24. Framework Documentation

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Obligatory Literature

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  - http://link.springer.com/chapter/10.1007/978-3-642-30561-0_22
- Ralph E. Johnson. Documenting frameworks using patterns. In Proceedings OOPSLA '92, volume 27, pages 63-76, October 1992.

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- G. Jimenz-Diaz, M. Gomez-Albarran. A Case-Based Approach for Teaching Frameworks.
- 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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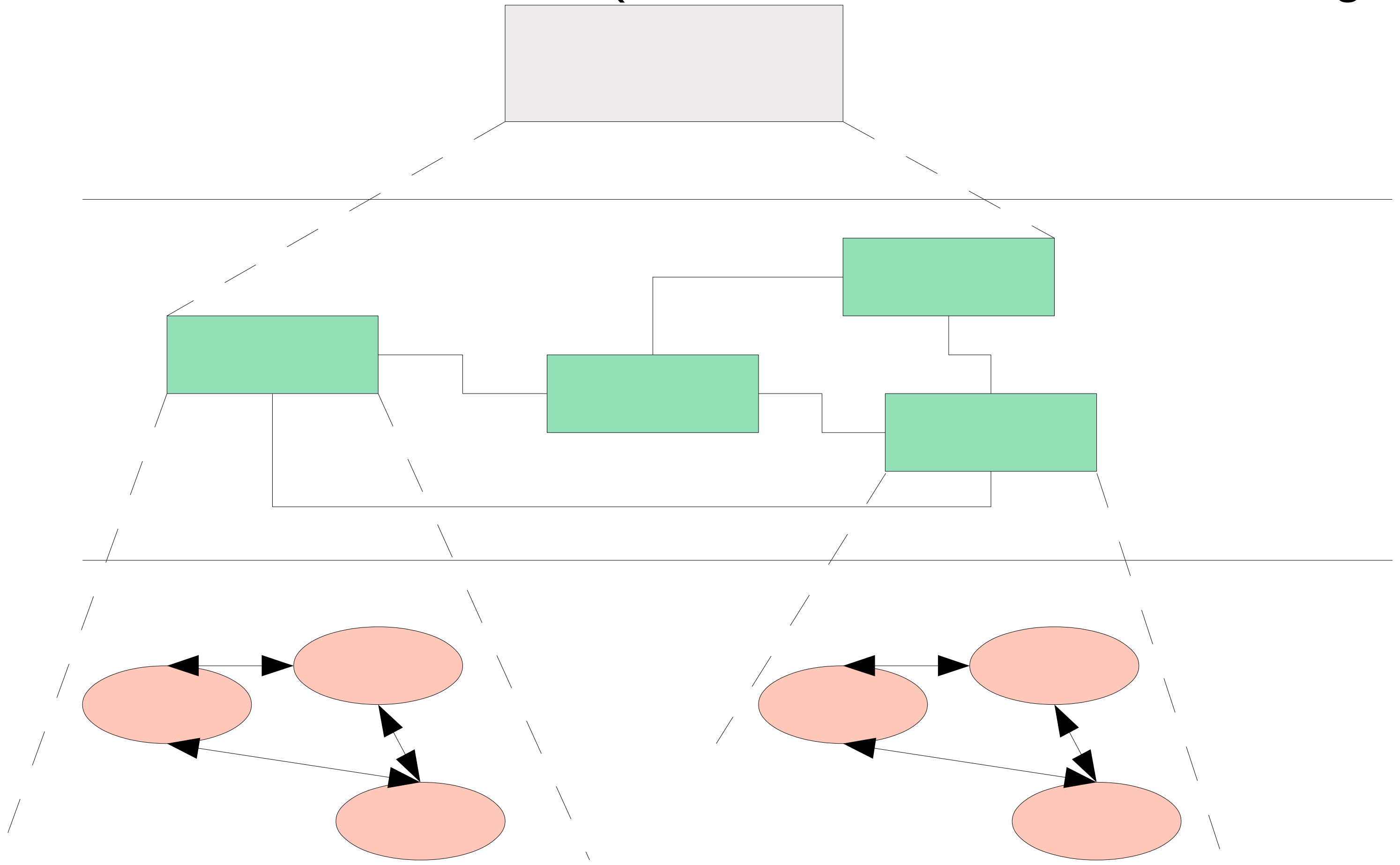
- T. Vestdam. Contributions to Elucidative Programming. PhD thesis, January 2003, University of Aalborg, Denmark.

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, ..)

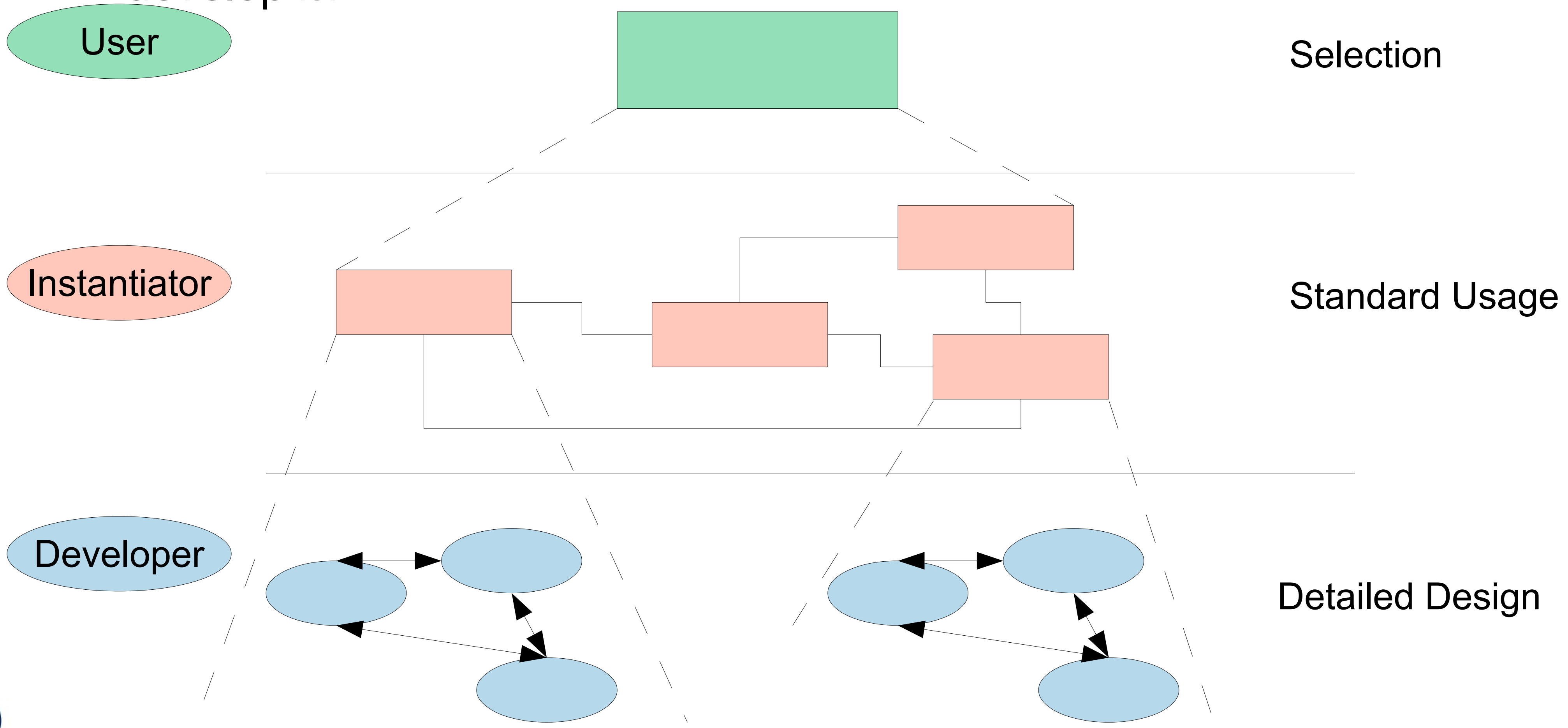
The Pyramid Principle

- 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

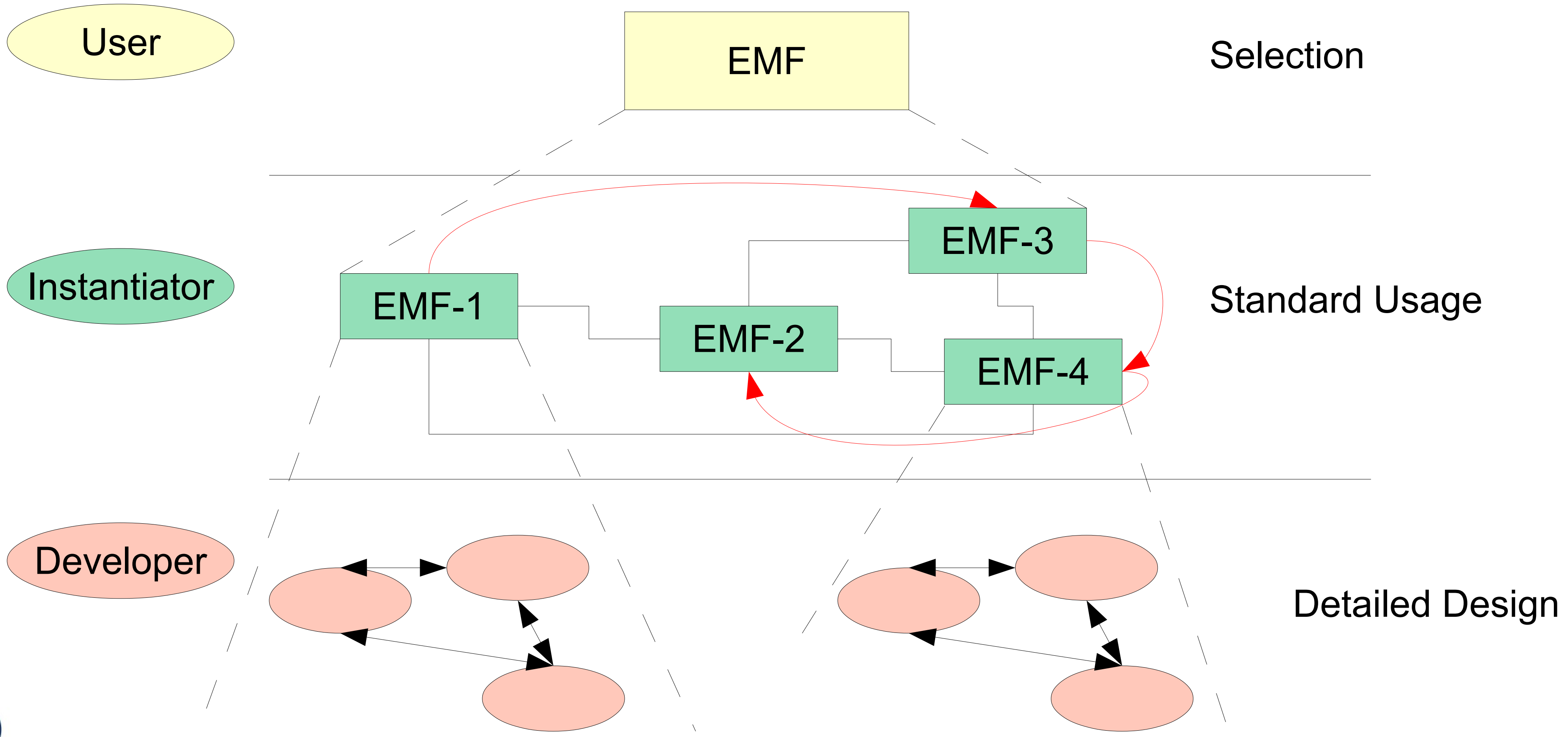
- Basically a short description (fact sheet), comparable to a Linux LSM:
  - **Name**: EMF (Eclipse Modelling Framework)
  - **Keywords**: modelling, editor, development environment, UML
  - **Problem description (application domain)**: EMF facilitates the construction of graphic editors, providing basic 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)

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.

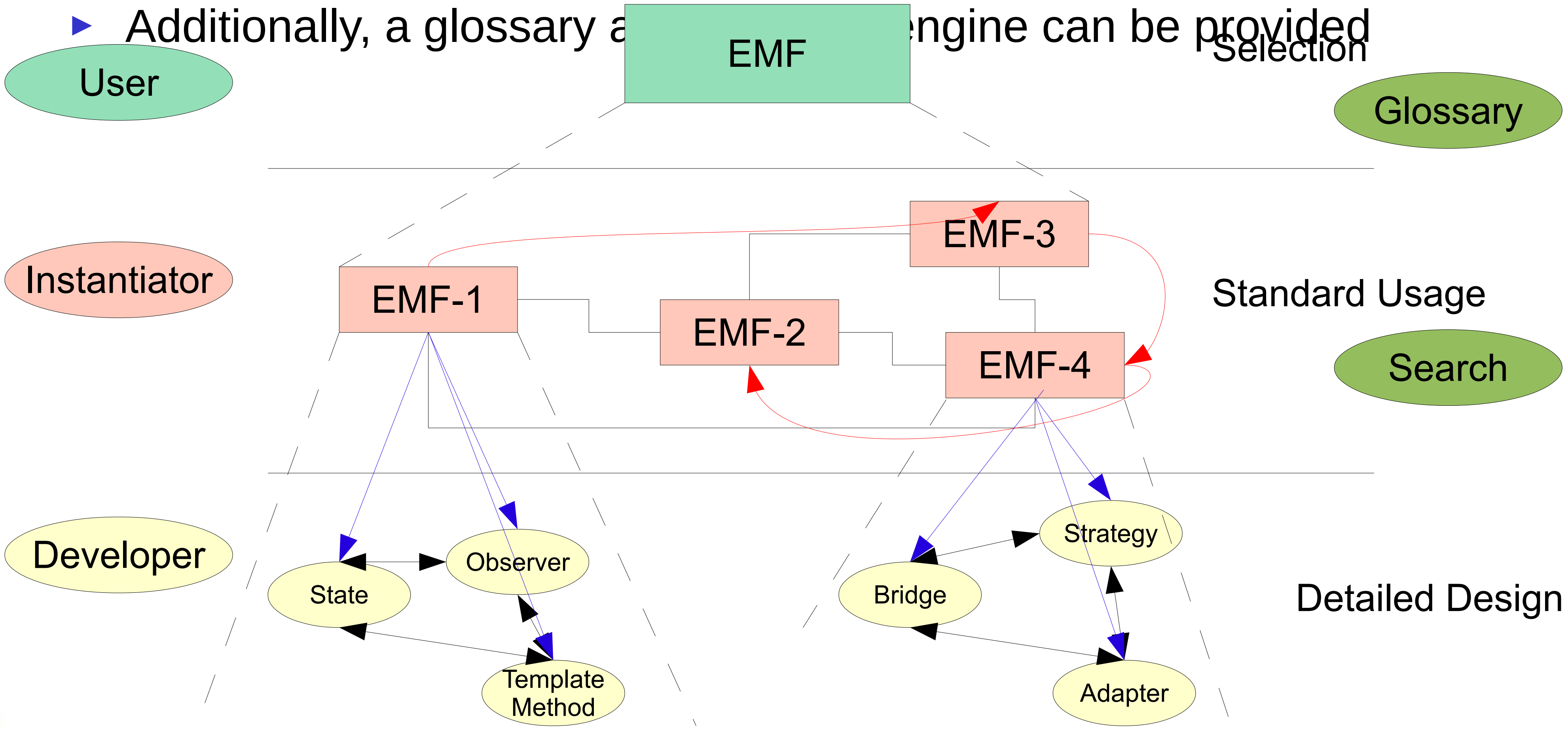
Application Pattern Documentation is Threaded

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



Third Level: Detailed Design

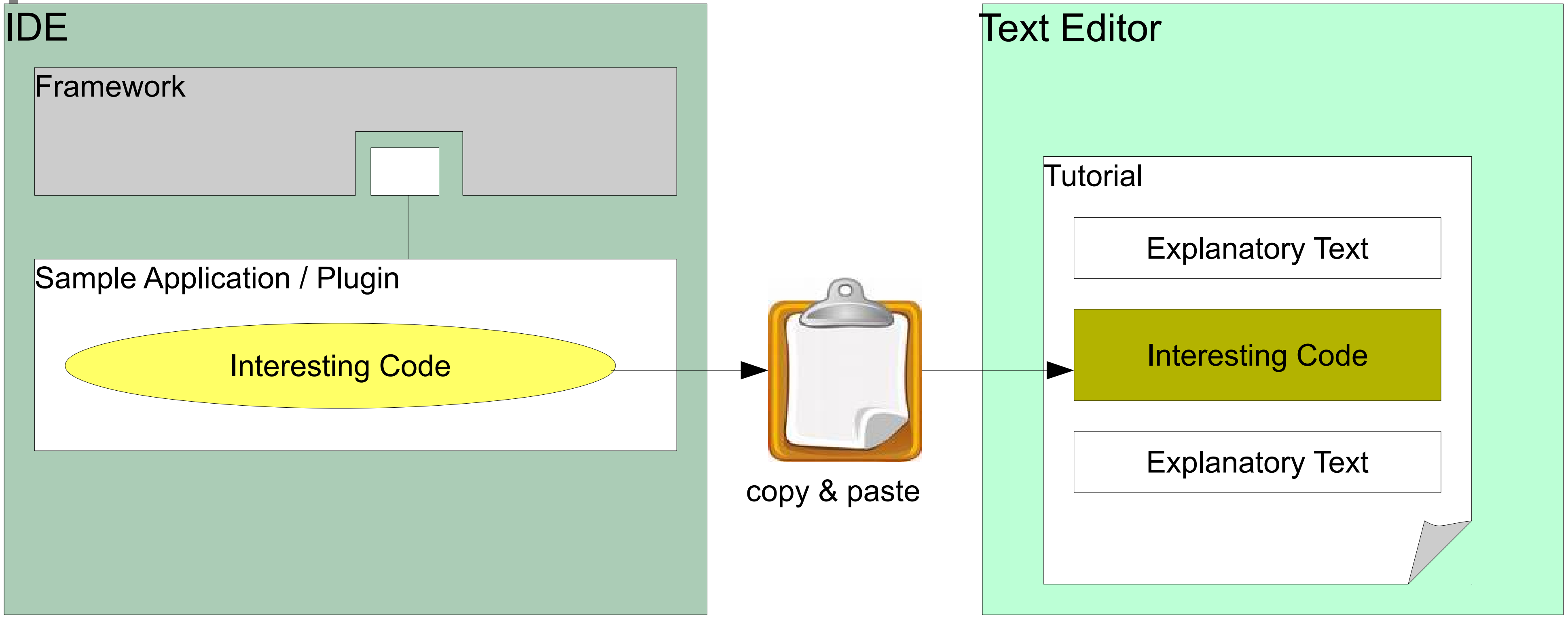
- On this level, the framework is documented by
  - Design patterns within the framework
  - Design patterns at the border of the framework (framework hook patterns)
- Additionally, a glossary and search engine can be provided



Realization with Elucidative Programming

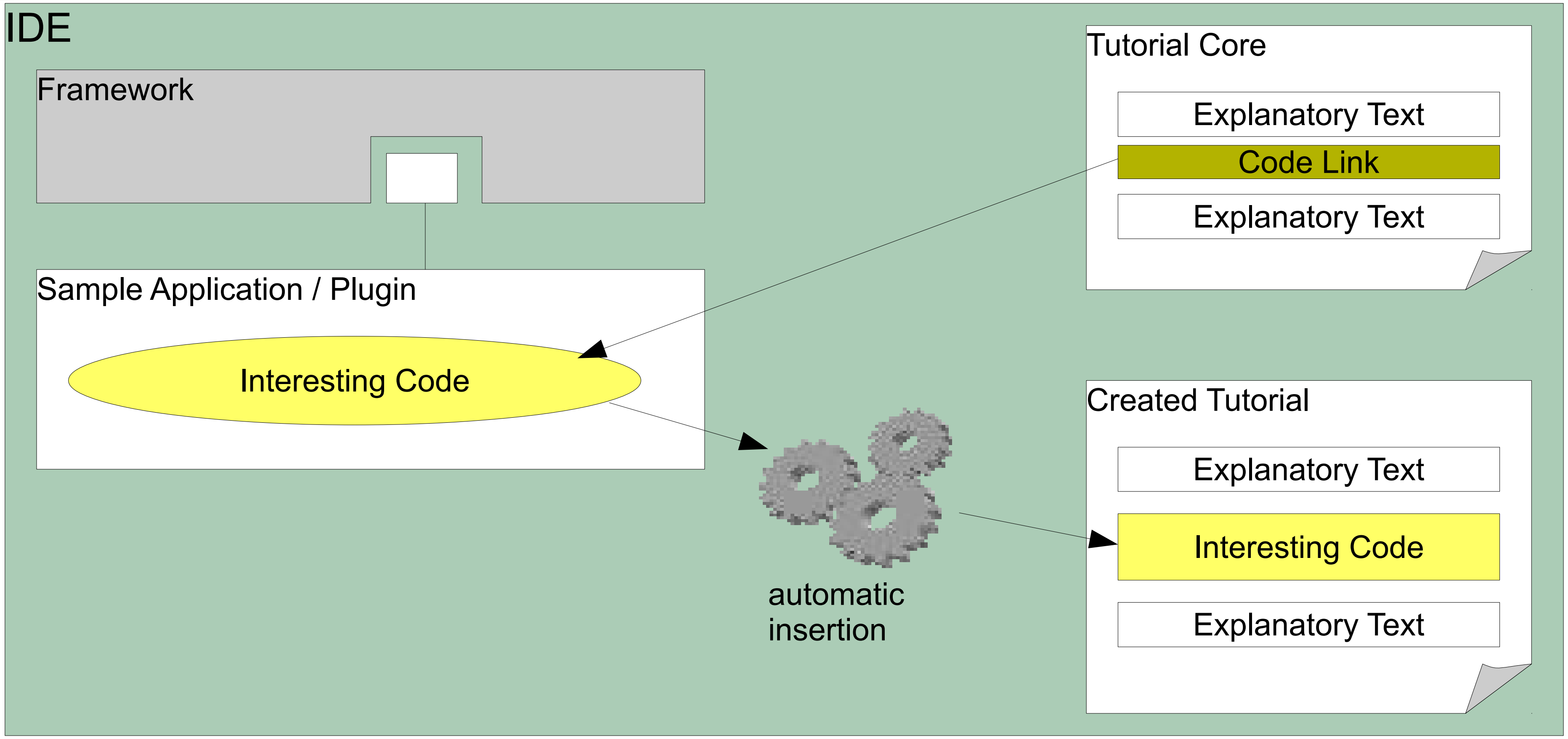
- **Elucidative programming** is programming by example
  - Basically cross-linked implementation documentation
  - Better form of literate programming (non-linear, but hypertext)
- 2 screens
  - Left: documentation
  - Right: source code
- A markup language marks up source code and puts fragments into 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



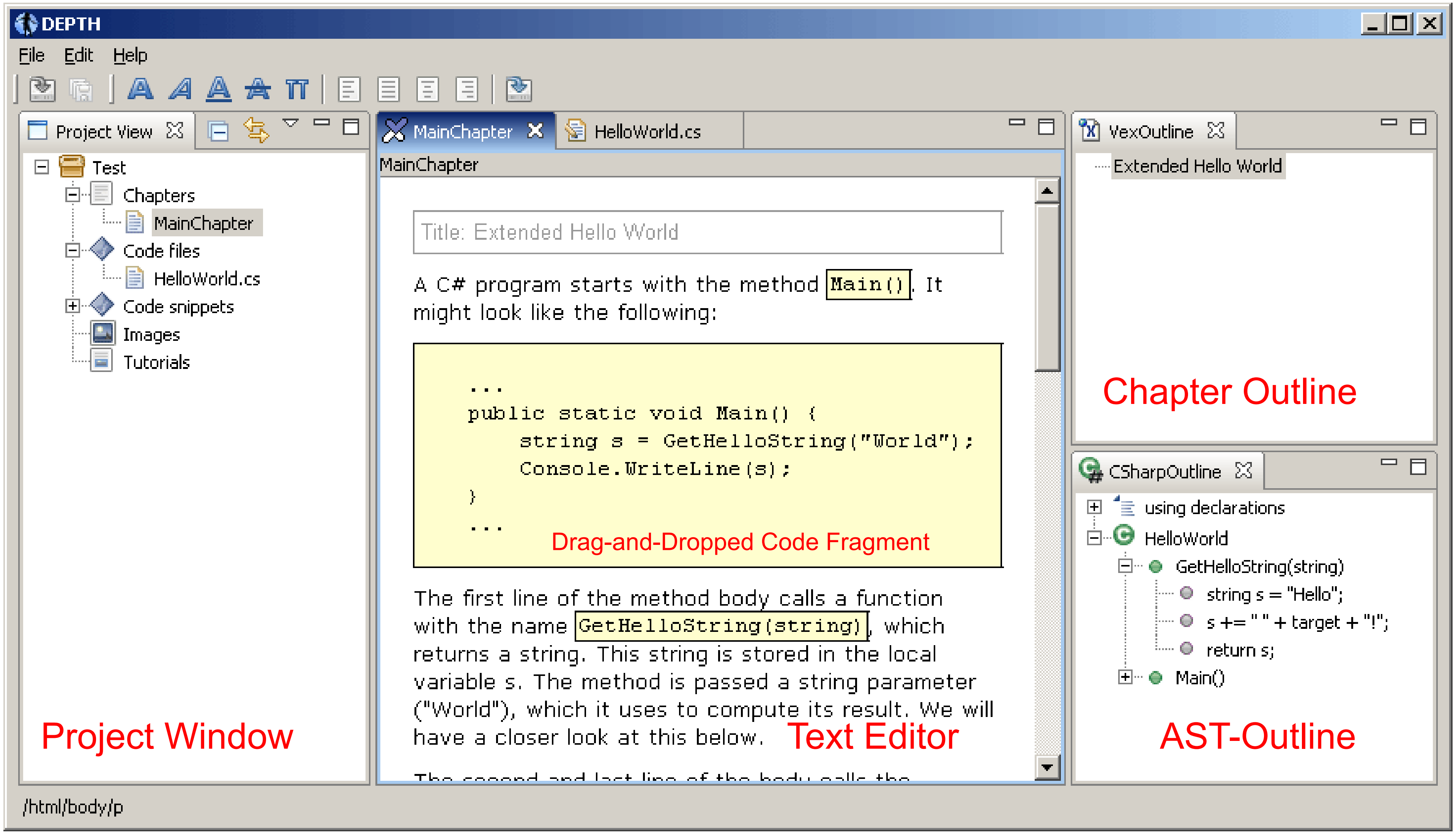
- Framework and Sample Plugin can be developed side by side
- Tutorial is detached and needs special treatment
  - code fragments are copied manually
  - documented code fragments can become inconsistent when framework and Sample Plugin evolve

Solution - Tutorial Generation Environment



- 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)



MainChapter

Title: Extended Hello World

A C# program starts with the method `Main()`. It might look like the following:

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

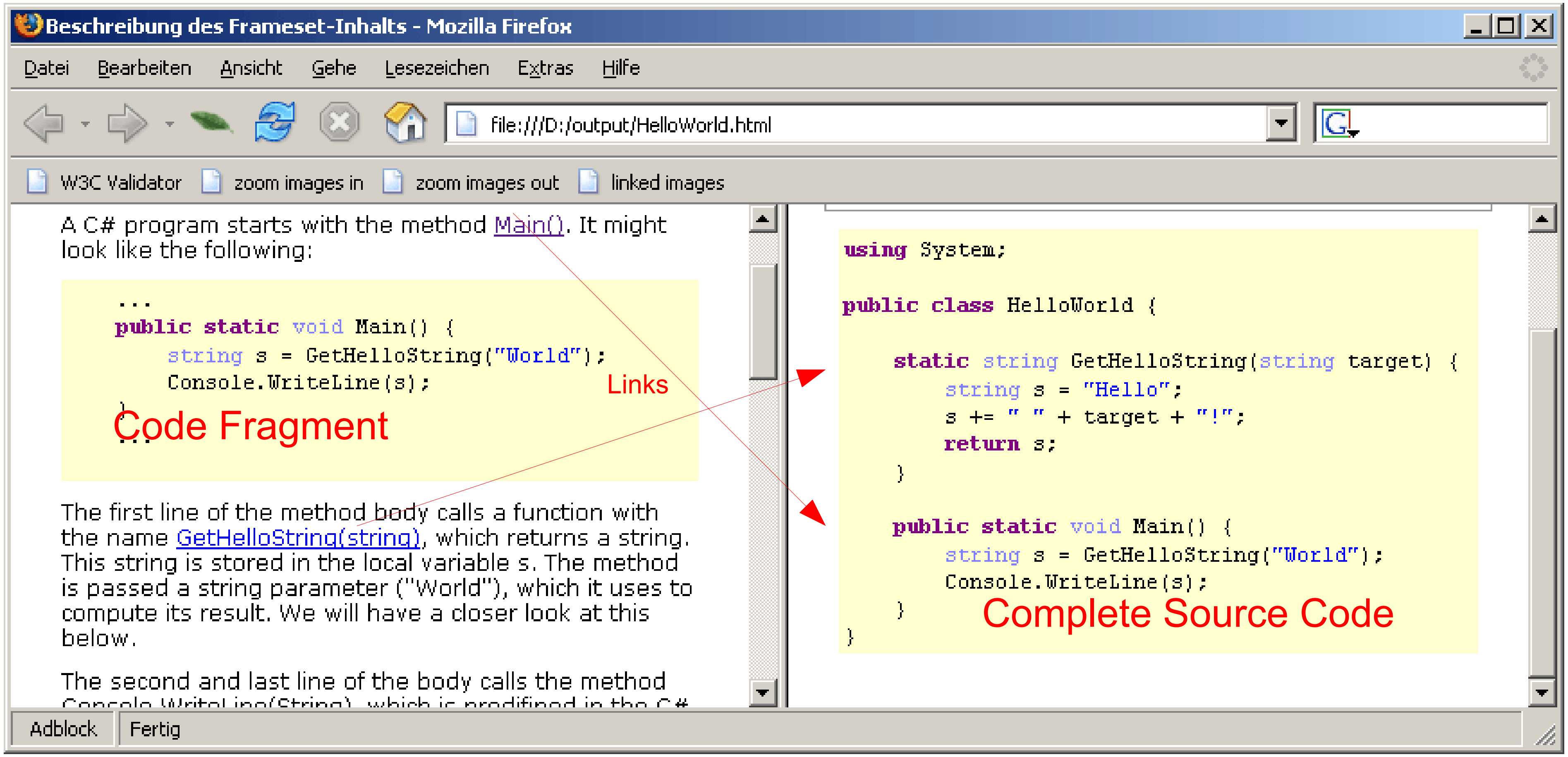
The first line of the method body calls a function with the name `GetHelloString(string)`, which returns a string. This string is stored in the local variable s. The method is passed a string parameter ("World"), which it uses to compute its result. We will have a closer look at this below.

- http://deftproject.org

Documenting HelloWorld

- 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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Datei Bearbeiten Ansicht Gehe Lesezeichen Extras Hilfe
file:///D:/output/HelloWorld.html
W3C Validator
zoom images in
zoom images out
linked images
Links
Code Fragment
Complete Source Code
Adblock
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The second and last line of the body calls the method

```
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