Fluid Templating System

Sebastian Kurfürst

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Abstract

Fluid is a Templating System which is used by default for FLOW3-based applications.

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Chapter 1. Introduction

Fluid is a next-generation templating engine which was engineered with several goals in mind:

- Simplicity
- Flexibility
- Extensibility
- Ease of use

This templating engine should not be bloated, instead, we try to do it "The Zen Way" - you do not need to learn too many things, thus you can concentrate on getting your things done, while the template engine handles everything you do not want to care about. In XML Schema aware editors (like Eclipse), you even get autocompletion and inline help support while writing your template.

What does it do?

In the current MVC system of FLOW3, the View currently does not have a lot of functionality. The standard view provides a `render` method, and nothing more. That makes it cumbersome to write powerful views, as most designers will not write PHP code.

That is where the Template Engine comes into play: It "lives" inside the View, and is controlled by a special `TemplateView` which instanciates the Template Parser, resolves the template HTML file, and renders the template afterwards.

Example

Below, you'll find a snippet of a real-world template displaying a list of blog postings. Use it to check whether you find the template language intuitive (we hope you will ;-))

Example 1.1. Basic Fluid Example

```
{namespace f3=F3\Fluid\ViewHelpers}
<html>
<head><title>Blog</title></head>
<body>
<h1>Blog Postings</h1>
<f3:for each="{postings}" as="posting">
  <h2>{posting.title}</h2>
  <div class="author">{posting.author.name} {posting.author.email}</div>
  <p><f3:link action="details" arguments="{id : posting.id}">{posting.teaser}</f3:
</f3:for>
</body>
</html>
```

The *Namespace Import* makes the `F3\Fluid\ViewHelper` namespace available under the shorthand `f3`. This is important for View Helpers, like the `<f3:link />` tag.
This essentially corresponds to `foreach($postings as $posting)` in PHP.
With the dot-notation (`{posting.title}`, or `{posting.author.name}`), you can traverse objects. In the latter example, the system calls `$posting->getAuthor()->getName()`.
The `<f3:link>...</f3:link>` tag is a so-called *ViewHelper*. It calls arbitary PHP code, and in this case renders a link to the "details"-Action.

There is a lot more to show, including:

- Layouts

- Autocompletion in Eclipse
- Custom View Helpers

We invite you to explore Fluid some more, and please do not hesitate to give feedback!

Chapter 2. User Manual

This chapter describes all things the users of the templating system needs to know. After you've read the introduction, you can dive into the concepts of Fluid which are relevant to you.

The chapter starts with an overview of basic concepts, continues with using layouts, and finishes with how to write your own view helpers.

Basic concepts

This section describes all basic concepts available.

This includes:

- Variables / Object Accessors
- View Helpers
- Arrays

Variables and Object Accessors

A templating system would be quite pointless if it was not possible to display some external data in the templates. That's what variables are for:

Suppose you want to output the title of your blog, you could write the following snippet into your controller:

```
$this->view->assign('blogTitle', $blog->getTitle());
```

Then, you could output the blog title in your template with the following snippet:

```
<h1>This blog is called {blogTitle}</h1>
```

Now, you might want to extend the output by the blog author as well. To do this, you could repeat the above steps, but that would be quite inconvenient and hard to read. [1]

That's why the template language has a special syntax for object access, demonstrated below. A nicer way of expressing the above is the following:

```
This should go into the controller:
$this->view->assign('blog', $blog);
This should go into the template:
<h1>This blog is called {blog.title}, written by {blog.author}</h1>
```

Instead of passing strings to the template, we are passing whole objects around now - which is much nicer to use both from the controller and the view side. To access certain properties of these objects, you can use *Object Accessors*. By writing `{blog.title}`, the template engine will call a `getTitle()` method on the `blog` object, if it exists. Besides, you can use that syntax to traverse associative arrays and public properties.

Tip

Deep nesting is supported: If you want to output the email address of the blog author, then you can use `{blog.author.email}`, which internally calls `$blog->getAuthor()->getEmail()`.

View Helpers

All output logic is placed in *View Helpers*.

[1]Besides, the semantics between the controller and the view should be the following: The controller says to the view "Please render the blog object I give to you", and not "Please render the Blog title, and the blog posting 1, ...". That's why passing objects to the view is highly encouraged.

The view helpers are invoked by using XML tags in the template, and are implemented as PHP classes (more on that later).

This concept is best understood with an example:

Example 2.1. Tags and Namespace declarations

```
{namespace f3=F3\Fluid\ViewHelpers}#
<f3:link controller="Administration">Administration</f3:link>
```

Namespace Declaration: You import the PHP Namespace `F3\Fluid\ViewHelpers` under the prefix `f3`.[2]
Calling the *View Helper:* The `<f3:link...> ... </f3:link>` tag renders a link.

Now, the main difference between Fluid and other templating engines is how the view helpers are implemented: *For each view helper, there exists a corresponding PHP class.* Let's see how this works for the example above:

The `<f3:link />` tag is implemented in the class `\F3\Fluid\ViewHelpers\LinkViewHelper`.

The class name of such a view helper is constructed for a given tag as follows:

- The first part of the class name is the namespace which was imported (the namespace prefix f3 was expanded to its full namespace `F3\Fluid\ViewHelpers`)
- The unqualified name of the tag, without the prefix, is capitalized (`Link`), and the postfix `ViewHelper` is appended.

The tag and view helper concept is *the core concept* of Fluid. *All output logic is implemented through such ViewHelpers / Tags!* Things like `if/else`, `for`, ... are all implemented using custom tags - a main difference to other templating languages.

Some benefits of this approach are:

- You cannot override already existing view helpers by accident.
- It is very easy to write custom view helpers, which live next to the standard view helpers
- All user documentation for a view helper can be automatically generated from the annotations and code documentation. This includes Eclipse autocompletion[3]

Most view helpers have some parameters. These can be plain strings, just like in `<f3:link controller="Administration">...</f3:link>`, but as well arbitary objects. Parameters of view helpers will just be parsed with the same rules as the rest of the template, thus you can pass arrays or objects as parameters.

This is often used when adding arguments to links:

Example 2.2. Creating a link with arguments

```
<f3:link controller="Blog" action="show" arguments="{id : blogPost.id}">... read m
```

Here, the view helper will get a parameter called `arguments` which is of type array.

Warning

Make sure you *do not put a space* before or after the opening or closing brackets of an array. If you type `arguments=" {id : blogPost.id}"` (notice the space before the opening curly bracket), the array is automatically casted to a string (as a string concatenation takes place).

This also applies when using object accessors: `<f3:do.something with="{object}" />` and `<f3:do.something with=" {object}" />` are substantially different: In the first case, the view helper will receive an *object* as argument, while in the second case, it will receive a *string* as argument.

This might first seem like a bug, but actually it is just consistent that it works that way.

Arrays

Some view helpers, like the `SelectViewHelper` (which renders an HTML select dropdown box), need to get associative arrays as arguments (mapping from internal to displayed name). See the following example how this works:

```
<f3:form.select options="{edit: 'Edit item', delete: 'Delete item'}" />
```

The array syntax used here is very similar to the JSON object syntax[4]. Thus, the left side of the associative array is used as key without any parsing, and the right side can be either:

- a number

  ```
  {a : 1,
   b : 2
  }
  ```

- a string; Needs to be in either single- or double quotes. In a double-quoted string, you need to escape the " with a \ in front (and vice versa for single quoted strings).

  ```
  {a : 'Hallo',
   b : "Second string with escaped \" (double quotes) but not escaped ' (single qu
  }
  ```

- a nested array

  ```
  {a : {
      a1 : "bla1",
      a2 : "bla2"
    },
   b : "hallo"
  }
  ```

- a variable reference (=an object accessor)

  ```
  {blogTitle : blog.title,
   blogObject: blog
  }
  ```

Passing data to the view

You can pass arbitary objects to the view, using `$this->view->assign(`*`#IdentifierString`*`, `*`#Object`*`)` from within the controller. See the above paragraphs about Object Accessors for details how to use the passed data.

Layouts

In almost all web applications, there are many similarities between each page. Usually, there are common templates or menu structures which will not change for many pages.

To make this possible in Fluid, we created a layout system, which we will introduce in this section.

Writing a layout

Every layout is placed in the `Resources/Private/Layouts` directory, and has the file ending `.html`. A layout is a normal Fluid template file, except there are some parts where the actual content of the target page should be inserted.

[4]Actually, it should be the same. If not, please tell us!

Example 2.3. An example layout

```
{namespace f3=F3\Fluid\ViewHelpers}
<html>
<head><title>My fancy web application</title></head>
<body>
<div id="menu">... menu goes here ...</div>
<div id="content">
  <f3:render section="content" />
</div>
</body>
</html>
```

With this tag, a section from the target template is rendered.

Using a layout

Using a layout involves two steps:

- Declare which layout to use: `<f3:layout name="..." />` can be written anywhere on the page (though we suggest to write it on top, right after the namespace declaration) - the given name references the layout.
- Provide the content for all sections used by the layout using the `<f3:section>...</f3:section>` tag: `<f3:section name="content">...</f3:section>`

For the above layout, a minimal template would look like the following:

Example 2.4. A template for the above layout

```
{namespace f3=F3\Fluid\ViewHelpers}
<f3:layout name="example.html" />

<f3:section name="content">
This HTML here will be outputted to inside the layout
</f3:section>
```

Writing your own View Helper

As we have seen before, *all output logic resides in View Helpers*. This includes the standard control flow operators such as `if/else`, HTML forms, and much more. This is the concept which makes Fluid extremely versatile and extensible.

If you want to create a view helper which you can call from your template (as a tag), you just write a plain PHP class which needs to inherit from `F3\Fluid\Core\AbstractViewHelper` (or its subclasses). You need to implement at least two methods to write a view helper:

- `initializeArguments()`: Inside this method, you need to register all the arguments you expect the view helper to use.
- `render()`: Render the view helper and return the result (usually as string).

Initializing arguments

As previously mentioned, initializing arguments takes place inside the `initializeArguments()` method. Call `$this->registerArgument(...)` once for each argument.

See the section about the `TagBasedViewHelper` for some more possibilities.

Rendering the View Helper

We refresh what we have learned so far: When a user writes something like `<blog:displayNews />` inside a template (and has imported the "blog" namespace to `F3\Blog\ViewHelpers`), Fluid will automatically instanciate the class `F3\Blog\ViewHelpers\DisplayNewsViewHelper`, and invoke the `render()` method on it.

This `render()` method should return the rendered content as string.

You have the following possibilities to access the environment when rendering your view helper:

- `$this->arguments` is a read-only associative array where you will find the values for all arguments you registered previously.
- `$this->renderChildren()` renders everything between the opening and closing tag of the view helper and returns the rendered result (as string).
- `$this->variableContainer` is an instance of `F3\Fluid\Core\VariableContainer`, with which you have access to all variables currently available in the template.

  Additionally, you can add variables to the container with `$this->variableContainer->add($identifier, $value)`, but you have to make sure that you *remove every variable you added* again! This is a security measure against side-effects.

  It is also not possible to add a variable to the VariableContainer if a variable of the same name already exists - again to prevent side effects and scope problems.

Now, we will look at an example: How to write a view helper giving us the `foreach` functionality of PHP.[5]

[5]This view helper is already available in the standard library as `<f3:for>..</f3:for>`. We still use it as example here, as it is quite simple and shows many possibilities.

Example 2.5. Implementing a loop

A loop could be called within the template in the following way:

```
<f3:for each="{blogPosts}" as="blogPost">
  <h2>{blogPost.title}</h2>
</f3:for>
```

So, in words, what should the loop do?

It needs two arguments:

- `each`: Will be set to some *object*[6] which can be iterated over.
- `as`: The *name* of a variable which will contain the current element being iterated over

It then should do the following (in pseudocode):

```
foreach ($each as $$as) {
  // render everything between opening and closing tag
}
```

Implementing this is fairly straightforward, as you will see right now:

```
public function render() {
  $out = '';
  foreach ($this->arguments['each'] as $singleElement) {
    $this->variableContainer->add($this->arguments['as'], $singleElement);
    $out .= $this->renderChildren();
    $this->variableContainer->remove($this->arguments['as']);
  }
  return $out;
}
```

The above example demonstrates how we add a variable, render all children (everything between the opening and closing tag), and remove the variable again to prevent side-effects.

Sometimes, the above possibilities to interact with the environment are not enough - that is where facets come into play.

TagBasedViewHelper

Many view helpers output an HTML tag - for example `<f3:link ...> outputs` a `<a href="...">` tag. There are many view helpers which work that way.

Very often, you want to add a CSS class or a target attribute to an `<a href="...">` tag. This often leads to repetitive code like below. (Don't look at the code too thoroughly, it should just demonstrate the boring and repetitive task one would have without the TagBasedViewHelper).

```
class LinkViewHelper extends \F3\Fluid\Core\AbstractViewHelper {
  public function initializeArguments() {
    $this->registerArgument('class', 'string', 'CSS class to add to the link');
    $this->registerArgument('target', 'string', 'Target for the link');
    ... and more ...
  }
  public function render() {
    $output = '<a href="..."';
    if ($this->arguments['class']) {
      $output .= ' class="' . $this->arguments['class'] . '"';
    }
    if ($this->arguments['target']) {
      $output .= ' target="' . $this->arguments['target'] . '"';
    }
    $output .= '>';
    ... and more ...
    return $output;
  }
}
```

Now, the TagBasedViewHelper introduces two more methods you can use inside `initializeArguments()`:

- `registerTagAttribute($name, $description, $required)`: Use this method to register an attribute which should be directly added to the tag
- `registerUniversalTagAttributes()`: If called, registers the standard HTML attributes (class, id, dir, lang, style, title).

It also adds a method called `renderTagAttributes()` which you can use inside `render()`, which will add all the `tagname="tagvalue"`-style attributes to the tag.

With the above methods we get, the `LinkViewHelper` from above can be condensed as follows:

```
class LinkViewHelper extends \F3\Fluid\Core\AbstractViewHelper {
  public function initializeArguments() {
    $this->registerUniversalTagAttributes();
    ... and more ...
  }
  public function render() {
    $output = '<a href="..."' . $this->renderTagAttributes() . '>';
    ... and more ...
    return $output;
  }
}
```

Additionally, we now already have support for all universal HTML attributes.

You might now think that the building blocks are ready, but there is one more nice thing to add: `additionalTagArguments`! Read about it in the next section.

additionalArguments

Sometimes, you need some HTML attributes which are not part of the standard. As an example: if you use the Dojo JavaScript framework, using these non-standard attributes makes life a lot easier.[7]We think that the templating framework should not constrain the user in his possibilities - thus, it should be possible to add custom HTML attributes as well, if they are needed (People who have already worked with JSP know that it can be difficult to archive this). Our solution looks as follows:

Every view helper which inherits from `TagBasedViewHelper` has a special property called `additionalArguments` which allows you to add arbitary HTML attributes to the tag.

`additionalArguments` should be an associative array, where the key is the name of the HTML attribute.

If the link tag from above needed a new attribute called `fadeDuration`, which is not part of HTML, you could do that as follows:

```
<f3:link ... additionalArguments="{fadeDuration : 800}">Link with fadeDuration set
```

[7]There are always some religious discussions whether to allow non-standard attributes or not. People being against it argue that it "pollutes" HTML, and makes it not validate anymore. More pragmatic people see some benefits to custom attributes in some contexts: If you use JavaScript to evaluate them, they will be ignored by the rendering engine if JavaScript is switched off, and can enable special behavior when JavaScript is turned on. Thus, they can make it easy to provide degradable interfaces.

(Before bashing Dojo now: Of course you do not *need* the additional HTML arguments, but they make work with it a lot more comfortable)

This attribute is available in all tags that inherit from `F3\Fluid\Core\TagBasedViewHelper`.

TODO: Rename to additionalAttributes??

Facets

The possibilities you get when you base your view helper on `F3\Fluid\Core\AbstractViewHelper` should be enough for most use cases - however, there are some cases when the view helper needs to interact in a special way with its surroundings - an example is the "if/else" view helper group.

If a view helper needs to know more about its surroundings, it has to implement a certain facet. Facets are plain PHP interfaces.

SubNodeAccess Facet

Sometimes, a view helper needs direct access to its child nodes - as it does not want to render all of its children, but only a subset. For this to work the `SubNodeAccessInterface` has been introduced.

Let's take if/then/else as an example and start with two examples how this view helper is supposed to work:

```
<f3:if condition="...">
   This text should only be rendered if the condition evaluates to TRUE.
</f3:if>
```

This above case is the most simple case. However, we want to support if/else as well:

```
<f3:if condition="...">
   <f3:then>If condition evaluated to TRUE, "then" should be rendered</f3:then>
   <f3:else>If condition evaluated to FALSE, "else" should be rendered</f3:else>
</f3:if>
```

To implement the functionality of the `<f3:if>` view helper, a standard `$this->renderChildren()` will not be sufficent, as the `if`-Tag has no control whether the `<f3:then>` or `<f3:else>` is rendered. Thus, the `<f3:if>` tag needs more information about its environment, namely it needs access to its subnodes in the syntax tree.

To make this work, the `<f3:if>`-tag implements the `F3\Fluid\Core\Facets\SubNodeAccessInterface`. Now, the method `setChildren(array $childNodes)` (defined in the interface) will be called before the `render()` method is invoked. Thus, the view helper has all of its subnodes directly available in the `render()` method and can decide which subnodes it will render based on arbitary conditions.

PostParse Facet

Standard View Helper Library

Should be autogenerated from the tags.

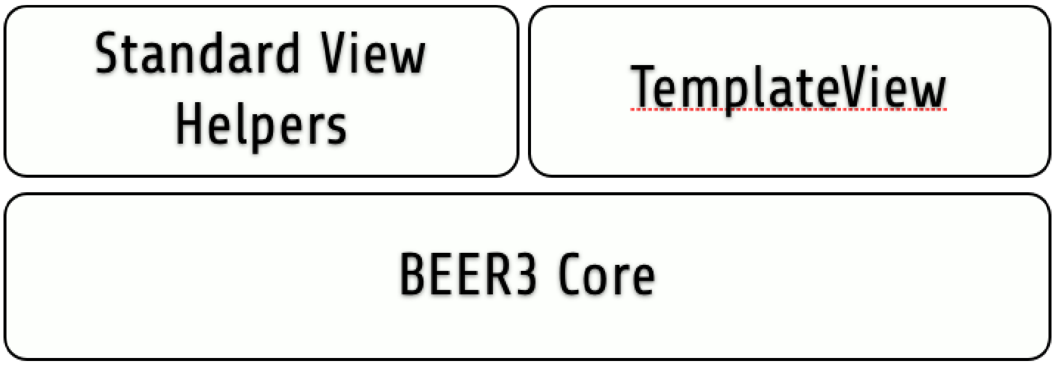
Chapter 3. Software Design

This chapter will explain some of the inner workings of Fluid. It is meant for people who want to help developing Fluid, and understand the inner workings of it.

Design Decisions

Fluid was born in the context of FLOW3, but from the beginning, we saw the needs for such a templating system in other contexts - namely TYPO3 v4, or stand-alone usage. That's why the core design of Fluid reflects this thinking.

We are using a layered architecture for Fluid, shown below:



Fluid Core consists of the parts which do not change depending on the environment, such as the template parser.

The upper layer, consisting of the Standard View Helpers and the TemplateView, are currently FLOW3-specific, but there will be separate layers for different contexts (like TYPO3 v4) which provide standard view helpers adjusted to the different platforms, different Fluid initialization code, etc.

The Core

Fluid Core consists of the following components:

- The TemplateParser, which takes a template file and builds up a syntax tree from it.
- The Syntax Tree Elements (which have logic inside them as well)
- The AbstractViewHelper, being the base class for all view helpers.

Rendering a template always involves two steps:

- Call the `parse` method in the `TemplateParser` class, which will return a SyntaxTree. This Syntax Tree will be cached in the future.
- The SyntaxTree is implemented using a *Composite* design pattern, with all syntax tree nodes extending `\F3\Fluid\Core\SyntaxTree\AbstractNode`.
- Call the `render(\F3\Fluid\Core\VariableContainer $variableContainer)` method. This method needs a `VariableContainer` as argument - this means all bound variables which should be rendered.
- The result of the render() method is the output string.

The upper layers for FLOW3

Chapter 4. Lorem Ipsum

- Technical information; Installation, Reference of TypoScript, configuration options on system level, how to extend it, the technical details, how to debug it.
- Language should be technical, assuming developer knowledge of FLOW3. Small examples/visuals are always encouraged.
- Target group: Developers

Chapter 5. Lorem ipsum

A full point-a-to-b-to-c walk-through of an application of the package. Include screenshots.