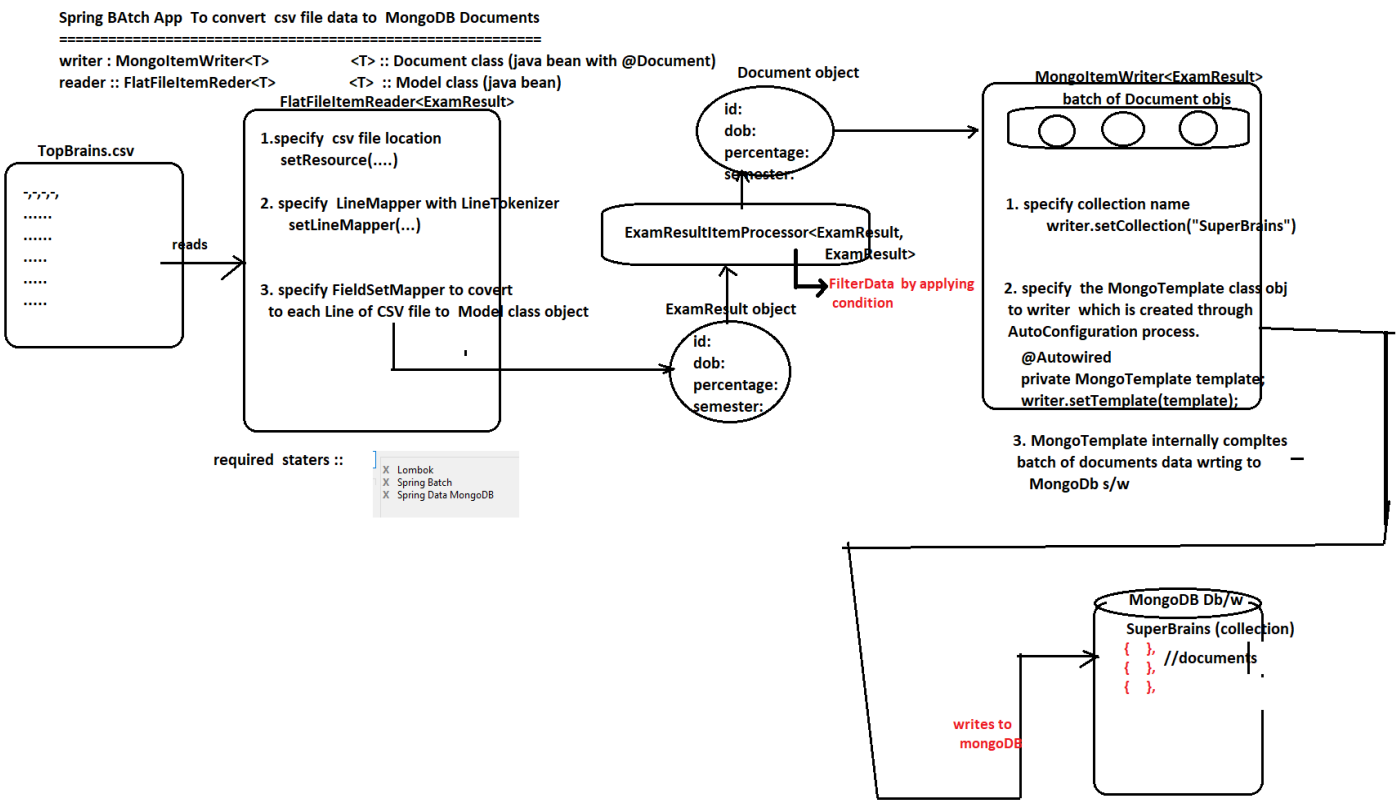
**Runner class**

==========

```
 package com.nt.runner;

 import java.util.Date;
import org.springframework.batch.core.Job;
import org.springframework.batch.core.JobExecution;
import org.springframework.batch.core.JobParameters;
import org.springframework.batch.core.JobParametersBuilder;
import org.springframework.batch.core.launch.JobLauncher;
import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.boot.CommandLineRunner;
import org.springframework.stereotype.Component;

@Component
public class DBToCSVBatchTestRunner implements CommandLineRunner {
    @Autowired
    private JobLauncher launcher;
    @Autowired
    private Job job;

    @Override
    public void run(String... args) throws Exception {
      //  create JobParams object
        JobParameters params=new  JobParametersBuilder()
                                        .addDate("sysDate", new Date()).toJobParameters();
        //run the job
        JobExecution execution=launcher.run(job, params);
        System.out.println("Job completion  status ::"+execution.getExitStatus());
    }//main
}//class
```

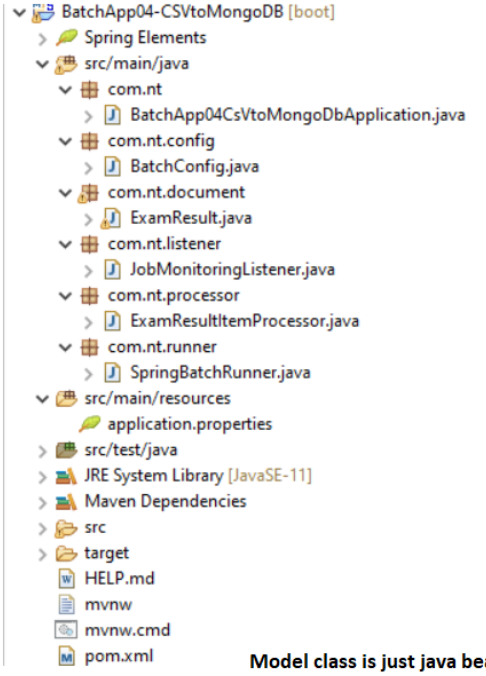


## 35 NTSPBMS615- Spring Batch App conveting csv file to MongoDB Collections -May17th and 18th




**example app1 (writing date value to mongodb collection as Stirng value)**

==========




Model class is just java bean class where as Document class is java bean class having @Document , @Id annotations

**Model cum Document class**

==========

```
//Model and Document class
package com.nt.document;

import java.time.LocalDate;

import org.springframework.data.annotation.Id;
import
org.springframework.data.mongodb.core.mapping.Doc
ument;

import lombok.AllArgsConstructor;
import lombok.Data;
import lombok.NoArgsConstructor;

@Document
@Data
@NoArgsConstructor
@AllArgsConstructor
public class ExamResult {
        @Id
        private Integer id;
        private String  dob;
        private  Float percentage;
        private  Integer semester;
}
```

**application.properties**

**==========**

```
# spring batch settings
spring.batch.job.enabled=true
spring.batch.jdbc.initialize-schema=always
#MongoDB settings
spring.data.mongodb.host=localhost
spring.data.mongodb.port=27017
spring.data.mongodb.database=NTSPBMS714DB1
spring.data.mongodb.username=testuser
spring.data.mongodb.password=testuser
```

```
//ItemProcessor
package com.nt.processor;

import org.springframework.batch.item.ItemProcessor;

import com.nt.document.ExamResult;

public class ExamResultItemProcessor implements ItemProcessor<ExamResult,ExamResult>{

    @Override
    public ExamResult process(ExamResult item) throws Exception {

        if(item.getPercentage()>=95)
            return item;
        else
            return null;
    }
}
```

**BatchConfig.java**

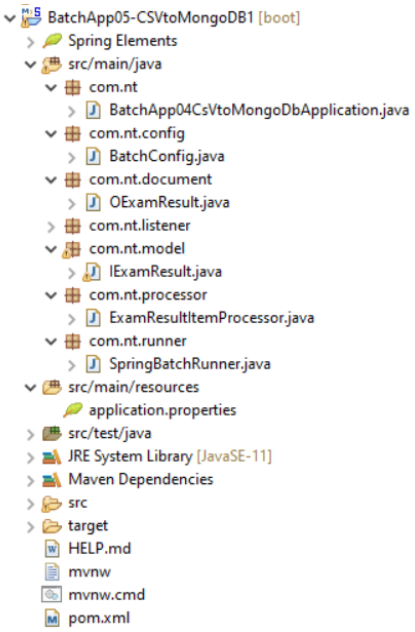
**----------**

```
package com.nt.config;

import org.springframework.batch.core.Job;
import org.springframework.batch.core.JobExecutionListener;
import org.springframework.batch.core.Step;
import org.springframework.batch.core.configuration.annotation.EnableBatchProcessing;
import org.springframework.batch.core.configuration.annotation.JobBuilderFactory;
import org.springframework.batch.core.configuration.annotation.StepBuilderFactory;
import org.springframework.batch.core.launch.support.RunIdIncrementer;
import org.springframework.batch.item.data.MongoItemWriter;
import org.springframework.batch.item.file.FlatFileItemReader;
import org.springframework.batch.item.file.mapping.BeanWrapperFieldSetMapper;
import org.springframework.batch.item.file.mapping.DefaultLineMapper;
import org.springframework.batch.item.file.transform.DelimitedLineTokenizer;
import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.context.annotation.Bean;
import org.springframework.context.annotation.Configuration;
import org.springframework.core.io.FileSystemResource;
import org.springframework.data.mongodb.core.MongoTemplate;

import com.nt.document.ExamResult;
import com.nt.listener.JobMonitoringListener;
import com.nt.processor.ExamResultItemProcessor;

@Configuration
@EnableBatchProcessing
public class BatchConfig {
    @Autowired
    private JobBuilderFactory jobFactory;
    @Autowired
    private StepBuilderFactory stepFactory;
    @Autowired
    private  MongoTemplate template;

    //listener
    @Bean
    public  JobExecutionListener createListener() {
        return new JobMonitoringListener();
    }
    //processor
    @Bean
    public  ExamResultItemProcessor createProcessor() {
        return  new  ExamResultItemProcessor();
    }
```

```
@Bean          //reader
public       FlatFileItemReader<ExamResult> createReader(){
        FlatFileItemReader<ExamResult> reader=new FlatFileItemReader<>();
        reader.setResource(new FileSystemResource("e:/csvs/TopBrains.csv"));
        reader.setLineMapper(new DefaultLineMapper<ExamResult>() {{
              setLineTokenizer(new DelimitedLineTokenizer() {{
                    setDelimiter(",");
                    setNames("id","dob","percentage","semester");
              }});
              setFieldSetMapper(new BeanWrapperFieldSetMapper<ExamResult>() {{
                     setTargetType(ExamResult.class);
              }});
        }});
        return reader;
}
//writer
        @Bean
public  MongoItemWriter<ExamResult> createWriter(){
          //object creation
          MongoItemWriter<ExamResult> writer=new MongoItemWriter<>();
            //specify the collection
          writer.setCollection("SuperBrains");
            //specify MongoTemplate
          writer.setTemplate(template);
          return writer;
}
//step
      @Bean(name="step1")
      public   Step createStep1() {
            return   stepFactory.get("step1")
                              .<ExamResult,ExamResult>chunk(3)
                              .reader(createReader())
                              .writer(createWriter())
                              .processor(createProcessor())
                              .build();
      }

          @Bean(name="job1")
          public Job createJob1() {
                return jobFactory.get("job1")
                              .incrementer(new RunIdIncrementer())
                              .listener(createListener())
                              .start(createStep1())
                              .build();
          }
  }
```

---

## Example App2 ( date value as java.time.LocalDate in @Document class)




```
//Model class
==============
//Model  class
package com.nt.model;

import java.util.Date;

import org.springframework.data.annotation.Id;
import org.springframework.data.mongodb.core.mapping.Document;
import org.springframework.format.annotation.DateTimeFormat;

import lombok.AllArgsConstructor;
import lombok.Data;
import lombok.NoArgsConstructor;

@Data
@NoArgsConstructor
@AllArgsConstructor
public class IExamResult {
	@Id
	private Integer id;
	private String  dob;
	private  Float percentage;
	private  Integer semester;
}
```

```
Processor
============
package com.nt.processor;

import java.time.LocalDate;

import org.springframework.batch.item.ItemProcessor;

import com.nt.document.OExamResult;
import com.nt.model.IExamResult;

public class ExamResultItemProcessor implements ItemProcessor<IExamResult,OExamResult> {

	@Override
	public OExamResult process(IExamResult item) throws Exception {
		if(item.getPercentage()>=90) {
			OExamResult result=new OExamResult();
			result.setId(item.getId());
			result.setDob(LocalDate.parse(item.getDob()));
			result.setPercentage(item.getPercentage());
			result.setSemester(item.getSemester());
			return result;
		}

		else
			return null;
	}
```

```
Document class
 ==============
//Document  class
package com.nt.document;

import java.time.LocalDate;

import org.springframework.data.annotation.Id;
import org.springframework.data.mongodb.core.mapping.Document;

import lombok.AllArgsConstructor;
import lombok.Data;
import lombok.NoArgsConstructor;

@Document
@Data
@NoArgsConstructor
@AllArgsConstructor
public class OExamResult {
	@Id
	private Integer id;
	private LocalDate  dob;
	private  Float percentage;
	private  Integer semester;
}
```

```
BatchConfig.java
 ==============

package com.nt.config;

import org.springframework.batch.core.Job;
import org.springframework.batch.core.JobExecutionListener;
import org.springframework.batch.core.Step;
import org.springframework.batch.core.configuration.annotation.EnableBatchProcessing;
import org.springframework.batch.core.configuration.annotation.JobBuilderFactory;
import org.springframework.batch.core.configuration.annotation.StepBuilderFactory;
```

```
import org.springframework.batch.core.launch.support.RunIdIncrementer;
import org.springframework.batch.item.data.MongoItemWriter;
import org.springframework.batch.item.file.FlatFileItemReader;
import org.springframework.batch.item.file.mapping.BeanWrapperFieldSetMapper;
import org.springframework.batch.item.file.mapping.DefaultLineMapper;
import org.springframework.batch.item.file.transform.DelimitedLineTokenizer;
import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.context.annotation.Bean;
import org.springframework.context.annotation.Configuration;
import org.springframework.core.io.FileSystemResource;
import org.springframework.data.mongodb.core.MongoTemplate;

import com.nt.document.OExamResult;
import com.nt.listener.JobMonitoringListener;
import com.nt.model.IExamResult;
import com.nt.processor.ExamResultItemProcessor;

@Configuration
@EnableBatchProcessing
public class BatchConfig {
	@Autowired
	private JobBuilderFactory jobFactory;
	@Autowired
	private StepBuilderFactory stepFactory;
	@Autowired
	private  MongoTemplate template;

 //listener
 @Bean
 public  JobExecutionListener createListener() {
	return new JobMonitoringListener();
 }
 //processor
 @Bean
 public  ExamResultItemProcessor createProcessor() {
	return  new  ExamResultItemProcessor();
 }
 @Bean
 public	FlatFileItemReader<IExamResult> createReader(){
	FlatFileItemReader<IExamResult> reader=new FlatFileItemReader<>();
	reader.setResource(new FileSystemResource("e:/csvs/TopBrains.csv"));
	reader.setLineMapper(new DefaultLineMapper<IExamResult>() {{
		setLineTokenizer(new DelimitedLineTokenizer() {{
			setDelimiter(",");
			setNames("id","dob","percentage","semester");
		}});
		setFieldSetMapper(new BeanWrapperFieldSetMapper<IExamResult>() {{
			setTargetType(IExamResult.class);
		}});

	}});

	return reader;
 }

//writer
	@Bean
public  MongoItemWriter<OExamResult> createWriter(){
	MongoItemWriter<OExamResult> writer=new MongoItemWriter<>();
	writer.setCollection("SuperBrains1");
	writer.setTemplate(template);
	return writer;
}
```

```
    //step
        @Bean(name="step1")
        public   Step createStep1() {
            return   stepFactory.get("step1")
                            .<IExamResult,OExamResult>chunk(3)
                            .reader(createReader())
                            .writer(createWriter())
                            .processor(createProcessor())
                            .build();
        }

        @Bean(name="job1")
        public Job createJob1() {
            return jobFactory.get("job1")
                            .incrementer(new RunIdIncrementer())
                            .listener(createListener())
                            .start(createStep1())
                            .build();
          }
}
```

## 36 NTSPBMS615- Spring Batch App conveting csv file to DB table using spring data jpa -May20th

**How to enable cron expression scheduling on Batch Processing**

==========

**step1) place cron expression in the application.properties as key=value (custom key)**

In application.properties

```
cron.expr=0/50 * * * * *
```

user-defined key

Every minute at 50th sec the job will will execute.

**step2) Place @EnableScheduling on the main class**

```
@SpringBootApplication
@EnableScheduling
public class BatchApp1PocApplication {

    public static void main(String[] args) {
        SpringApplication.run(BatchApp1PocApplication.class, args);
    }

}
```

***step3) Develop service/spring bean class having b.method to run the job by enabling scheduling***

BatchProcessTest.java

```
package com.nt.runner;

import java.util.Random;
import org.springframework.batch.core.Job;
import org.springframework.batch.core.JobExecution;
import org.springframework.batch.core.JobParameters;
import org.springframework.batch.core.JobParametersBuilder;
import org.springframework.batch.core.launch.JobLauncher;
import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.boot.CommandLineRunner;
import org.springframework.scheduling.annotation.Scheduled;
import org.springframework.stereotype.Component;

@Component
public class BatchProcessingTest  {
      @Autowired
      private  JobLauncher launcher;
      @Autowired
      private  Job job;

  @Scheduled(cron = "${cron.expr}")
  public void runJob() throws Exception  {
      //prepare  Job Parameters
      JobParameters params=new JobParametersBuilder()
                                  .addLong("time",System.currentTimeMillis()).toJobParameters();
      //run the job
   JobExecution exeution=launcher.run(job, params);
       System.out.println("Job execution status ::"+exeution.getStatus());
      System.out.println("Exit Status ::"+exeution.getExitStatus());
      System.out.println(" Job Id"+exeution.getJobId());
   }
}
```

@Scheduled must be enabled on the b.method that is not having args

starters

- X Lombok
- X Spring Batch
- X Spring Data JPA
- X Oracle Driver

(To read form csv file)

Model class1

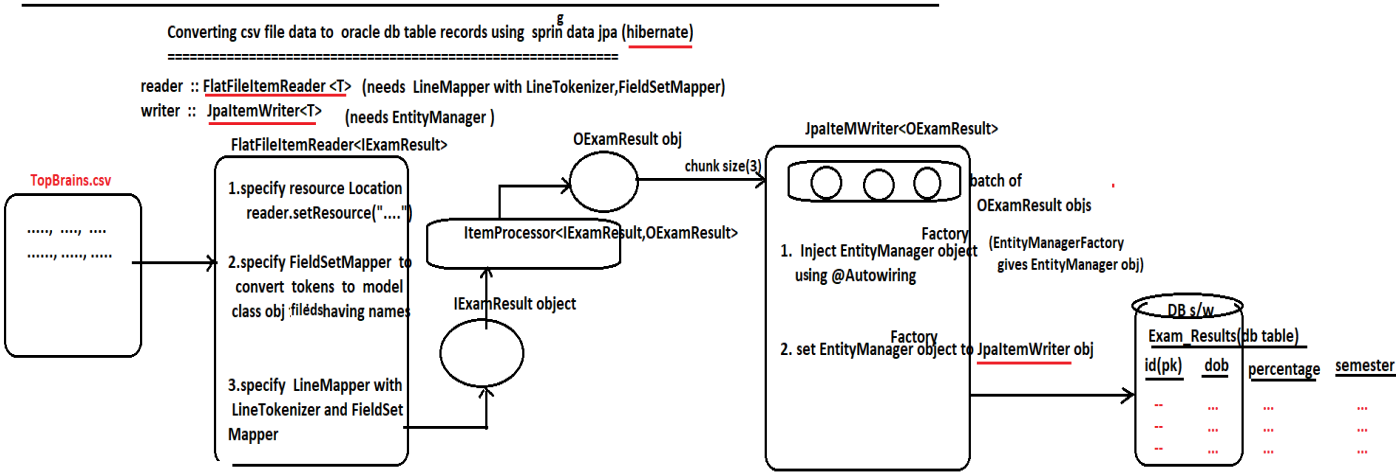
```
============
 @Data
 public class  IExamResult{
   private Integer id;
   private  String dob;
   private  Float percentage;
  private    Integer semester;
   }
```

Model class2 (To write to db table records)

```
============
 @Data
@Entity
 @Table(name="Exam_result")
 public class  OExamResult{
   @Id
   private Integer id;
   private  LocalDate  dob;
   private  Float percentage;
  private    Integer semester;
   }
```

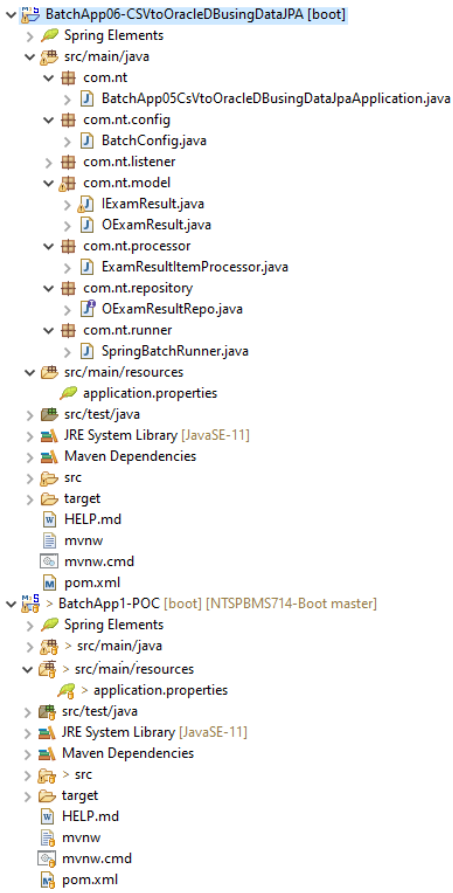
**=>The spring batch supplied pre-defined ItemWriters and ItemReaders provides abstraction their relavent technology /framework programming and simplifies developer's job towards reading data from source repository and towards writing data to destination repository.**

---



**example App**

==========




**application.properties**

---

```
# spring batch settings
spring.batch.job.enabled=true
spring.batch.jdbc.initialize-schema=always

#DataSource cfg
spring.datasource.driver-class-name=oracle.jdbc.driver.OracleDriver
spring.datasource.url=jdbc:oracle:thin:@localhost:1521:xe
spring.datasource.username=system
spring.datasource.password=manager

# data jpa cfgs
spring.jpa.hibernate.ddl-auto=update
spring.jpa.show-sql=true
spring.jpa.properties.format_sql=true
spring.jpa.properties.dialect=org.hibernate.dialect.Oracle10gDialect
```

**BatchConfig.java**

==========

```
package com.nt.config;

import javax.persistence.EntityManagerFactory;

import org.springframework.batch.core.Job;
import org.springframework.batch.core.JobExecutionListener;
import org.springframework.batch.core.Step;
import org.springframework.batch.core.configuration.annotation.EnableBatchProcessing;
import org.springframework.batch.core.configuration.annotation.JobBuilderFactory;
import org.springframework.batch.core.configuration.annotation.StepBuilderFactory;
import org.springframework.batch.core.launch.support.RunIdIncrementer;
import org.springframework.batch.item.database.JpaItemWriter;
import org.springframework.batch.item.database.builder.JpaItemWriterBuilder;
import org.springframework.batch.item.file.FlatFileItemReader;
import org.springframework.batch.item.file.builder.FlatFileItemReaderBuilder;
import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.context.annotation.Bean;
import org.springframework.context.annotation.Configuration;
import org.springframework.core.io.FileSystemResource;
import com.nt.listener.JobMonitoringListener;
import com.nt.model.IExamResult;
import com.nt.model.OExamResult;
import com.nt.processor.ExamResultItemProcessor;

@Configuration
@EnableBatchProcessing
public class BatchConfig {
	@Autowired
	private JobBuilderFactory jobFactory;
	@Autowired
	private StepBuilderFactory stepFactory;
```

```
@Autowired
private EntityManagerFactory  entityFactory;

//listener
@Bean
public  JobExecutionListener createListener() {
      return new JobMonitoringListener();
}
//processor
@Bean
public  ExamResultItemProcessor createProcessor() {
      return  new  ExamResultItemProcessor();
}

/*@Bean
public      FlatFileItemReader<IExamResult> createReader(){
      FlatFileItemReader<IExamResult> reader=new FlatFileItemReader<>();
      reader.setResource(new FileSystemResource("e:/csvs/TopBrains.csv"));
      reader.setLineMapper(new DefaultLineMapper<IExamResult>() {{
            setLineTokenizer(new DelimitedLineTokenizer() {{
                  setDelimiter(",");
                  setNames("id","dob","percentage","semester");
            }});
            setFieldSetMapper(new BeanWrapperFieldSetMapper<IExamResult>() {{
                  setTargetType(IExamResult.class);
            }});

      }});

      return reader;
}*/

 //reader
 @Bean
 public  FlatFileItemReader<IExamResult> createReader(){
    return  new FlatFileItemReaderBuilder<IExamResult>()
                  .name("csv-reader")
                  .resource(new FileSystemResource("e:/csvs/TopBrains.csv"))
                  .delimited()
                  .delimiter(",")
                  .names("id","dob","percentage","semester")
                  .targetType(IExamResult.class)
                  .build();
 }
 /*//writer
 @Bean
 public  JpaItemWriter<OExamResult>  createWriter(){
       JpaItemWriter<OExamResult> writer=new JpaItemWriter<>();
       //set EntityManager factory
       writer.setEntityManagerFactory(entityFactory);

       return writer;
 }
 */
 @Bean
 public  JpaItemWriter<OExamResult>  createWriter(){
       return  new JpaItemWriterBuilder<OExamResult>()
                        .entityManagerFactory(entityFactory)
                        .build();
 }
```

```
//step
    @Bean(name="step1")
    public  Step createStep1() {
        return  stepFactory.get("step1")
                    .<IExamResult,OExamResult>chunk(3)
                    .reader(createReader())
                    .writer(createWriter())
                    .processor(createProcessor())
                    .build();
    }

    @Bean(name="job1")
    public Job createJob1() {
        return jobFactory.get("job1")
                    .incrementer(new RunIdIncrementer())
                    .listener(createListener())
                    .start(createStep1())
                    .build();
    }
}
```

---

**JobRepository contains multiple details about job executions**

==========

```
spring.batch.jdbc.initialize-schema=always
                                    never
                                    embedded
```

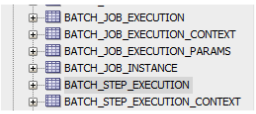
**always (recomanded)**

---

**=>BatchProcessing activities should be kept tracked by creating multiple db tables in the underlying Db s/w.**

**=>If no DataSource cfg then exception will raised**

**=>if we cfg embedded DB s/w like H2,HSQL and etc.. then db tables will be created in that Embedded DB s/w**




**never**

======

**=>BatchProcessing activities should not be kept tracked.**

**embedded**

==========

**=>BatchProcessing activities should kept tracked only in the Embedded DB s/w through extenal DB s/ws are configured.**

---

**Assignment :: Convert oracle db table data to mysql DB table data using spring batch and spring data jpa based writers and readers**

**reader:: JpaItemReader /JpaPagingItemReader**

**writer :: JpaItemWriter**

**====Gradle vedios==========**

**https://www.youtube.com/watch?v=5JkqrUu4kGM&t=75s**
**https://www.youtube.com/watch?v=CfATtI9_nMA**
**https://www.youtube.com/watch?v=A12Z8LjJEMo**
**https://www.youtube.com/watch?v=jTJwieViWQQ&t=7074s**

**====Junit5, HttpUnit & Mockito===**

**https://www.youtube.com/watch?v=6VVplfYp40M**
**https://www.youtube.com/watch?v=AI3b3FY2iD0**
**https://www.youtube.com/watch?v=7Xq4j0Q7aPE**

**=== tools used in modren build process ======**

**https://www.youtube.com/watch?v=5oemloT3KEc**

**========== Log4j vedios ==========**

**https://www.youtube.com/watch?v=RBxHHV_7Q0cd**
**https://www.youtube.com/watch?v=uKsKwFpRkgg**