

24. Framework Documentation

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Design Patterns and Frameworks, © Prof. Uwe Aßmann

Obligatory Literature

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- ▶ Claas Wilke, Andreas Bartho, Julia Schroeter, Sven Karol, and Uwe Aßmann. Elucidative development for model-based documentation. In Carlo Furia and Sebastian Nanz, editors, Objects, Models, Components, Patterns – 50th International Conference, TOOLS, volume 7304 of Lecture Notes in Computer Science, pages 320-335. Springer Berlin / Heidelberg, 2012.
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- ▶ Andreas Bartho. Creating and Maintaining Tutorials with DEFT. ICPC 2009
- ▶ T. Vestdam. Generating Consistent Program Tutorials. Technical Report, University of Aalborg, Denmark.
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Problem: How to Document a Framework?

- ▶ Framework understanding is hampered by many problems
 - Good documentation should help to solve them
 - Good framework contracts will help (trustworthy instantiation)
 - Good extension languages will help (framework composition)
- ▶ Lack of knowledge of domain of the framework
 - Unknown mapping between domain concepts and framework classes
 - Often not 1:1, but n:m mappings
- ▶ Unknown framework functionality
 - Does this framework fit?
- ▶ Lack of knowledge of the architecture of the framework
 - Framework integrity is related
 - Lack of knowledge of interactions between framework classes
 - Impact of instantiations cannot be estimated
 - Multiple solutions possible with the framework
 - Technical problems (platform knowledge, ..)

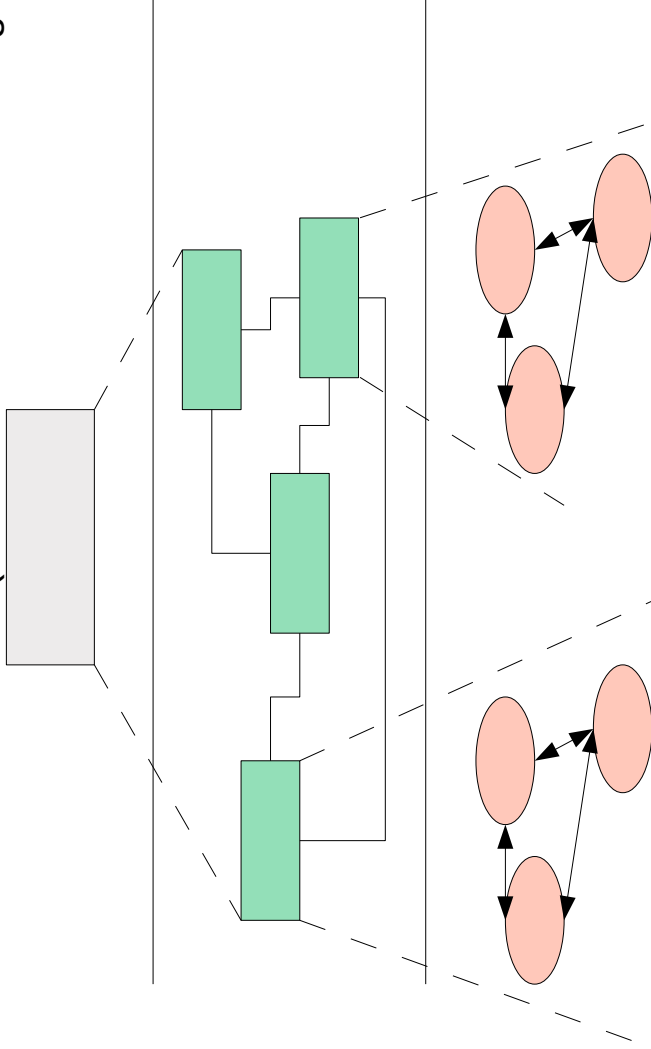
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The Pyramid Principle

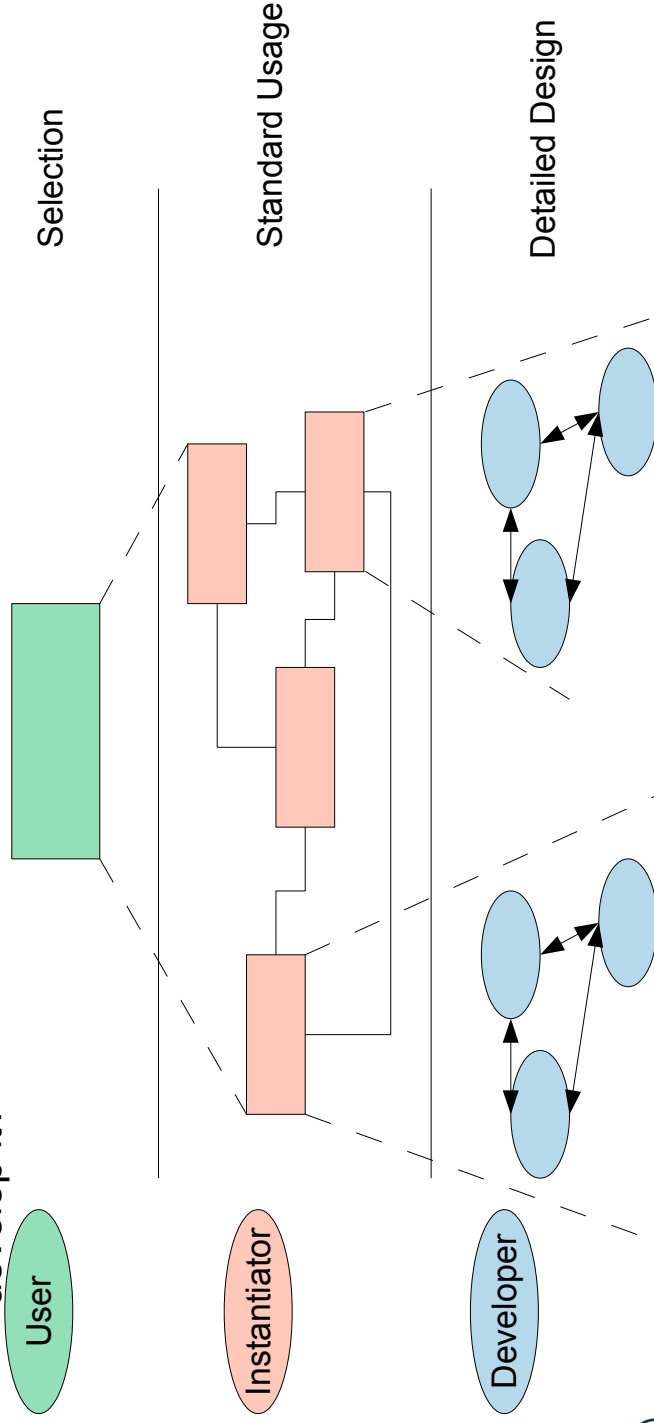
- ▶ Documents (also documentation) should consist of several *abstraction levels*

- ▶ A top node is refined into lower levels [Minto]
- ▶ A *reducible structure* results (see course Softwaretechnologie-II)



The Pyramid Principle in Framework Documentation

- ▶ Framework Selection: Does the framework address my problem?
- ▶ Framework Standard Usage: How to use it?
- ▶ Framework Detailed Design: How does it work? How to further develop it?



Level 1: Framework Selection Sheet

- ▶ Basically a short description (fact sheet), comparable to a Linux LSM:
 - **Name:** EMF (Eclipse Modelling Framework)
 - **Keywords:** modelling, editor, development environment, UML
 - **Problem description (application domain):** EMF facilitates the construction of graphic editors, providing basic functionality for diagrams, nodes, edges, including the workspace of an IDE
 - **Solution (features, design concepts):** EMF is an extensible framework, and itself an Eclipse plugin
 - **Examples (typical applications):** UML-EMF application
 - **Other related frameworks:** JDT (Java Development Tools)

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Level 2: Standard Use Cases with Application Patterns

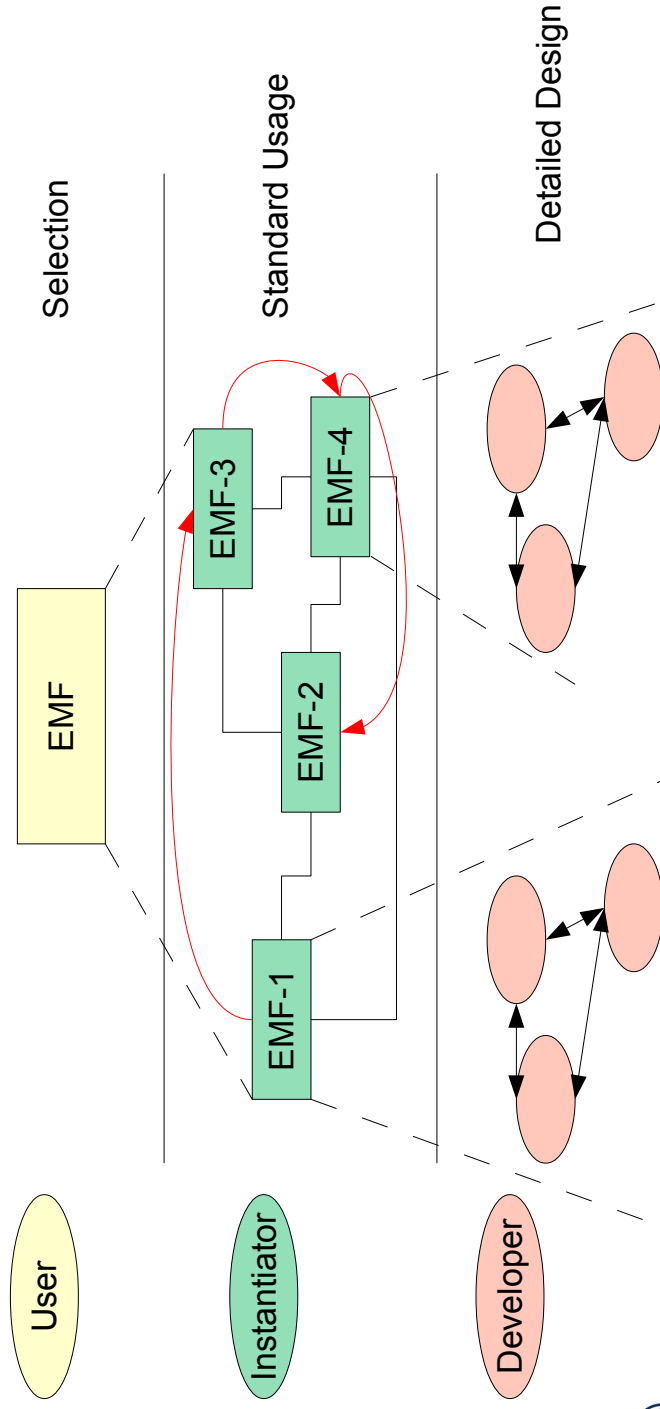
- ▶ An *application pattern* is a standard usage pattern (use case) of a framework
- ▶ Example:
 - **Name:** EMF-1
 - **Short Description:** “Creating a Petri-Net Editor”
 - **Context:** “EMF is the eclipse-based modelling framework, which can be tailored towards more specific editors”
 - **Problem:** How can I draw a Petri-Net?
 - **Instantiation Explanation (Solution Explanation)**
 - This can be a petri net, statechart, activity diagram, or flowchart to describe the framework instantiation process. Description step by step:
 - “1) write a plugin.xml file
 - 2) write a Java Plugin class and name it in the plugin.xml
 - 3) describe the extended extension points in the plugin.xml
 - 4) load the .jar file into the eclipse plugin directory”
 - **Instantiation Chart (Instantiation Solution):** <<a chart showing the process>>
 - **Example applications:** PN Editor
 - **Design information:** << info about extension points, extended points>>
 - And many more.

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Application Pattern Documentation is Threaded

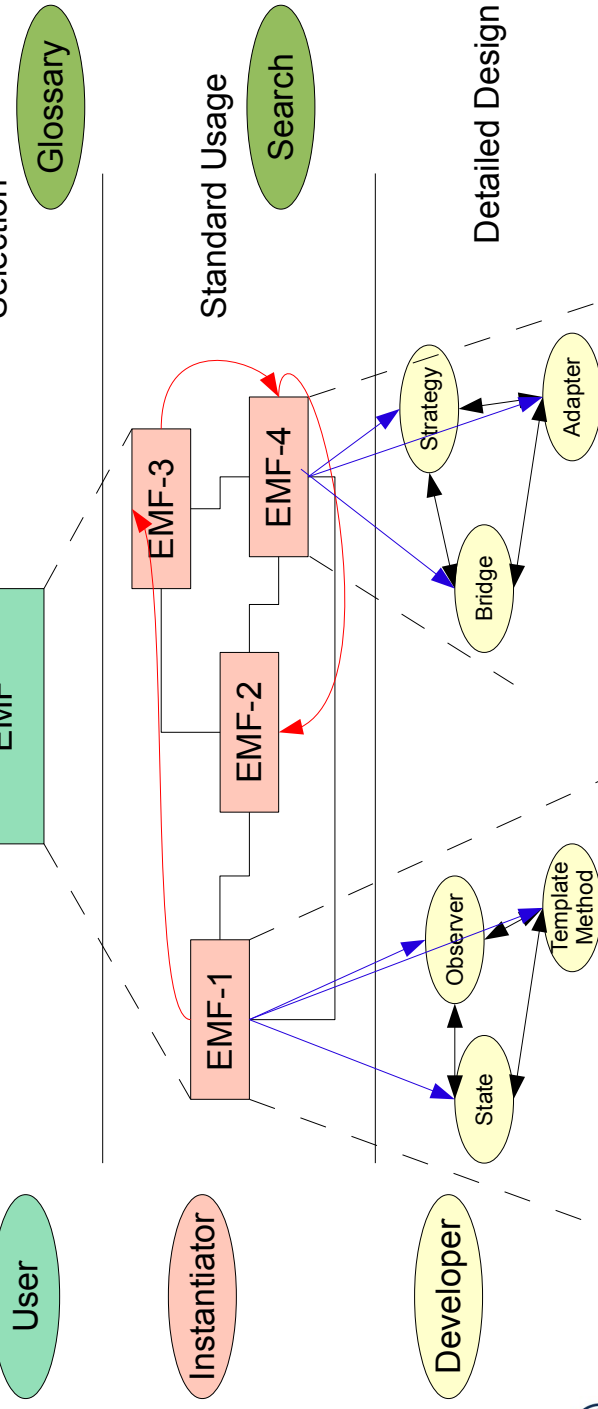
- ▶ For a tutorial, the application patterns will be **threaded**



Third Level: Detailed Design

- ▶ On this level, the framework is documented by
 - Design patterns within the framework
 - Design patterns at the border of the framework (framework hook patterns)

- ▶ Additionally, a glossary and search engine can be provided



Realization with Elucidative Programming

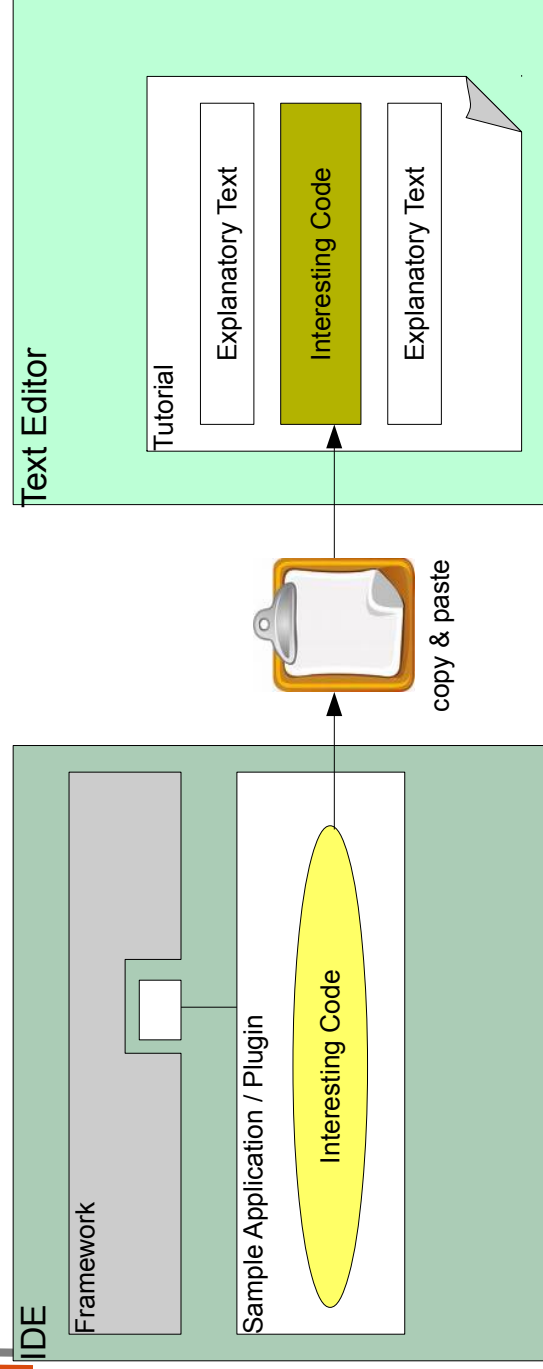
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- ▶ **Elucidative programming** is programming by example
 - Basically cross-linked implementation documentation
 - Better form of literate programming (non-linear, but hypertext)
- ▶ 2 screens
 - Left: documentation
 - Right: source code
- ▶ A markup language marks up source code and puts fragments into the documentation
 - Crosslinking between source and documentation possible
- ▶ Documentation threads (as required for tutorials on level 2)
- ▶ Tools
 - Java elucidator <http://elucidator.sf.net>
 - Scheme elucidator
 - DocSewer tools for tutorial threads
 - DEFT <http://deftproject.org>



Tutorial Creation – Conventional Approach

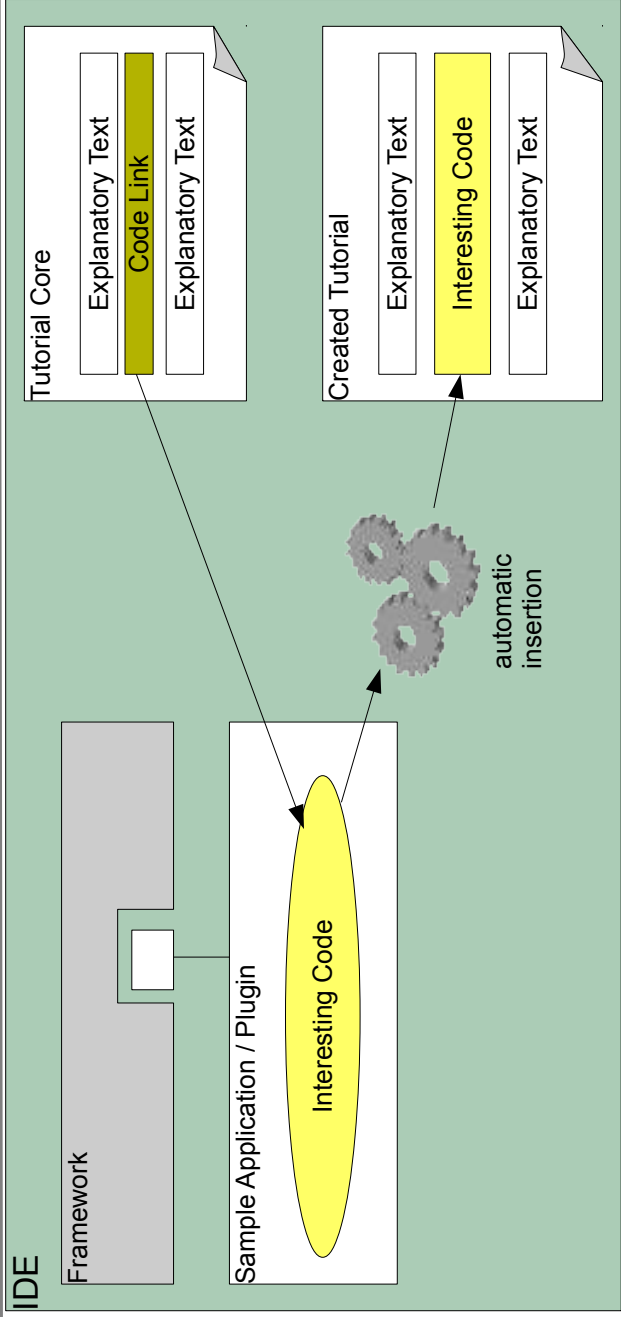
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- ▶ Framework and Sample Plugin can be developed side by side
- ▶ Tutorial is detached and needs special treatment
 - code fragments are copied manually
 - documented code fragments can become inconsistent when framework and Sample Plugin evolve



Solution - Tutorial Generation Environment



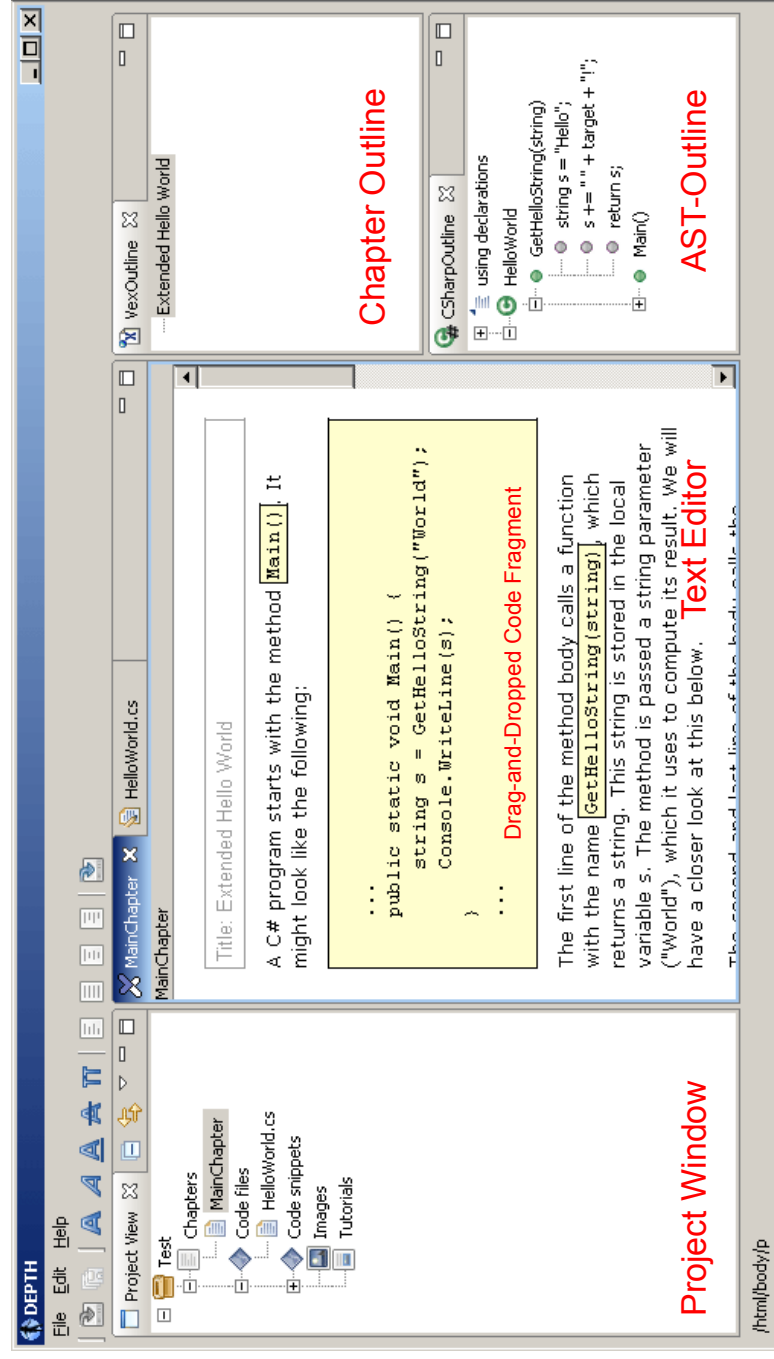
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▶ Tutorial can be developed along with Framework and Sample Application

- code not included directly, only linked
- automatic tutorial update when original code changes

Documenting HelloWorld with DEFT (Development Env. for Tutorials)

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Documenting HelloWorld

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- ▶ write explanatory text
- ▶ embed code fragments via drag&drop
- ▶ set different styles for code fragments
 - code snippets
 - in-line fragments for variable-/method names
- ▶ select output format (HTML, PDF, ...)
- ▶ compile tutorial to output format



HTML Output

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...
`public static void Main() {
string s = GetHelloString("World");
Console.WriteLine(s);
}`
Code Fragment

The first line of the method body calls a function with the name `GetHelloString(string)`, which returns a string. This string is stored in the local variable `s`. The method is passed a string parameter ("World"), which it uses to compute its result. We will have a closer look at this below.

The second and last line of the body calls the method `Console.WriteLine(string)`, which is predefined in the C#

Complete Source Code

```
using System;  
public class HelloWorld {  
static string GetHelloString(string target) {  
string s = "Hello";  
s += " " + target + "!";  
return s;  
}  
public static void Main() {  
string s = GetHelloString("World");  
Console.WriteLine(s);  
}  
}
```



The End

