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## applications menu and/or to the REST backend.    Domain Service layout customization. When present, overridden by membars slyouls and programs are recommended by the membars slyouls are recommended by the membars slyouls and programs are recommended by the membars slyouls and programs are recommended by the membars slyouls are						
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## Scales Service   Un notifications	type	View-models may	alternatively implement interface ViewModel and	RepositoryService	access to persistence layer	
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Contributes an Action   String   Machine   String   Machine   String   Machine	-			ClockService	provides virtual clock	
boolean hide(plil2)PlaceOrder(XIVIZ) String <sup>©</sup> validate(plil2)PlaceOrder(XIVIZ) String <sup>©</sup> validate(plil2)PlaceOrder(plil2)Place	method, mixin	contributes an	boolean hidePlaceOrder() String <sup>(1)</sup> disablePlaceOrder() boolean hide{0 1 2}PlaceOrder(X Y Z);	WrapperFactory		
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CollX/I/2 autoComplete(oll(2)PlaceOrder(X/I/2, with Complete(oll(2)PlaceOrder(X/I/2, with Collection (X/I/2 chalut(oll(2)PlaceOrder(X/I/2))   String of			String <sup>[1]</sup> validate{0 1 2}PlaceOrder(X Y Z)	BookmarkService	bookmark = object identity	
Collection x Y Z + choices   Collection x Y			Coll <x y z> autoComplete {0 1 2}PlaceOrder (X Y Z, @MinLength (3) String search) 2 args Collection <x y z> choices {0 1 2}PlaceOrder (X Y Z)</x y z></x y z>	InteractionService		
String   Meacribed PlaceOrder()   String   Meacribed PlaceOrder()				TransactionService	request transactions	
### Action layout customization. When present, overriden by the property and indicates which property or properties make up the object title.  ### Object Methods    Dobject Methods			String <sup>[1]</sup> namedPlaceOrder()	MetaModelService	export domain model	
Field, getter, mixin   Field, method   Field, method   Field, method   Field, getter, mixin   Field, getter, mixin   Field getter,		A - ti l t t				
Indicates which property or properties make up the object title.   String <sup>III</sup> disabled()   disable all members	-	Xxx.layout[.layoutName].xml > Xxx.layout.xml > Xxx.layout.fallback.xml.				
Property   field, getter, mixin   field or method contributes a   Property.   email, getEmail();   String <sup>[1]</sup> disableEmail();   String <sup>[1]</sup> validateEmail();   String <sup>[1]</sup> validateEmail();   String <sup>[1]</sup> namedEmail();   String <sup>[1]</sup> namedImail();   Strin	@Title	Indicates which pr	operty or properties make up the object title.	boolean hidden()	hide all members	
field, getter, mixin  Typically used with @lombok.Setter @lombok.Getter, mixin field, getter, mixin field or method contributes a Collection	field, method			String <sup>[1]</sup> disabled()	disable all members	
contributes a Typically used with @lombok.Setter & Action parameter constraint and behavior customization. @Parameter @MinLength parameter & Action parameter layout customization. @Parameter @MinLength parameter & Action parameter layout customization. @Parameter layout didicates that a method supports either an Action or a Property or a group of the parameter layout parameter layout parameter layout parameter layout customization. @Parameter layout lindicates that a method supports either an Action or a Property or a group of the parameter layout parameter layout return TranslatableString.	@Property			Layout Support		
Typically used with @lombok.Setter  @lombok.Setter  ### String <sup>[1]</sup> validateEmail(X); Collection> autoCompleteEmail(), Collection> autoCompleteEmail(), String <sup>[1]</sup> namedEmail() String <sup>[1]</sup> namedEmail() String <sup>[1]</sup> describedEmail()  ### Property Layout  ### Property layout customization. When present, overriden by ### field, getter, mixin  ### Collection  ### field, getter, mixin  ### Collection  ### Typically used with @lombok.Getter @lombok.Getter @lombok.Setter  ### Collection  ### Collection  ### Collection  ### String to Indicates that a field or method contributes a Collection. orders, List-Order> getOrders() ### String layout()  ### Lifecycle Callback  ### void created() ### woid saved() ### void saved() #	field, getter, mixin	contributes a	boolean <b>hide</b> Email(); String <sup>[1]</sup> <b>disable</b> Email();	String <sup>[1]</sup> title()	imperative title literal	
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String   NamedEmail()   NamedEmail()   String   NamedEmail()			Collection<> autoCompleteEmail(),	String cssClass()	additional css class (UI)	
### Property Layout ### Property Layout Customization. When present, overriden by ### field, getter, mixin ### field, getter, mixin ### field or method contributes a Collection, meaning a non-scalar property. String <sup>[1]</sup> disableOrders() **String <sup>[1]</sup> namedOrders() **String <sup>[1]</sup> nam			String <sup>[1]</sup> namedEmail()	String layout()	layout file suffix (grid layout)	
### Field, getter, mixin   Xxx.layout[.layoutName].xml > Xxx.layout.xml > Xxx.layout.fallback.xml.   void created()   emitted by FactoryService    ### Word Created()   void loaded()    ### Word Created()   emitted by FactoryService    ### Word Created()   void loaded()    ### Word Saved()    ### Word	© Duramantul avvaut	Proporty layout ou		Lifecycle Callback		
field, getter, mixin Typically used with @lombok.Getter @lombok.Setter  @Collection, meaning a non-scalar property.  @Collection layout field, getter, mixin  @Parameter  @MinLength  @Parameter  @ParameterLayout parameter  @PerameterLayout parameter  @MemberSupport  [Action parameter layout customization.  @MemberSupport  [Action parameter layout customization.  @MemberSupport  [1] All member-support methods (and some object methods) that return String can optionally return TranslatableString.		V 1 151 181		void created()	emitted by FactoryService	
@CollectionLayout       Collection layout customization. Overriden by XXXX.layout.stall.         @Parameter       Action parameter constraint and behavior customization.         @MinLength       Action parameter layout customization.         @ParameterLayout parameter       Action parameter layout customization.         @MemberSupport       Indicates that a method supports either an Action or a Property or a             Void removing()         void updated()         void updating()             Translation             [1] All member-support methods (and some object methods) that return String can optionally return TranslatableString.	field, getter, mixin  Typically used with  @lombok.Getter	field or method contributes a <i>Collection</i> , meaning a non-	@Collection orders, List <order> getOrders() boolean hideOrders() String<sup>[1]</sup> disableOrders() String<sup>[1]</sup> namedOrders()</order>	void saved() void saving() void persisted()		
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@Parameter       Action parameter constraint and behavior customization.         @MinLength       Translation         @ParameterLayout parameter       Action parameter layout customization.         @MemberSupport       Indicates that a method supports either an Action or a Property or a             Void updating()         Translation         [1] All member-support methods (and some object methods) that return String can optionally return TranslatableString.	field, getter, mixin	Xxx.layout[.layoutName].xml > Xxx.layout.xml > Xxx.layout.fallback.xml.				
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Communication of the state of t	-					
	1 1		ethod supports either an <i>Action</i> or a <i>Property</i> or a			

#### Value Types

Number Types	byte, Byte, short, Short, int, Integer, long, Long, float, Float, double, Double, BigInterger, BigDecimal
Boolean Types	boolean, Boolean
Text Types	char, Character, String, Password
Markup Types	Markup, AsciiDoc, Markdown
Temportal Types	java.util.Date, java.sql.{Date Timestamp}
	java.time.{LocalDate LocalDateTime}
	Joda Time (deprecated)
	time-of-day types yet not supported by UI, hence not listed
Enum Types	any
Collection Types	Collection <t>, List<t>, Set<t>, Can<t></t></t></t></t>
Additional Types	BufferedImage, Blob, Clob, UUID, Url, LocalResourcePath, SSE (ServerSentEvents)

#### **Error & Exception Handling**

RecoverableException	anticipated error that results in an UI notification popup	
NonRecoverableExeption	error that results in an error page showing the stacktrace	

Spring Annotations and Standard API				
@SpringBootApplication @SpringBootTest @Configuration @Import @ComponentScan @EntityScan	Bootstrapping			
@Component @Service @Repository	Indicates that a class is a "component". Such classes are considered as candidates for auto-detection when using annotation-based configuration and classpath scanning.			
@EventListener	Marks a method as a listener for application events.  Domain Events subscribe using Spring's  @EventListener  @DomainObject(xxxLifecycleEvent=)  @DomainObjectLayout(xxxUiEvent=)  @Action(domainEvent=)  @Property(domainEvent=)			
@Nullable (org.springframework.lang)	declares that annotated elements can be null			
@javax.inject.Inject @Autowired	Marks a constructor, field, setter method, or config method as to be autowired by Spring's dependency injection facilities.			
@PostConstruct	Marks a method to be executed after dependency injection is done to perform any initialization.			
@PreDestroy	Marks a method as a listener for notification that the instance is in the process of being removed by the container .			

## New Programming Style: Parameters as Typed Tuple [2.0.0-M6]

Action parameters can now be collected into an immutable value type say Parameters, a typed tuple. The name is arbitrary. Future releases might support Java records. Instances of the Parameters type are passed to the various action-support methods, which need to be single-arg, except for autoComplete, which is required to be bi-arg.

For regular objects, action-support methods must reference parameters by index (0, 1, 2, ...). However, with Mixins it is allowed to reference parameters

Example: Action Mixin, with nested class Parameters, using parameter references by name.

```
@Action
@RequiredArgsConstructor
public class Customer_placeOrder {
  private final Customer target;
   // typed tuple made of all the action parameters
  @Value @Accessors(fluent = true)
  public static class Parameters {
     Product product;
    int quantity;
  public Customer act(
     @Parameter Product product,
     @Parameter int quantity) {
    return target:
  // supporting methods (no action name reference required)
  public boolean hide() { ... }
  public String disable() { ... }
  public String validate(Parameters params) { ... }
  // parameter supporting methods (exemplified on first parameter)
  public boolean hideProduct(Parameters params) { ... }
  public String disableProduct(Parameters params) { ... }
  public String validateProduct(Parameters params) { ... }
  public Collection<Product> choicesProduct(Parameters params){ ... }
  // note: additional search parameter required
  public Collection<Product> autoCompleteProduct(
      Parameters params, String search) { ... }
  public Product defaultProduct(Parameters params) { ... }
  // parameter supporting methods (exemplified on second parameter)
  public boolean hideQuantity(Parameters params) { ... }
  // ...
```

#### **Entity and Viewmodel Annotations**

# JPA Entities (javax.persistence)

@Entity @Table @NamedQueries @Id @Version @Column @Transient

# JDO Entities (javax.jdo.annotation)

@PersistenceCapable @DatastoreIdentity @Inheritance @Discriminator @Version @Queries @Uniques @Indices @NotPersistent @Column @PrimaryKey @Join @Element

### JAXB View Models (javax.xml.bind.annotation)

@XmRootElement; @XmlType @XmlAccessorType; @XmlTransient referenced entities: @XmlJavaTypeAdapter(PersistentEntityAdapter.class)