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Exception Handling in Spring MVC







NOVEMBER 01, 2013

Spring MVC provides several complimentary approaches to exception handling but, when teaching Spring MVC, I often find that my students are confused or not comfortable with them.

Today I'm going to show you the various options available. Our goal is to not handle exceptions explicitly in Controller methods where possible. They are a cross-cutting concern better handled separately in dedicated code.

There are three options: per exception, per controller or globally.











A demonstration application that shows the points discussed here can be found at

http://github.com/paulc4/mvc-exceptions.

See Sample Application below for details.

NOTE: The demo applications has been revamped and updated (October 2014) to use Spring Boot 1.1.8 and is (hopefully) easier to use and understand.

Using HTTP Status Codes

Normally any unhandled exception thrown when processing a webrequest causes the server to return an

HTTP 500 response. However, any exception that you write yourself can be annotated with the

@ResponseStatus annotation (which supports all the HTTP status codes defined by the HTTP

specification). When an annotated exception is thrown from a controller method, and not handled elsewhere,

it will automatically cause the appropriate HTTP response to be returned with the specified status-code.

For example, here is an exception for a missing order.

```
@ResponseStatus(value=HttpStatus.NOT FOUND, reason="No su
ch Order") // 404
    public class OrderNotFoundException extends RuntimeExcept
ion {
```

And here is a controller method using it:

```
@RequestMapping(value="/orders/{id}", method=GET)
    public String showOrder (@PathVariable ("id") long id, Mode
1 model) {
        Order order = orderRepository.findOrderById(id);
        if (order == null) throw new OrderNotFoundException(i
d);
        model.addAttribute(order);
       return "orderDetail";
```

A familiar HTTP 404 response will be returned if the URL handled by this method includes an unknown order id.

Controller Based Exception Handling

Using @ExceptionHandler

You can add extra (@ExceptionHandler) methods to any controller to specifically handle exceptions thrown by request handling (@RequestMapping) methods in the same controller. Such methods can:

- 1. Handle exceptions without the @ResponseStatus annotation (typically predefined exceptions that you didn't write)
- 2. Redirect the user to a dedicated error view
- 3. Build a totally custom error response

The following controller demonstrates these three options:

```
@Controller
public class ExceptionHandlingController {
  // @RequestHandler methods
  // Exception handling methods
  // Convert a predefined exception to an HTTP Status code
```

```
@ResponseStatus(value=HttpStatus.CONFLICT, reason="Data int
egrity violation") // 409
  @ExceptionHandler(DataIntegrityViolationException.class)
 public void conflict() {
    // Nothing to do
  // Specify the name of a specific view that will be used to
display the error:
  @ExceptionHandler({SQLException.class,DataAccessException.c
lass})
 public String databaseError() {
    // Nothing to do. Returns the logical view name of an er
ror page, passed to
    // the view-resolver(s) in usual way.
    // Note that the exception is not available to this vie
w (it is not added to
    // the model) but see "Extending ExceptionHandlerException
nResolver" below.
    return "databaseError";
  // Total control - setup a model and return the view name y
ourself. Or consider
  // subclassing ExceptionHandlerExceptionResolver (see below
) .
  @ExceptionHandler(Exception.class)
 public ModelAndView handleError (HttpServletRequest req, Exc
```

```
eption exception) {
    logger.error("Request: " + req.getRequestURL() + " raised
" + exception);

    ModelAndView mav = new ModelAndView();
    mav.addObject("exception", exception);
    mav.addObject("url", req.getRequestURL());
    mav.setViewName("error");
    return mav;
}
```

In any of these methods you might choose to do additional processing the most common example is to log the exception.

```
Handler methods have flexible signatures so you can pass in obvious servlet-related objects such
```

```
as HttpServletRequest, HttpServletResponse, HttpSession and/or Principle. Important Note: the Model may not be a parameter of any @ExceptionHandler method. Instead, setup a model inside the method using a ModelAndView as shown by handleError() above.
```

Exceptions and Views

Be careful when adding exceptions to the model. Your users do not want to see

web-pages containing Java exception details and stack-traces. However, it can be useful to put exception

details in the page source as a comment, to assist your support people. If using JSP, you could

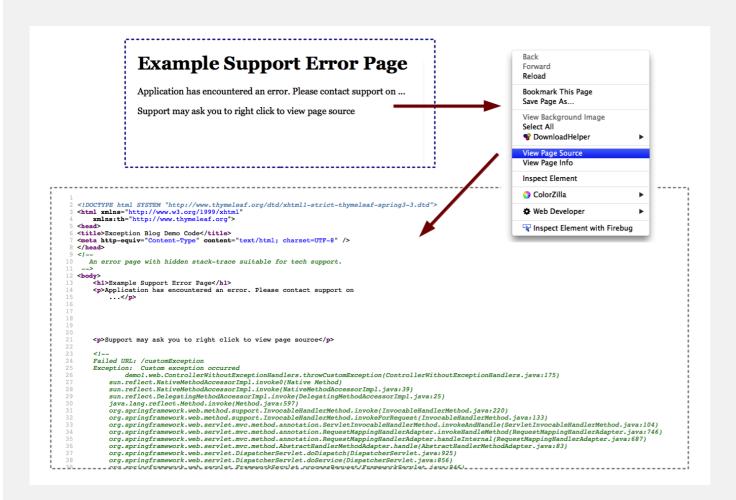
do something like this to output the exception and the corresponding stack-trace (using a hidden

<div> is another option).

```
<h1>Error Page</h1>
   Application has encountered an error. Please contact s
upport on ...
   <!--
   Failed URL: ${url}
   Exception: ${exception.message}
       <c:forEach items="${exception.stackTrace}" var="ste">
${ste}
   </c:forEach>
   -->
```

For the Thymeleaf equivalent see support.html

in the demo application. The result looks like this.



Global Exception Handling

Using @ControllerAdvice Classes

A controller advice allows you to use exactly the same exception handling techniques but apply them

across the whole application, not just to an individual controller. You can think of them as an annotation driven interceptor.

Any class annotated with @ControllerAdvice becomes a controlleradvice and three types of method are supported:

- Exception handling methods annotated with @ExceptionHandler.
- Model enhancement methods (for adding additional data to the model) annotated with @ModelAttribute. Note that these attributes are not available to the exception handling views.
- Binder initialization methods (used for configuring form-handling) annotated with

```
@InitBinder.
```

We are only going to look at exception handling - see the online manual for more on

@ControllerAdvice methods.

Any of the exception handlers you saw above can be defined on a controller-advice class - but now they

apply to exceptions thrown from any controller. Here is a simple example:

```
@ControllerAdvice
class GlobalControllerExceptionHandler {
    @ResponseStatus(HttpStatus.CONFLICT) // 409
    @ExceptionHandler(DataIntegrityViolationException.class)
    public void handleConflict() {
        // Nothing to do
    }
}
```

If you want to have a default handler for any exception, there is a slight wrinkle. You need to ensure annotated exceptions are handled by the framework. The code looks like this:

```
@ControllerAdvice
class GlobalDefaultExceptionHandler {
   public static final String DEFAULT_ERROR_VIEW = "error";

    @ExceptionHandler(value = Exception.class)
   public ModelAndView defaultErrorHandler(HttpServletReques
   t req, Exception e) throws Exception {
        // If the exception is annotated with @ResponseStatus
   rethrow it and let
```

```
// the framework handle it - like the OrderNotFoundEx
ception example
       // at the start of this post.
        // AnnotationUtils is a Spring Framework utility clas
S.
        if (AnnotationUtils.findAnnotation(e.getClass(), Resp
onseStatus.class) != null)
            throw e;
        // Otherwise setup and send the user to a default err
or-view.
        ModelAndView mav = new ModelAndView();
        mav.addObject("exception", e);
        mav.addObject("url", req.getRequestURL());
        mav.setViewName (DEFAULT ERROR VIEW);
        return mav;
```

Going Deeper

HandlerExceptionResolver

Any Spring bean declared in the DispatcherServlet 's application context that implements

HandlerExceptionResolver will be used to intercept and process any exception raised in the MVC system and not handled by a Controller. The interface looks like this:

```
public interface HandlerExceptionResolver {
    ModelAndView resolveException (HttpServletRequest request,
            HttpServletResponse response, Object handler, Exc
eption ex);
```

The handler refers to the controller that generated the exception (remember that

@Controller instances are only one type of handler supported by Spring MVC.

For example: HttpInvokerExporter and the WebFlow Executor are also types of handler).

Behind the scenes, MVC creates three such resolvers by default. It is these resolvers that implement the behaviours discussed above:

ExceptionHandlerExceptionResolver matches uncaught exceptions

against for suitable @ExceptionHandler methods on both the handler (controller) and on any controller-advices.

- ResponseStatusExceptionResolver looks for uncaught exceptions annotated by @ResponseStatus (as described in Section 1)
- DefaultHandlerExceptionResolver converts standard Spring exceptions and converts them to HTTP Status Codes (I have not mentioned this above as it is internal to Spring MVC).

These are chained and processed in the order listed (internally Spring creates a dedicated bean - the HandlerExceptionResolverComposite to do this).

Notice that the method signature of resolveException does not include the Model. This is why @ExceptionHandler methods cannot be injected with the model.

You can, if you wish, implement your own HandlerExceptionResolver to setup your own custom exception handling system. Handlers typically implement Spring's Ordered interface so you can define the order that the handlers run in.

SimpleMappingExceptionResolver

Spring has long provided a simple but convenient implementation of

HandlerExceptionResolver

that you may well find being used in your application already - the

SimpleMappingExceptionResolver.

It provides options to:

- Map exception class names to view names just specify the classname, no package needed.
- Specify a default (fallback) error page for any exception not handled anywhere else
- Log a message (this is not enabled by default).
- Set the name of the exception attribute to add to the Model so it can be used inside a View (such as a JSP). By default this attribute is named exception. Set to null to disable. Remember that views returned from @ExceptionHandler methods do not have access to the exception but views defined to SimpleMappingExceptionResolver do.

Here is a typical configuration using XML:

```
<bean id="simpleMappingExceptionResolver"</pre>
          class="org.springframework.web.servlet.handler.Simp
leMappingExceptionResolver">
        cproperty name="exceptionMappings">
            < map >
                <entry key="DatabaseException" value="databas</pre>
eError"/>
                <entry key="InvalidCreditCardException" value</pre>
="creditCardError"/>
            </map>
        </property>
        <!-- See note below on how this interacts with Spring
Boot -->
        cproperty name="defaultErrorView" value="error"/>
        cproperty name="exceptionAttribute" value="ex"/>
        <!-- Name of logger to use to log exceptions. Unset b
y default, so logging disabled -->
        cproperty name="warnLogCategory" value="example.MvcLo"
gger"/>
    </bean>
```

Or using Java Configuration:

```
@Configuration
@EnableWebMvc // Optionally setup Spring MVC defaults if yo
```

```
u aren't doing so elsewhere
public class MvcConfiguration extends WebMvcConfigurerAdapter
   @Bean (name="simpleMappingExceptionResolver")
   public SimpleMappingExceptionResolver createSimpleMapping
ExceptionResolver() {
       SimpleMappingExceptionResolver r =
            new SimpleMappingExceptionResolver();
       Properties mappings = new Properties();
       mappings.setProperty("DatabaseException", "databaseEr
ror");
       mappings.setProperty("InvalidCreditCardException", "c
reditCardError");
       r.setExceptionMappings (mappings); // None by default
       r.setDefaultErrorView("error");  // No default
       eption"
       r.setWarnLogCategory("example.MvcLogger");
                                                  // No
default
       return r;
```

The defaultErrorView property is especially useful as it ensures any

uncaught exception generates a suitable application defined error page. (The default for most application servers is to display a Java stack-trace - something your users should never see).

Extending SimpleMappingExceptionResolver

It is quite common to extend SimpleMappingExceptionResolver for several reasons:

- Use the constructor to set properties directly for example to enable exception logging and set the logger to use
- Override the default log message by overriding buildLogMessage. The default implementation always returns this fixed text:

Handler execution resulted in exception

To make additional information available to the error view by overriding doResolveException

For example:

```
public class MyMappingExceptionResolver extends SimpleMapping
ExceptionResolver {
    public MyMappingExceptionResolver() {
        // Enable logging by providing the name of the logger
to use
        setWarnLogCategory (MyMappingExceptionResolver.class.g
etName());
    @Override
    public String buildLogMessage(Exception e, HttpServletReg
uest req) {
        return "MVC exception: " + e.getLocalizedMessage();
    @Override
    protected ModelAndView doResolveException (HttpServletRequ
est request,
            HttpServletResponse response, Object handler, Exc
eption exception) {
        // Call super method to get the ModelAndView
        ModelAndView mav = super.doResolveException(request,
response, handler, exception);
        // Make the full URL available to the view - note Mod
elAndView uses addObject()
        // but Model uses addAttribute(). They work the same.
```

```
mav.addObject("url", request.getRequestURL());
return mav;
```

This code is in the demo application as ExampleSimpleMappingExceptionResolver

Extending ExceptionHandlerExceptionResolver

```
It is also possible to extend ExceptionHandlerExceptionResolver and
override its
doResolveHandlerMethodException | method in the same way. It has
almost the same signature
(it just takes the new HandlerMethod instead of a Handler).
```

To make sure it gets used, also set the inherited order property (for example in the constructor of your new class) to a value less than MAX INT so it runs before the default

ExceptionHandlerExceptionResolver instance (it is easier to create your own handler instance than try to modify/replace the one created by Spring). See

 $\label{lem:example} Example Exception Handler Exception Resolver$

in the demo app for more.

Errors and REST

RESTful GET requests may also generate exceptions and we have already seen how we can return standard HTTP Error response codes. However, what if you want to return information about the error? This is very easy to do.

Firstly define an error class:

```
public class ErrorInfo {
   public final String url;
   public final String ex;

public ErrorInfo(String url, Exception ex) {
    this.url = url;
    this.ex = ex.getLocalizedMessage();
}
```

Now we can return an instance from a handler as the @ResponseBody like this:

```
@ResponseStatus(HttpStatus.BAD_REQUEST)
@ExceptionHandler(MyBadDataException.class)
```

```
@ResponseBody ErrorInfo handleBadRequest (HttpServletRequest r
eq, Exception ex) {
    return new ErrorInfo(req.getRequestURL(), ex);
```

What to Use When?

As usual, Spring likes to offer you choice, so what should you do? Here are some rules of thumb.

However if you have a preference for XML configuration or Annotations, that's fine too.

- For exceptions you write, consider adding @ResponseStatus to them.
- For all other exceptions implement an @ExceptionHandler method on a @ControllerAdvice class or use an instance of SimpleMappingExceptionResolver . You may well have SimpleMappingExceptionResolver configured for your application already, in which case it may be easier to add new exception classes to it than implement a @ControllerAdvice.
- For Controller specific exception handling add @ExceptionHandler methods to your controller.
- Warning: Be careful mixing too many of these options in the same

application. If the same exception can be handed in more than one way, you may not get the behavior you wanted. @ExceptionHandler methods on the Controller are always selected before those on any @ControllerAdvice instance. It is undefined what order controlleradvices are processed.

Sample Application

A demonstration application can be found at github. It uses Spring Boot and Thymeleaf to build a simple web application.

The application was revised (Oct 2014) and is (hopefully) better and easier to understand. The fundamentals stay the same. It uses Spring Boot V1.1.8 and Spring 4.1 but the code is applicable to Spring 3.x also.

The demo is running on Cloud Foundry at http://mvc-exceptionsv2.cfapps.io/.

About the Demo

The application leads the user through 5 demo pages, highlighting different exception handling techniques:

1. A controller with @ExceptionHandler methods to handle its own

exceptions

- 2. A contoller that throws exceptions for a global ControllerAdvice to handle
- 3. Using a SimpleMappingExceptionResolver to handle exceptions
- 4. Same as demo 3 but with the SimpleMappingExceptionResolver disabled for comparison
- 5. Shows how Spring Boot generates its error page

A description of the most important files in the application and how they relate to each demo can be found in the project's README.md.

The home web-page is index.html

which:

- Links to each demo page
- Links (bottom of the page) to Spring Boot endpoints for those interested in Spring Boot.

Each demo page contains several links, all of which deliberately raise

exceptions. You will need to use the back-button on your browser each time to return to the demo page.

Thanks to Spring Boot, you can run this demo as a Java application (it runs an embedded Tomcat container). To run the application, you can use one of the following (the second is thanks to the Spring Boot maven plugin):

```
mvn exec: java
```

mvn spring-boot:run

Your choice. The home page URL will be http://localhost:8080.

Spring Boot and Error Handling

Spring Boot allows a Spring project to be setup with minimal configuration. Spring Boot creates sensible defaults automatically when it detects certain key classes and packages on the classpath. For example if it sees that you are using a Servlet environment, it sets up Spring MVC with the most commonly used viewresolvers, hander mappings and so forth.

If it sees JSP and/or Thymeleaf, it sets up these view-technologies.

```
Spring MVC offers no default (fall-back) error page out-of-the-box. The
most common way to set a default error
page has always been the SimpleMappingExceptionResolver (since
Spring V1 in fact). However
Spring Boot also provides for a fallback error-handling page.
At start-up, Spring Boot tries to find a mapping for /error . By
convention, a URL ending in /error maps to
a logical view of the same name: error . In the demo application this
view maps in turn to the error.html
Thymeleaf template. (If using JSP, it would map to error.jsp according
to the setup of your
InternalResourceViewResolver ).
If no mapping from /error to a View can be found, Spring Boot defines
its own fall-back error page - the so-called "Whitelabel Error Page" (a
minimal page with just the HTTP status information and any error details,
such as the message from an uncaught exception). If you rename the
error.html template to, say, error2.html
then restart, you will see it being used.
By defining a Java configuration @Bean method called
defaultErrorView() you can return your own error View instance. (see
```

```
Spring Boot's ErrorMvcAutoConfiguration class for more information).
What if you are already using SimpleMappingExceptionResolver to
setup a default
error view? Simple, make sure the defaultErrorView defines the same
view that Spring Boot uses: error . Or you can disable Spring boot's
error page by setting the property
error.whitelabel.enabled to false. Your container's default error
page is used instead.
There are examples of setting Spring Boot properties in the constructor
of
Main.
```

Note that in the demo, the defaultErrorView property of the SimpleMappingExceptionResolver is deliberately set not to error but to defaultErrorPage so you can see when the handler is generating the error page and when Spring Boot is responsible. Normally both would be set to error.

Also in the demo application I show how to create a support-ready error page with a stack-trace hidden in the HTML source (as a comment). Ideally support should get this information from the logs, but life isn't always ideal. Regardless, what this page does show is how the underlying error-handling method handleError creates its own ModelAndView to provide extra information in the error page. See:

- * ExceptionHandlingController.handleError() on github
- GlobalControllerExceptionHandler.handleError() on github

17 Comments spring.io







Join the discussion...



Jesper de Jong • 7 months ago

I have a remark, or question, about the @ResponseStatus annotation.

With this annotation you can specify the HTTP status code and message specific type of exception occurs. I find it a bit inflexible that you can or have something like this:

@ResponseStatus(value = HttpStatus.NOT FOUND) public class OrderNotFoundException {

```
super("There is no order with id: " + orderld);
```

Instead of specifying a fixed message string with 'reason = ...' in the air exception message, which is in this case "There is no order with id: ... status code = 404, message string = "There is no order with id: ...".

Is this currently possible? If not, then is it a reasonable feature request 6 ^ Reply · Share >



Thomas Jarnot → Jesper de Jong • 4 months ago

As you might have noticed from the javadoc of @ExceptionHar allowed to return various types. Returning an instance of Resp message) should meet you flexibility requirements.



Jan Šťastný ∘ a year ago Hi,

thanks a lot for a nice post.

I have used the technique of handling generic Exception in my @Conti exceptions annotated with @ResponseStatus annotation as proposed if (AnnotationUtils.findAnnotation(e.getClass(), ResponseStatus.class) throw e;

However, using this technique causes an error message with text:

"Failed to invoke @ExceptionHandler method ..." to appear in the log. ExceptionHandlerExceptionResolver:

try {

if (logger.isDebugEnabled()) {

logger.debug("Invoking @ExceptionHandler method: " + exceptionHan

see more



Brian Clozel Mod → Jan Šťastný • a year ago

StackOverflow is probably a better place for questions: could y your comment? https://stackoverflow.com/ques...



Jan Šťastný → Brian Clozel · a year ago

Ok, Thanks Brian. I have created a new question for thi https://stackoverflow.com/ques...



Kirandeep Rana • a year ago

Very good and comprehensive explanation..great JOB. I would surly re



Never reveal information about your implementation to outside entities



Guest • a year ago

I've implemented a convenient exception handler (extends AbstractHa meets the IETF draft Problem Details for HTTP APIs.

It's very easy to handle custom exceptions without repeating yourself, customize error responses and even localize them. Also solves some pitfalls in Spring MVC with a content negotiation when producing an error response.

You can find it on GitHub under jirutka/spring-rest-exception-handler ar will be useful for others.

```
1 ^ Reply · Share >
```



Lavesh Singhal → Guest • a year ago nice explanation.



JAEHYUNG cho • a month ago

thank so much



Mattias Severson • 9 months ago

Nice! I discovered this post when I was working on my latest blog post have written similar blog posts before, for example about a custom err above), and one about generalizing error responses (by using the @cor



Franjo Markovic • 10 months ago

Very nice article, well explained, thanks!

I agree with bblain7 that posting stack trace (even as hidden div) is a p someone too many details about your configuration. The intended use stack trace) is also inappropriate - support should have access to the information.



Gareth Barnard • a year ago

Thank you Paul for this illuminating post.

In 'Using @ExceptionHandler' you have 'Handle exceptions without the predefined exceptions that you didn't write)' but the example in the san

@ResponseStatus(value=HttpStatus.CONFLICT, reason="Data integ @ExceptionHandler(DataIntegrityViolationException.class)

So, should the 'without' be 'with'?



Kumar • a year ago

Thank you for the awesome post.

Very good article about best practices.



alienacidtechno • a year ago

Hi

Thanks for the tutorial. I have one concern though. Please don't post s r.setWarnLogCategory("example.MvcLogger"); or mav.setViewName(resolver or modelAndView, but it encourages good naming practices a brain cycles to process it). A lot of people copy-paste code from such one letter variables everywhere.

Thank you.



Paul Chapman → alienacidtechno • a year ago

Fair point, no argument from me there. In my defence, I have to lines in code-snippets short enough to fit on the page and be e bars annoying).

Anyway, I hope you found the blog useful and thanks for taking



SolrWind • a year ago

Thanks, this was a thorough explanation and walkthrough. I needed m defined in XML for SimpleMappingExceptionResolver. I ended up imple advised so I could handle exceptions on a more granular basis depend there's an entire section of my app that communicates with the client : send a custom JSON structure back. I now get to clean up a lot of my

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