Saxonia Systems
So geht Software.

CLEAN CODE AM BEISPIEL

Der Sprecher

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Coach

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Just-About.Net

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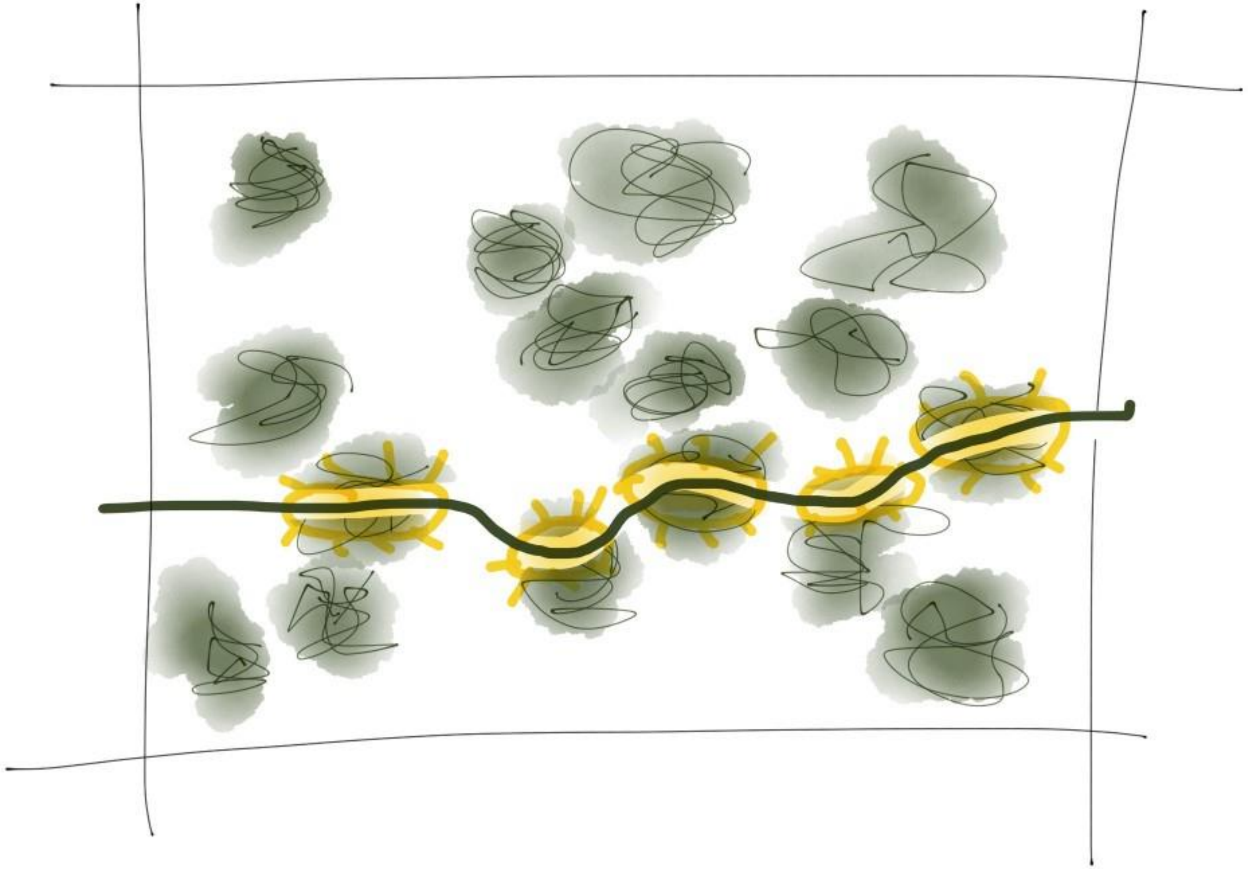
Technische Schuld



Quelle: Ron Jeffries http://xprogramming.com/articles/refactoring-not-on-the-backlog

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Clean Code am Beispiel

CODE STIL & LESBARKEIT

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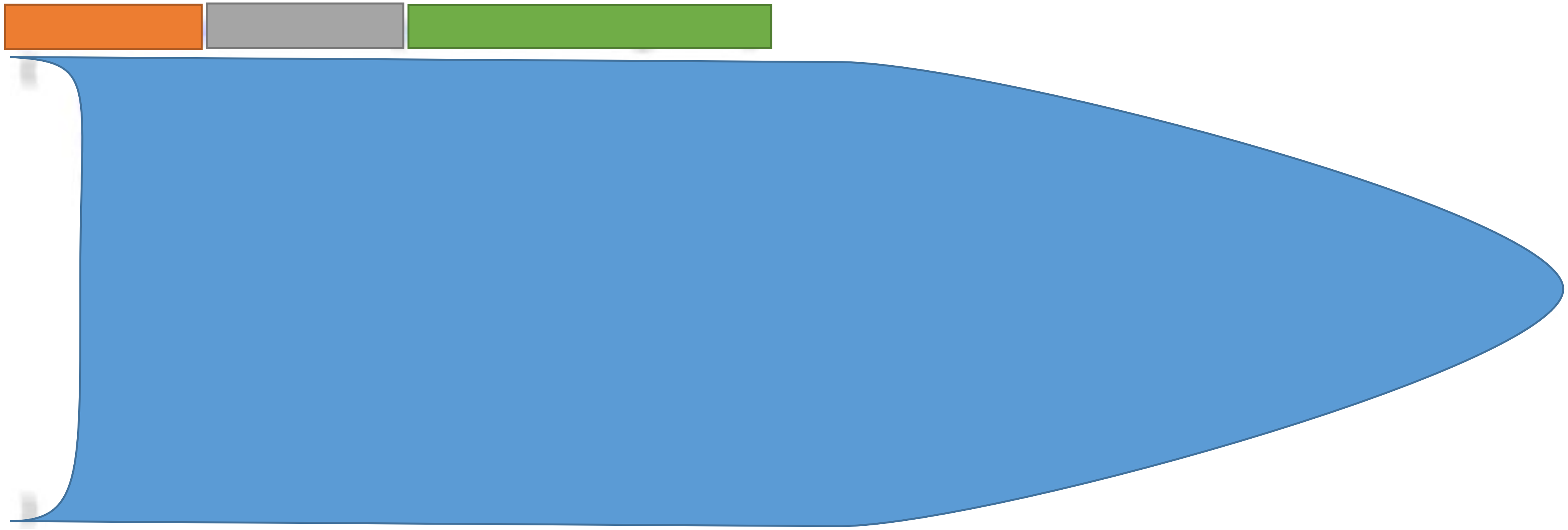
Lesbarkeit & Code Stil

Gmäes enia Shutidce ebneir älgnihcesn Uveinihnstert ißt es nchit whcitich, (…)

Gmäeß eneir Sutide eneir elgnihcesn Uvinisterät ist es nchit witihcg, (…)

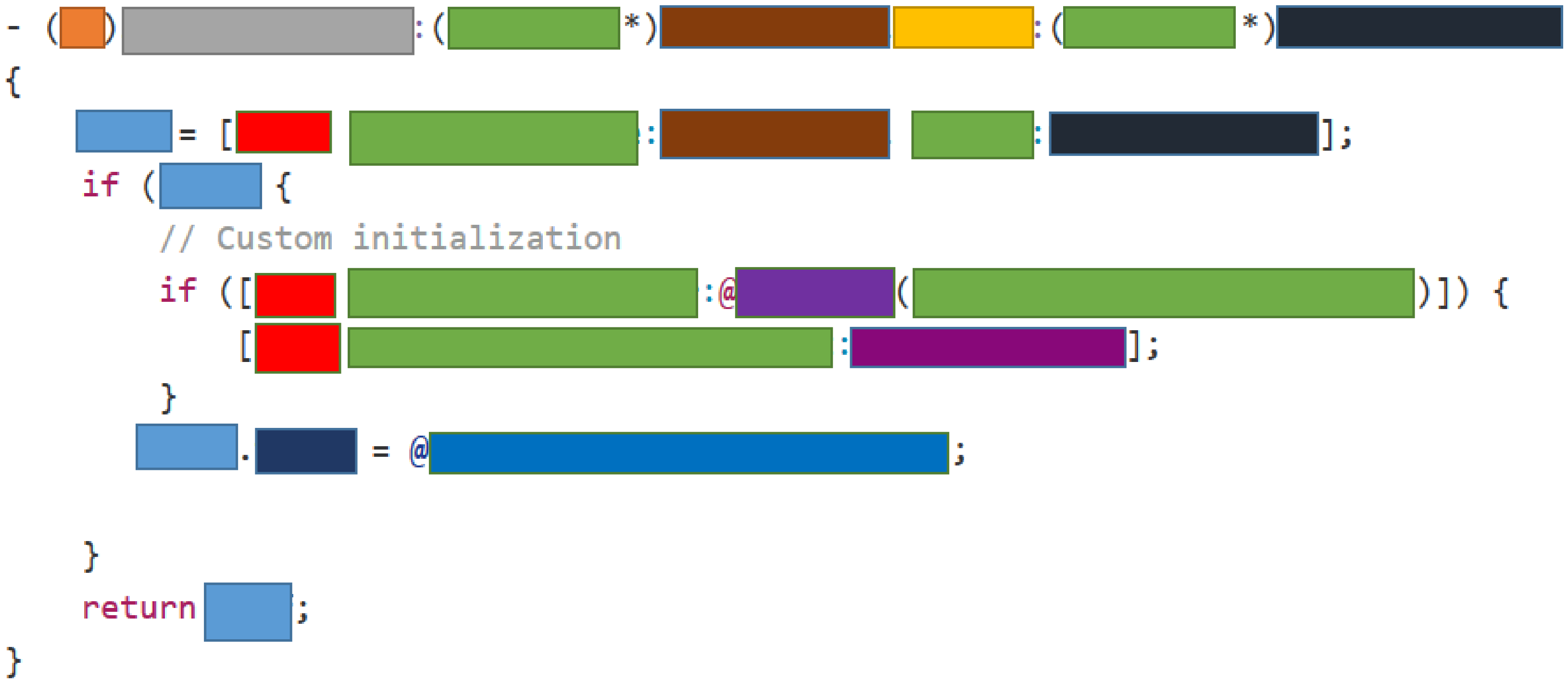
Quelle: http://www.fehler-haft.de/wissen/buchstabensalat.html

Lesbarkeit & Code Stil



Quelle: Johannes Hofmeister, http://empathic.herokuapp.com

Lesbarkeit & Code Stil



```
- (🟧)⬜:(🟩*)🟫🟨:(🟩*)⬛
{
    🟦 = [🟥 🟩:🟫 🟩:⬛];
    if (🟦 {
        // Custom initialization
        if ([🟥 🟩:@🟪(🟩)]) {
            [🟥 🟩:🟪];
        }
        🟦.⬛ = @🟦;

    }
    return 🟦;
}
```

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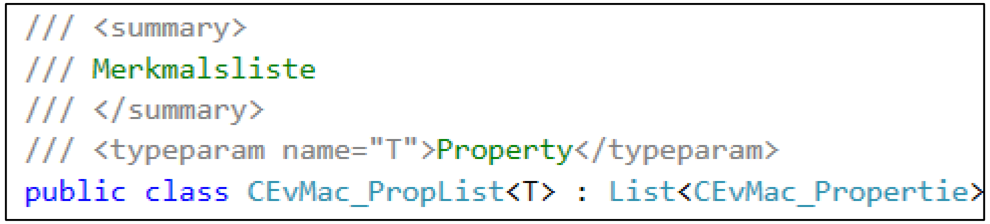
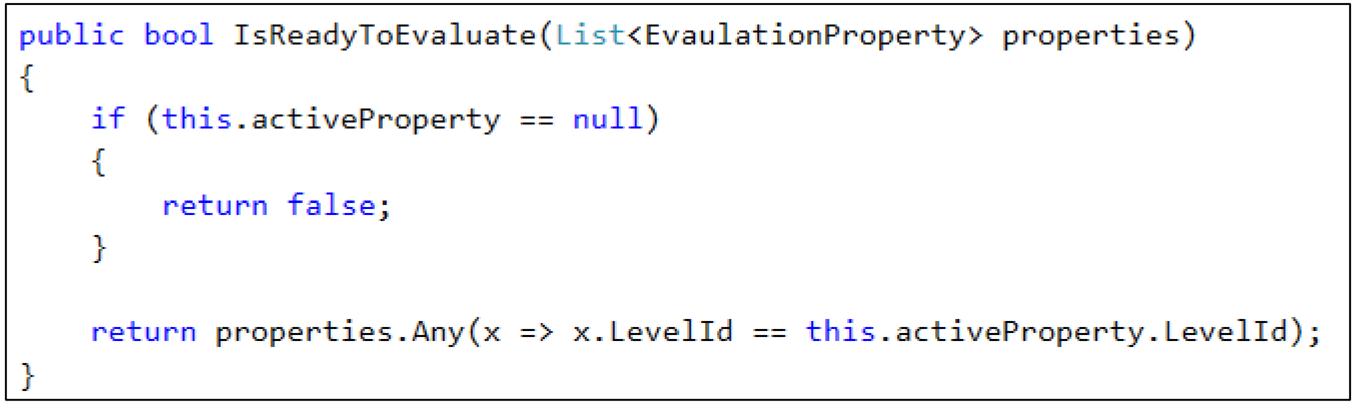
Lesbarkeit & Code Stil



```
/// <summary>
/// Merkmalsliste
/// </summary>
/// <typeparam name="T">Property</typeparam>
public class CEvMac_PropList<T> : List<CEvMac_Propertie>
```



```
public bool IsReadyToEvaluate(List<EvaulationProperty> properties)
{
    if (this.activeProperty == null)
    {
        return false;
    }

    return properties.Any(x => x.LevelId == this.activeProperty.LevelId);
}
```

```
public bool IsReadyToEval
    (
        EVMacDouble.CEvMac_PropList<EVMacDouble.CEvMac_Propertie> v_PropList
    )
{

    var v_RsltList = v_PropList.Where
                           (
                               delegate
                               (
                                   EVMacDouble.CEvMac_Propertie v_EMPropCur

                                   )
                               {
                                   return (
                                           (v_EMPropCur.LLvlId == ActLvlId)
                                           &&
                                           (!v_EMPropCur.IsSet )
                                           );
                               }
                           );
    if (v_RsltList.Count() > 0)
    {
        return false;
    }
    return true ;
}
```

Code Style Guidelines

Statische Analyse von Code mit Einbindung in den Build

Adressiert:

- Dokumentation
- Layout
- Wartbarkeit
- Namensgebung
- Lesbarkeit

{ } StyleCop

checkstyle

Religionskriege

```
private string name;

public string Name
{
    get
    {
        return this.name;
    }

    set
    {
        this.name = value;
    }
}
```

```
private string _name;

public string Name
{
    get { return _name; }

    set { _name = value; }
}
```

```
var name =  "Hendrik";

string name =  "Hendrik";
```

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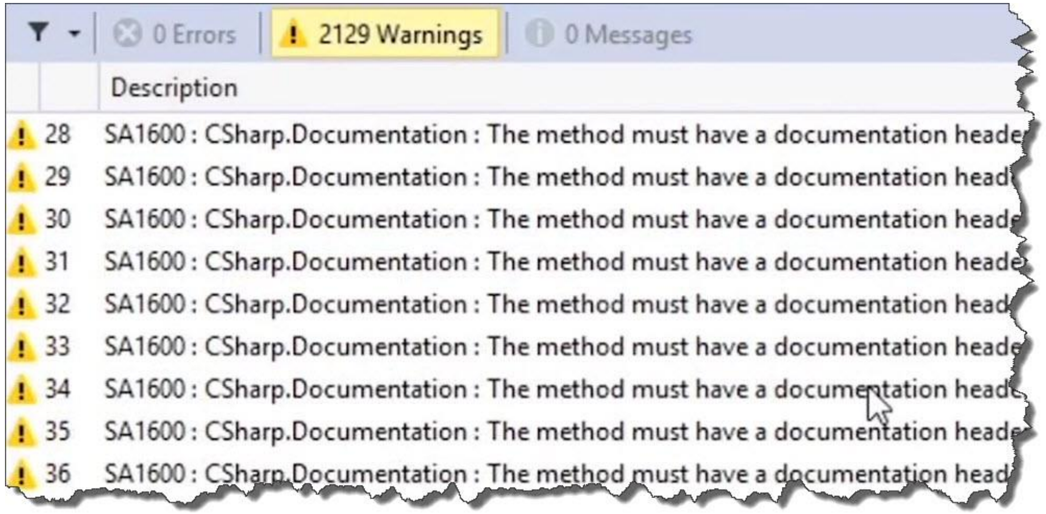
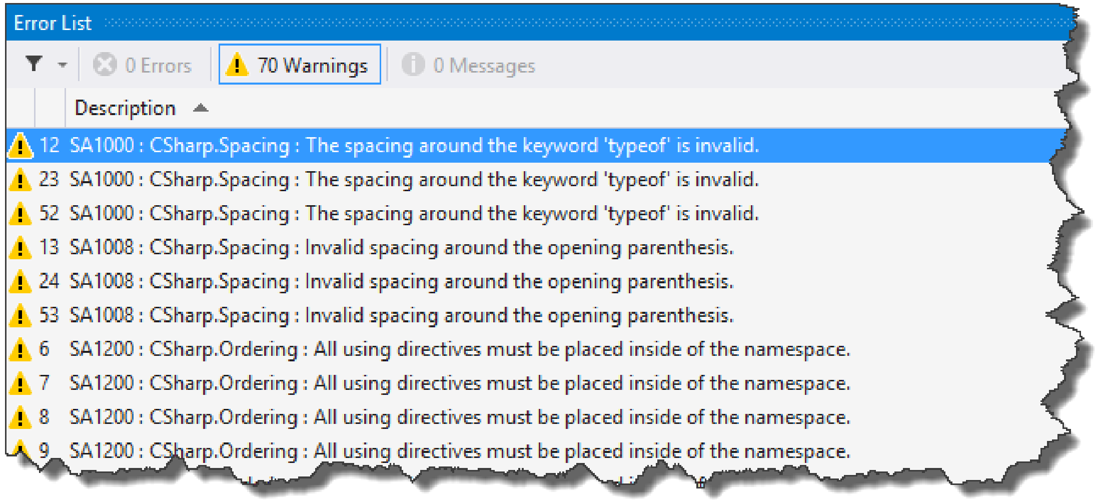
Coding Rules

Legacy Software



		Description
⚠	28	SA1600 : CSharp.Documentation : The method must have a documentation heade
⚠	29	SA1600 : CSharp.Documentation : The method must have a documentation head
⚠	30	SA1600 : CSharp.Documentation : The method must have a documentation heade
⚠	31	SA1600 : CSharp.Documentation : The method must have a documentation heade
⚠	32	SA1600 : CSharp.Documentation : The method must have a documentation head
⚠	33	SA1600 : CSharp.Documentation : The method must have a documentation heade
⚠	34	SA1600 : CSharp.Documentation : The method must have a documentation head
⚠	35	SA1600 : CSharp.Documentation : The method must have a documentation heade
⚠	36	SA1600 : CSharp.Documentation : The method must have a documentation head

Visual Studio Projekttemplate



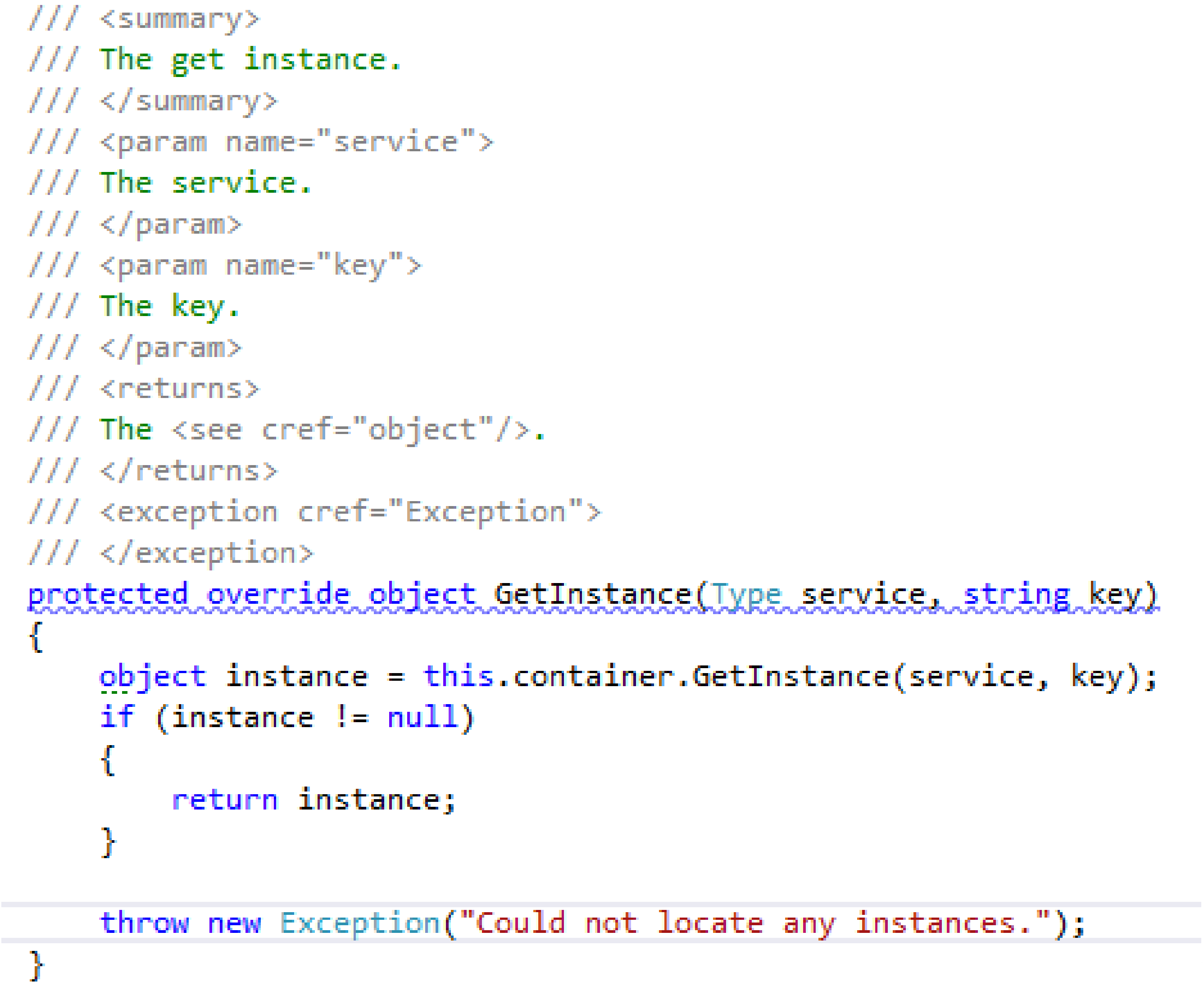
		Description
⚠	12	SA1000 : CSharp.Spacing : The spacing around the keyword 'typeof' is invalid.
⚠	23	SA1000 : CSharp.Spacing : The spacing around the keyword 'typeof' is invalid.
⚠	52	SA1000 : CSharp.Spacing : The spacing around the keyword 'typeof' is invalid.
⚠	13	SA1008 : CSharp.Spacing : Invalid spacing around the opening parenthesis.
⚠	24	SA1008 : CSharp.Spacing : Invalid spacing around the opening parenthesis.
⚠	53	SA1008 : CSharp.Spacing : Invalid spacing around the opening parenthesis.
⚠	6	SA1200 : CSharp.Ordering : All using directives must be placed inside of the namespace.
⚠	7	SA1200 : CSharp.Ordering : All using directives must be placed inside of the namespace.
⚠	8	SA1200 : CSharp.Ordering : All using directives must be placed inside of the namespace.
⚠	9	SA1200 : CSharp.Ordering : All using directives must be placed inside of the namespace.

Kommentare

Kommentare

Code -> Wie?

Kommentar -> Warum?

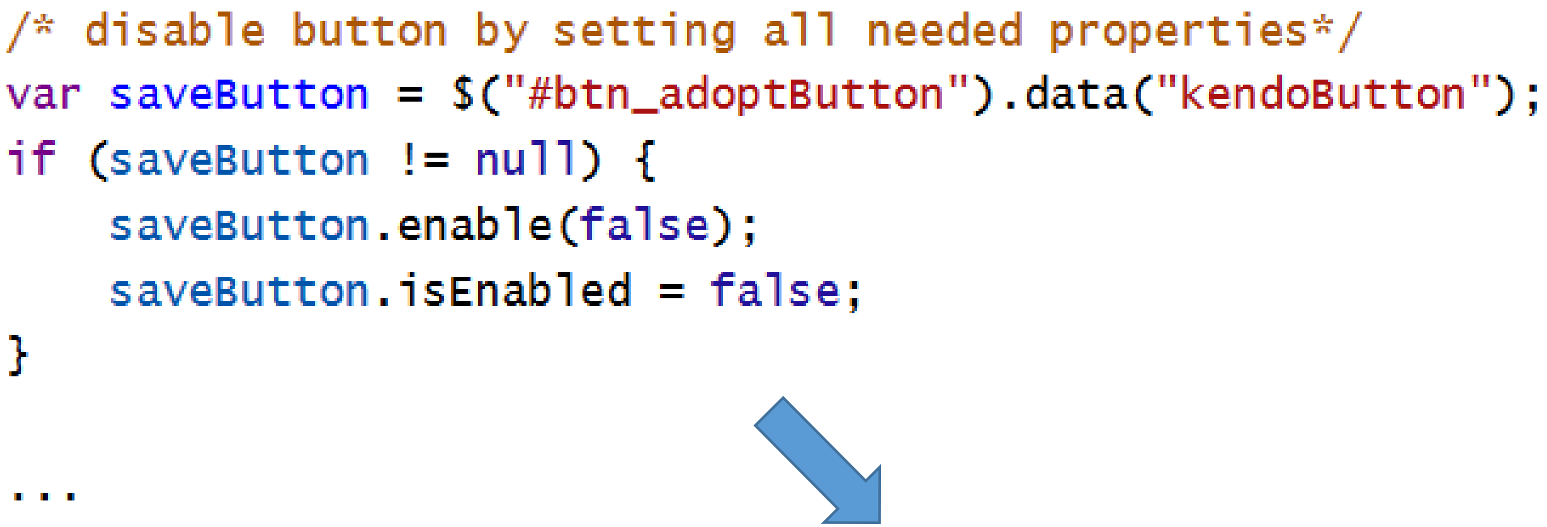


```
/// <summary>
/// The get instance.
/// </summary>
/// <param name="service">
/// The service.
/// </param>
/// <param name="key">
/// The key.
/// </param>
/// <returns>
/// The <see cref="object"/>.
/// </returns>
/// <exception cref="Exception">
/// </exception>
protected override object GetInstance(Type service, string key)
{
    object instance = this.container.GetInstance(service, key);
    if (instance != null)
    {
        return instance;
    }

    throw new Exception("Could not locate any instances.");
}
```

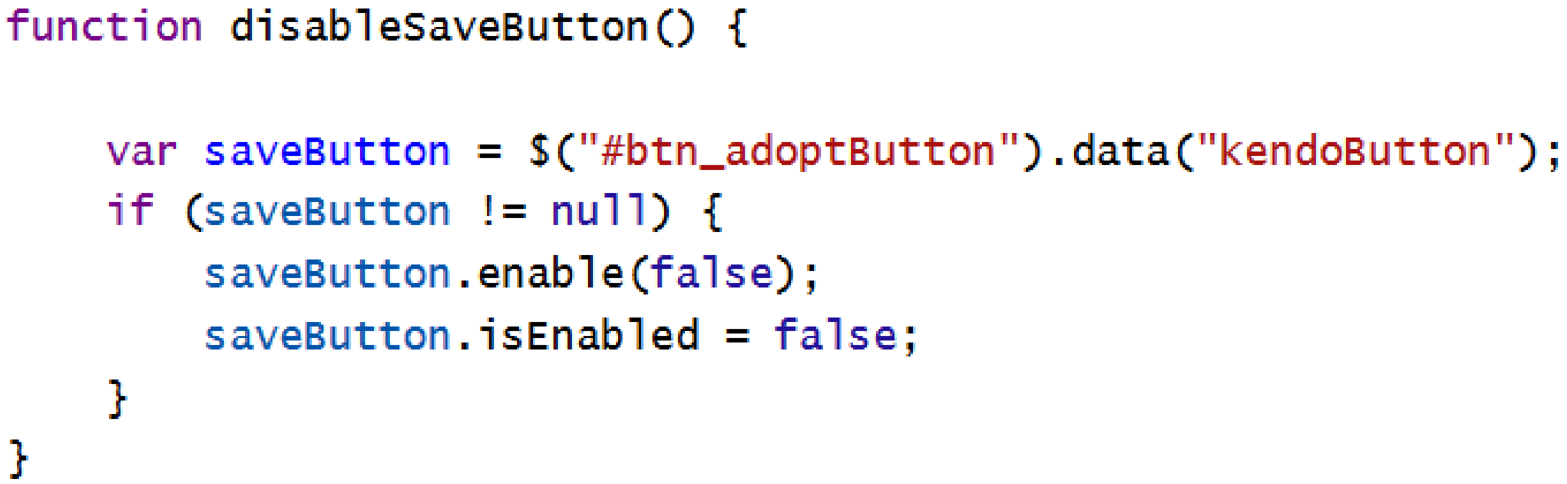
Kommentare

Code -> Wie?
Kommentar -> Warum?
Methodenname -> Was?



```
/* disable button by setting all needed properties*/
var saveButton = $("#btn_adoptButton").data("kendoButton");
if (saveButton != null) {
    saveButton.enable(false);
    saveButton.isEnabled = false;
}

...
```



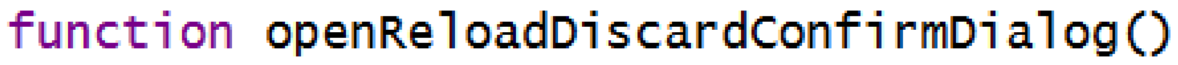
```
function disableSaveButton() {

    var saveButton = $("#btn_adoptButton").data("kendoButton");
    if (saveButton != null) {
        saveButton.enable(false);
        saveButton.isEnabled = false;
    }
}
```

Methodennamen

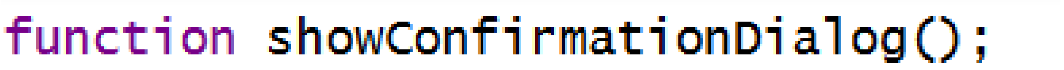
Principle of Least Astonishment???

to open, reload, discard and confirm dialog…



```
function openReloadDiscardConfirmDialog()
```

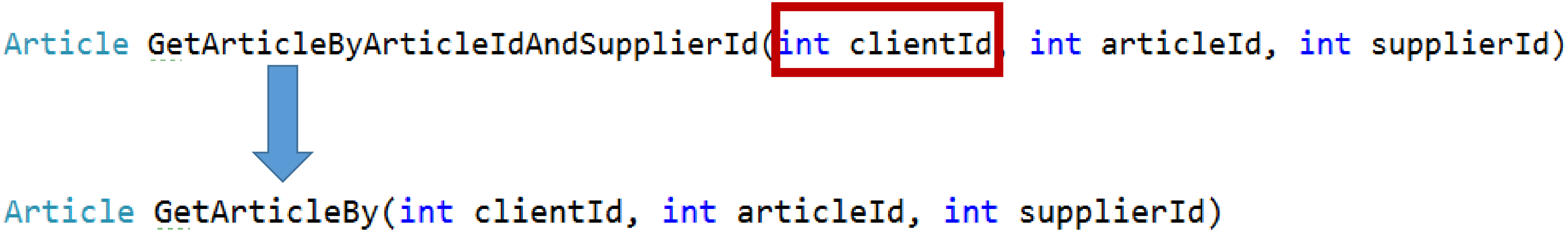
↓



```
function showConfirmationDialog();
```

Methodennamen

Information Hiding!!!

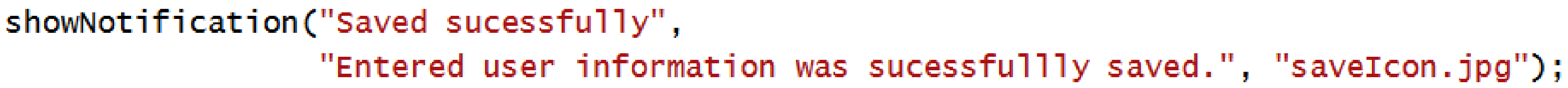


```
Article GetArticleByArticleIdAndSupplierId(int clientId, int articleId, int supplierId)
```

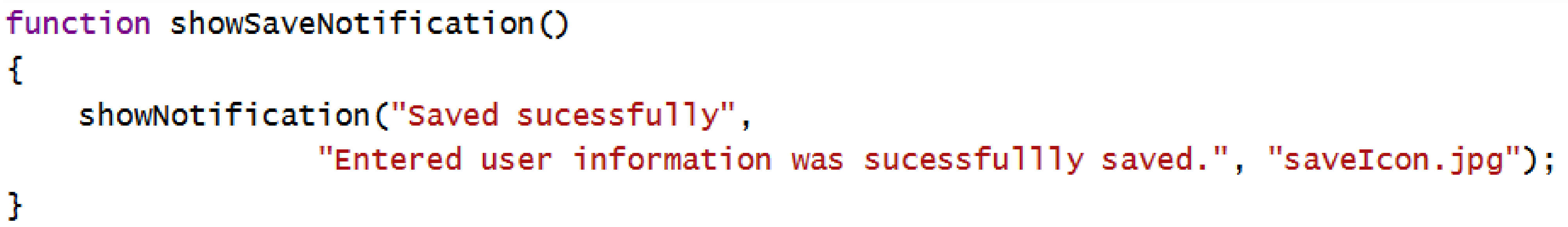
```
Article GetArticleBy(int clientId, int articleId, int supplierId)
```

Code Clones vs. Duplikate

Don´t Repeat Yourself!!!



```
showNotification("Saved sucessfully",
                 "Entered user information was sucessfullly saved.", "saveIcon.jpg");
```



```
function showSaveNotification()
{
    showNotification("Saved sucessfully",
                 "Entered user information was sucessfullly saved.", "saveIcon.jpg");
}
```

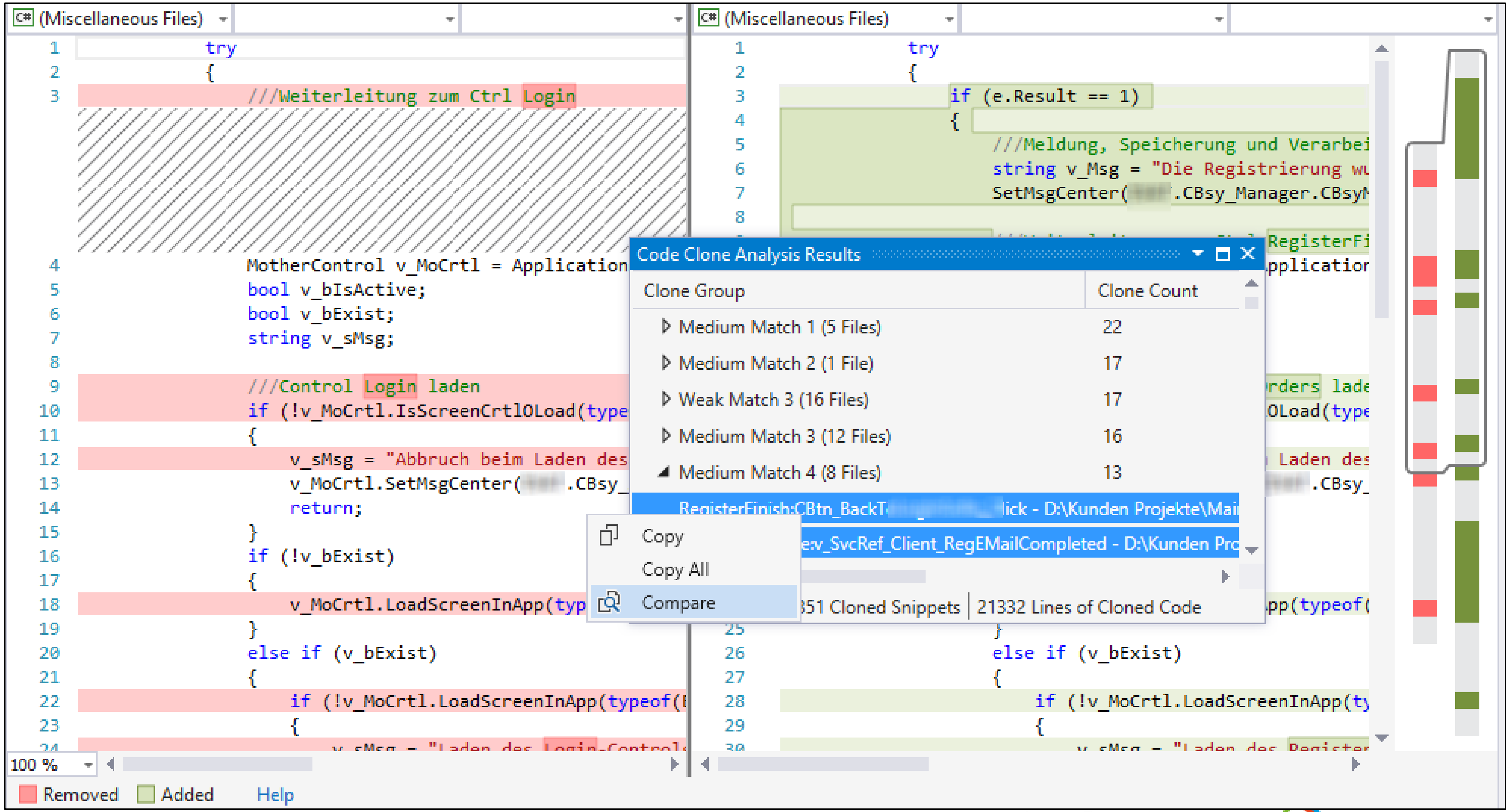
Code Clones vs. Duplikate

Don´t Repeat Yourself!!!

```
public PageViewModel(INavigationService navigationService)
{
    if (navigationService == null)
    {
        throw new ArgumentException("navigationService");
    }

    this.NavigationService = navigationService;
}
```

Code Clones vs. Duplikate



(Miscellaneous Files)

```
try
{
    ///Weiterleitung zum Ctrl Login
    MotherControl v_MoCrtl = Application
    bool v_bIsActive;
    bool v_bExist;
    string v_sMsg;

    ///Control Login laden
    if (!v_MoCrtl.IsScreenCrtlOLoad(type
    {
        v_sMsg = "Abbruch beim Laden des
        v_MoCrtl.SetMsgCenter([redacted].CBsy_
        return;
    }
    if (!v_bExist)
    {
        v_MoCrtl.LoadScreenInApp(typ
    }
    else if (v_bExist)
    {
        if (!v_MoCrtl.LoadScreenInApp(typeof(E
        {
            v_sMsg = "Laden des Login-Control
```

(Miscellaneous Files)

```
try
{
    if (e.Result == 1)
    {
        ///Meldung, Speicherung und Verarbei
        string v_Msg = "Die Registrierung wu
        SetMsgCenter([redacted].CBsy_Manager.CBsyM

                                 RegisterFi
                                 pplication

                                 rders lade
                                 OLoad(type

                                 Laden des
                                 [redacted].CBsy_

                                 pp(typeof(
        }
        else if (v_bExist)
        {
            if (!v_MoCrtl.LoadScreenInApp(ty
            {
                v_sMsg = "Laden des Register
```

Code Clone Analysis Results

Clone Group	Clone Count
Medium Match 1 (5 Files)	22
Medium Match 2 (1 File)	17
Weak Match 3 (16 Files)	17
Medium Match 3 (12 Files)	16
Medium Match 4 (8 Files)	13
RegisterFinish:CBtn_BackT[redacted]lick - D:\Kunden Projekte\Mai	
e:v_SvcRef_Client_RegEMailCompleted - D:\Kunden Pro	

351 Cloned Snippets | 21332 Lines of Cloned Code

Clean Code am Beispiel

QUALITÄTSMETRIKEN

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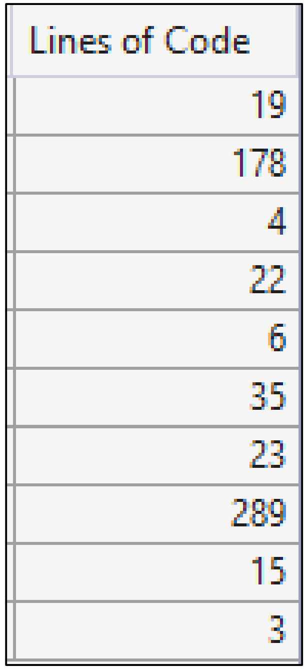
Lines of Code

	SLOC (in Mio.)
Windows NT 3.1 (1993)	4–5
Windows NT 3.5 (1994)	7–8
Windows NT 4.0 (1996)	11–12
Windows 2000 (2000)	> 29
Windows XP (2001)	40
Windows Server 2003 (2003)	50



Lines of Code
19
178
4
22
6
35
23
289
15
3

Lines of Code

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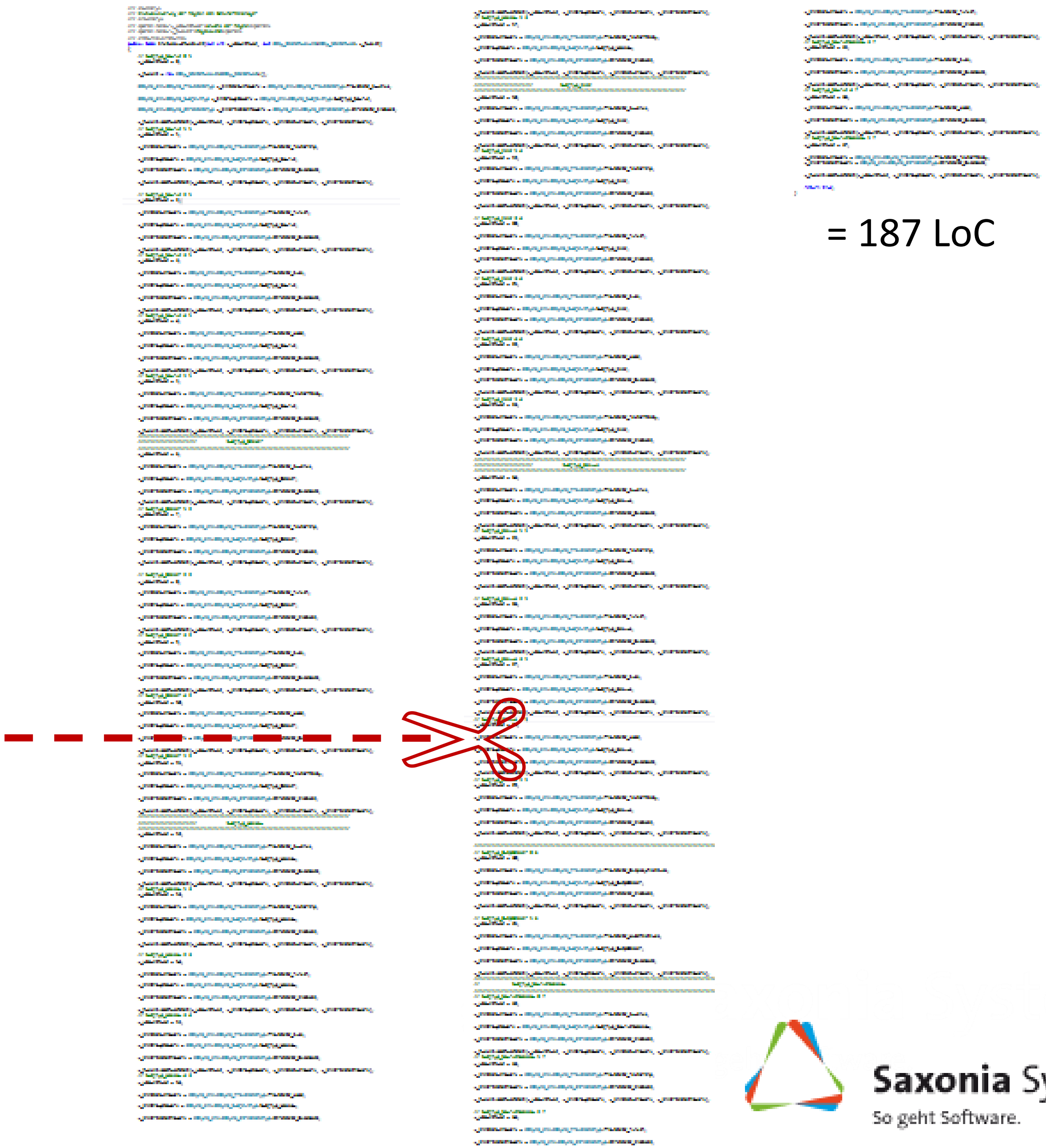
Klasse < 500 LoC
Methode < 50 LoC

?



= 187 LoC

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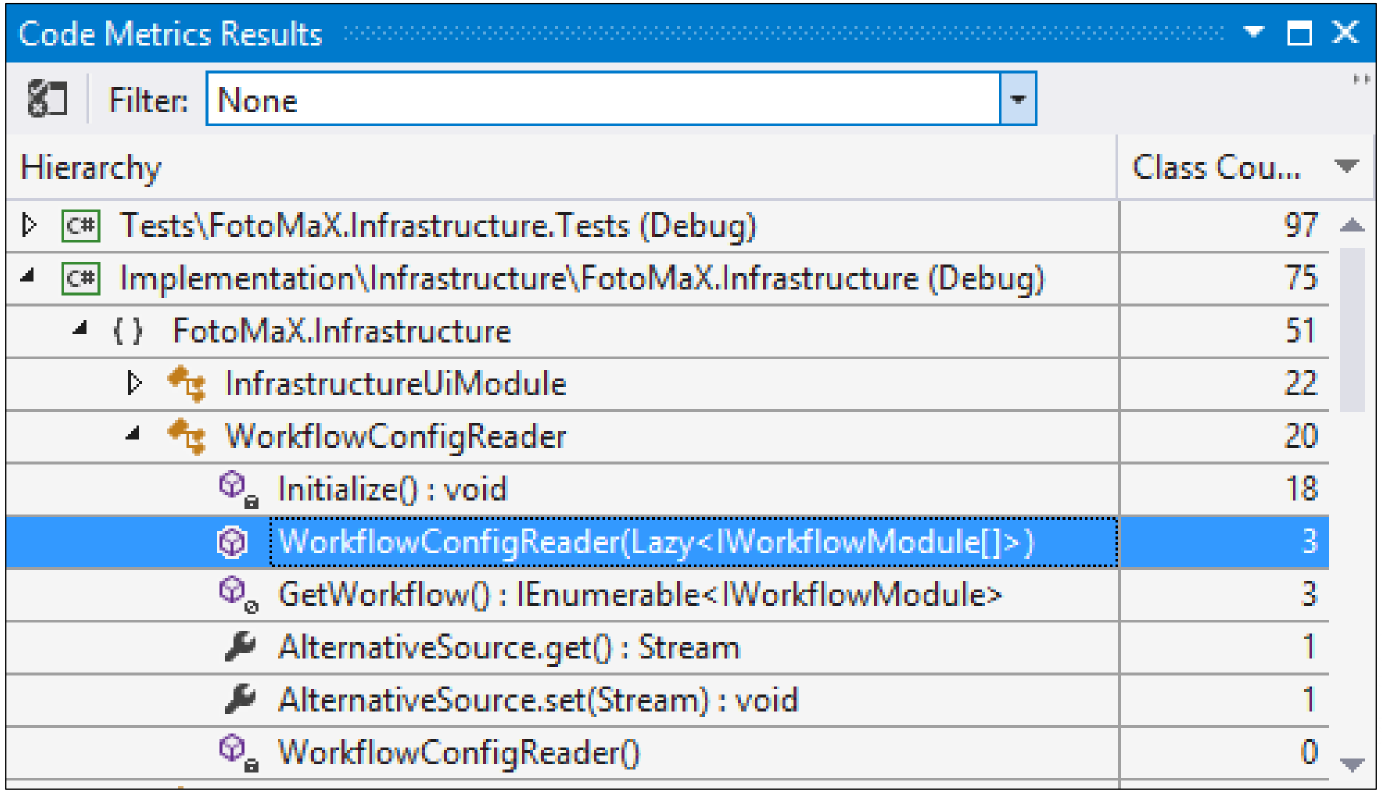
Class Coupling

1 2 3

```
public WorkflowConfigReader(Lazy<IWorkflowModule[]> availableWorkflowModules)
{
    this.availableWorkflowModules = availableWorkflowModules;
}
```



Filter: None

Hierarchy	Class Cou...
Tests\FotoMaX.Infrastructure.Tests (Debug)	97
Implementation\Infrastructure\FotoMaX.Infrastructure (Debug)	75
{ } FotoMaX.Infrastructure	51
InfrastructureUiModule	22
WorkflowConfigReader	20
Initialize() : void	18
WorkflowConfigReader(Lazy<IWorkflowModule[]>)	3
GetWorkflow() : IEnumerable<IWorkflowModule>	3
AlternativeSource.get() : Stream	1
AlternativeSource.set(Stream) : void	1
WorkflowConfigReader()	0

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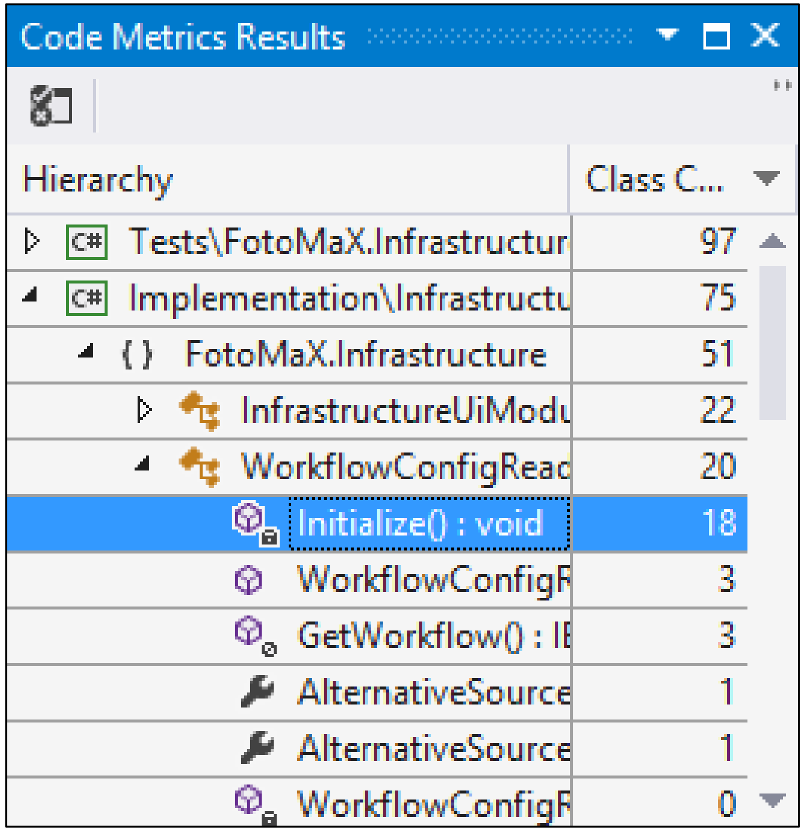
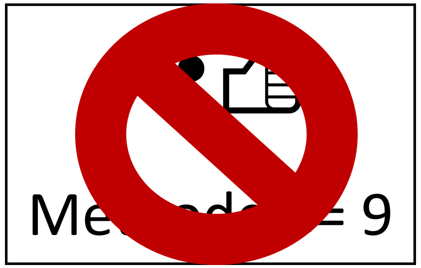
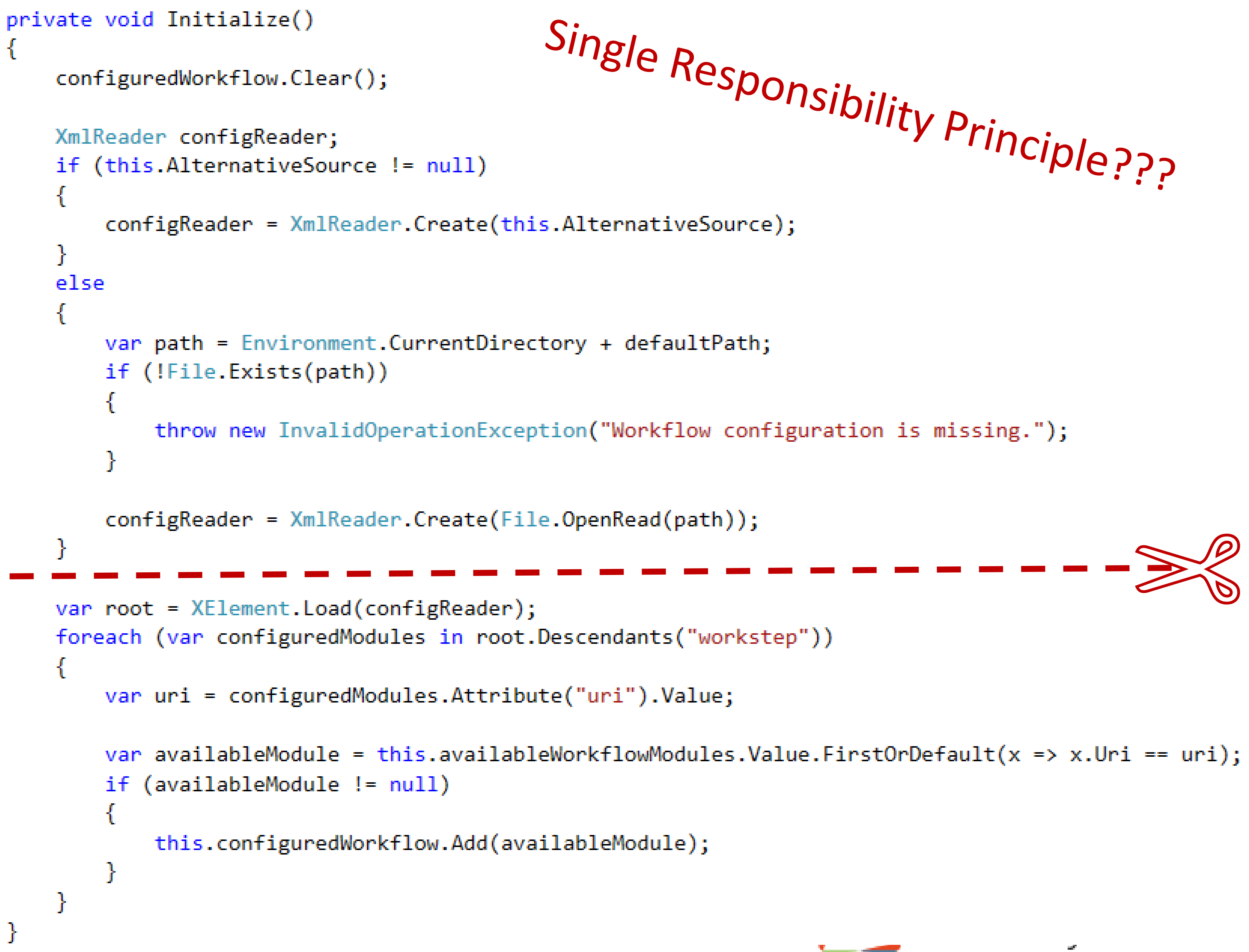
Methode <= 9

Class Coupling



Hierarchy	Class C...
Tests\FotoMaX.Infrastructur	97
Implementation\Infrastructu	75
FotoMaX.Infrastructure	51
InfrastructureUiModu	22
WorkflowConfigReac	20
Initialize() : void	18
WorkflowConfigR	3
GetWorkflow() : IE	3
AlternativeSource	1
AlternativeSource	1
WorkflowConfigR	0

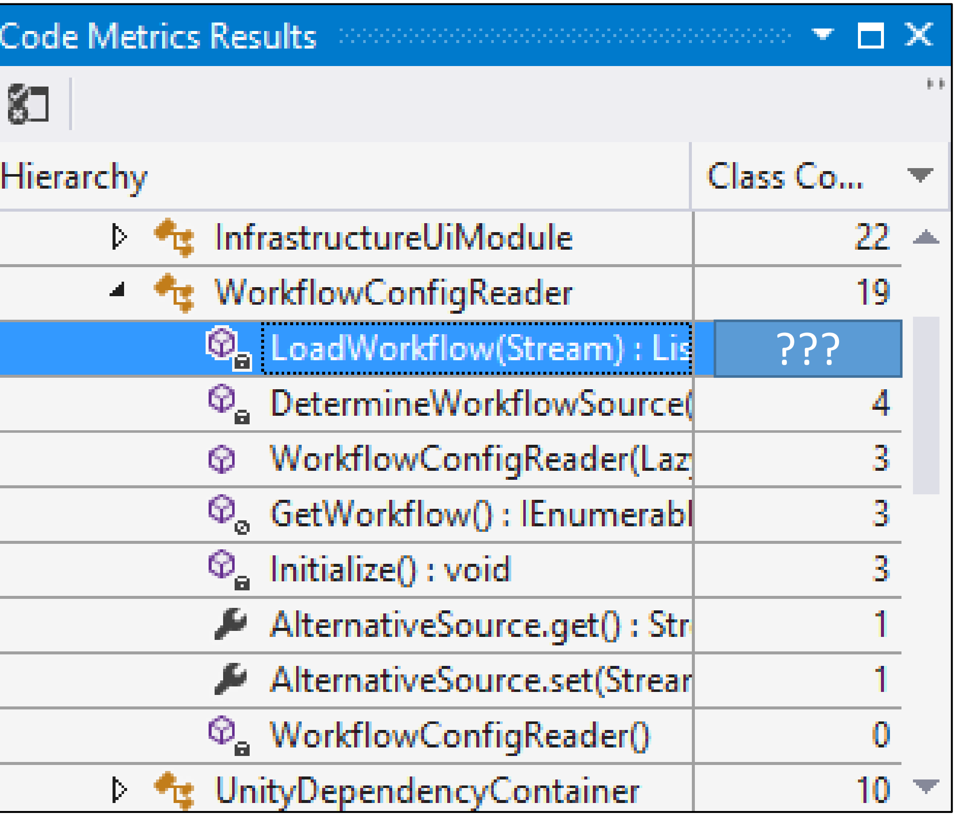




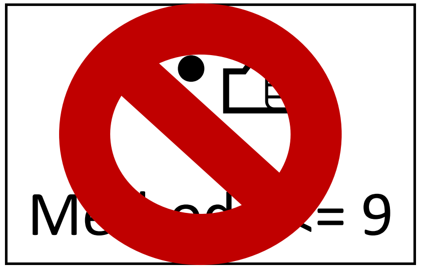
```
private void Initialize()
{
    configuredWorkflow.Clear();

    XmlReader configReader;
    if (this.AlternativeSource != null)
    {
        configReader = XmlReader.Create(this.AlternativeSource);
    }
    else
    {
        var path = Environment.CurrentDirectory + defaultPath;
        if (!File.Exists(path))
        {
            throw new InvalidOperationException("Workflow configuration is missing.");
        }

        configReader = XmlReader.Create(File.OpenRead(path));
    }

    var root = XElement.Load(configReader);
    foreach (var configuredModules in root.Descendants("workstep"))
    {
        var uri = configuredModules.Attribute("uri").Value;

        var availableModule = this.availableWorkflowModules.Value.FirstOrDefault(x => x.Uri == uri);
        if (availableModule != null)
        {
            this.configuredWorkflow.Add(availableModule);
        }
    }
}
```

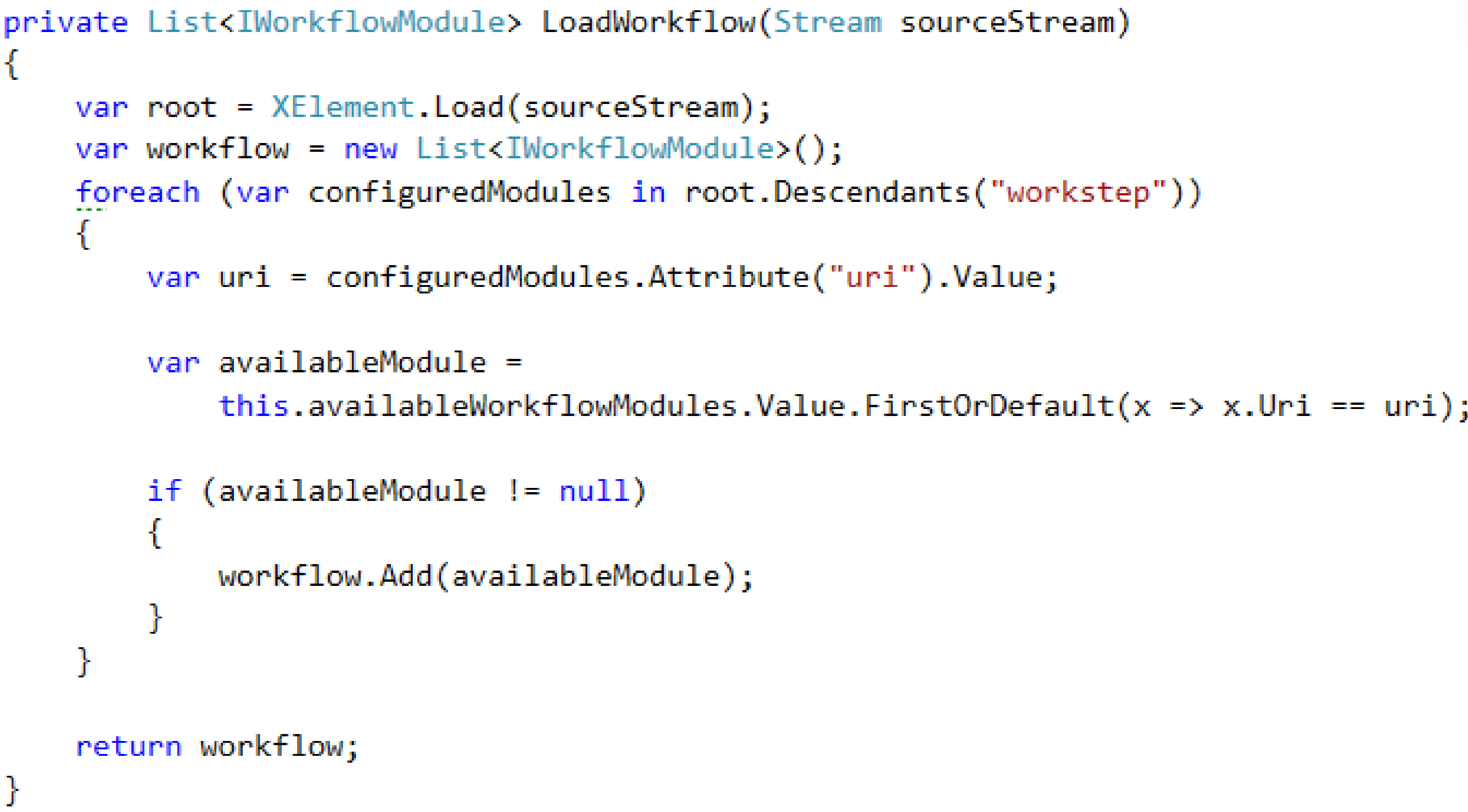
Single Responsibility Principle???

Class Coupling



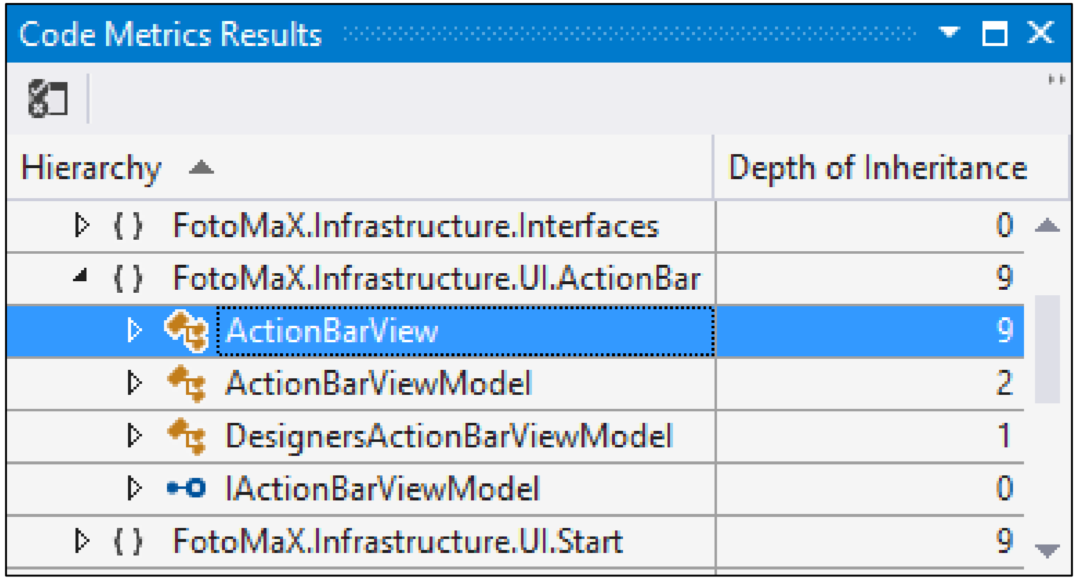
Hierarchy	Class Co...
InfrastructureUiModule	22
WorkflowConfigReader	19
LoadWorkflow(Stream) : Lis	???
DetermineWorkflowSource(	4
WorkflowConfigReader(Laz	3
GetWorkflow() : IEnumerabl	3
Initialize() : void	3
AlternativeSource.get() : Str	1
AlternativeSource.set(Strear	1
WorkflowConfigReader()	0
UnityDependencyContainer	10





```
private List<IWorkflowModule> LoadWorkflow(Stream sourceStream)
{
    var root = XElement.Load(sourceStream);
    var workflow = new List<IWorkflowModule>();
    foreach (var configuredModules in root.Descendants("workstep"))
    {
        var uri = configuredModules.Attribute("uri").Value;

        var availableModule =
            this.availableWorkflowModules.Value.FirstOrDefault(x => x.Uri == uri);

        if (availableModule != null)
        {
            workflow.Add(availableModule);
        }
    }

    return workflow;
}
```

Depth of Inheritance

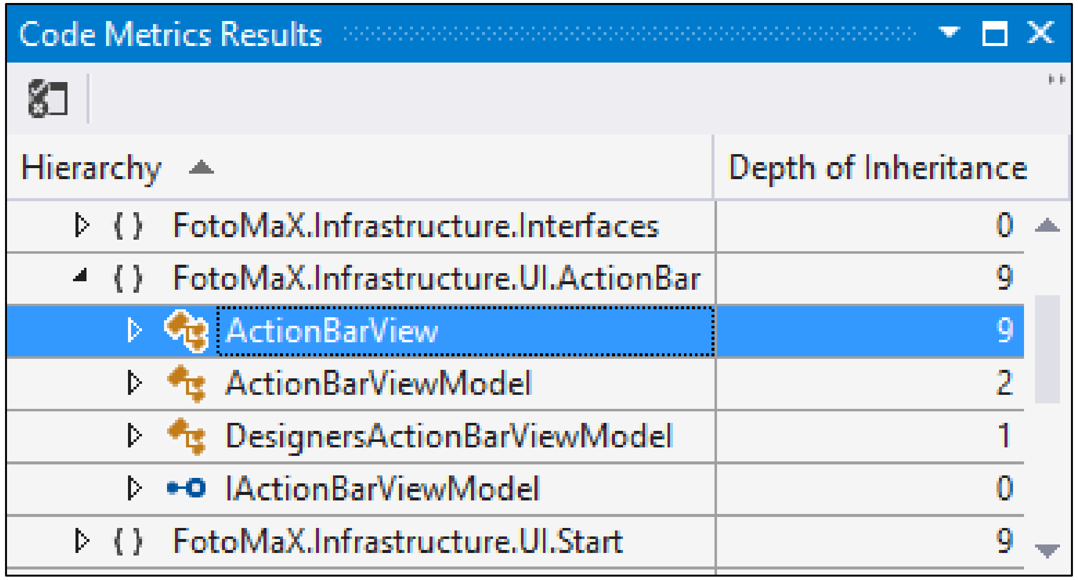


Hierarchy	Depth of Inheritance
FotoMaX.Infrastructure.Interfaces	0
FotoMaX.Infrastructure.UI.ActionBar	9
ActionBarView	9
ActionBarViewModel	2
DesignersActionBarViewModel	1
IActionBarViewModel	0
FotoMaX.Infrastructure.UI.Start	9

System.Object
System.Windows.Threading.DispatcherObject
System.Windows.DependencyObject
System.Windows.Media.Visual
System.Windows.UIElement
System.Windows.FrameworkElement
System.Windows.Controls.Control
System.Windows.Controls.ContentControl
System.Windows.Window

Depth of Inheritance

Favour Composition over Inheritance!!!



Code Metrics Results

Hierarchy	Depth of Inheritance
{ } FotoMaX.Infrastructure.Interfaces	0
{ } FotoMaX.Infrastructure.UI.ActionBar	9
ActionBarView	9
ActionBarViewModel	2
DesignersActionBarViewModel	1
IActionBarViewModel	0
{ } FotoMaX.Infrastructure.UI.Start	9

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Hierachieebene <= 6

```
public class ActionBarViewModel : ReactiveObject, IActionBarViewModel
```

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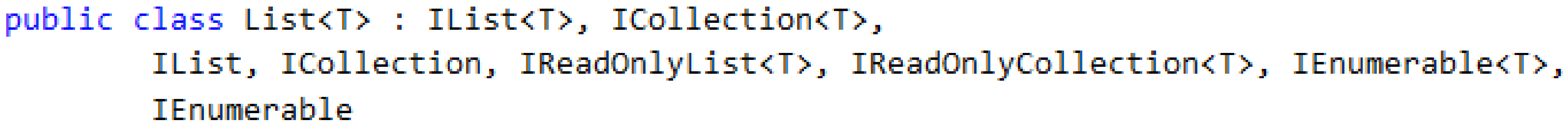
Depth of Inheritance



```
public class List<T> : IList<T>, ICollection<T>,
        IList, ICollection, IReadOnlyList<T>, IReadOnlyCollection<T>, IEnumerable<T>,
        IEnumerable
```

✓ Information Hiding Principle

✓ Interface Segregation Principle

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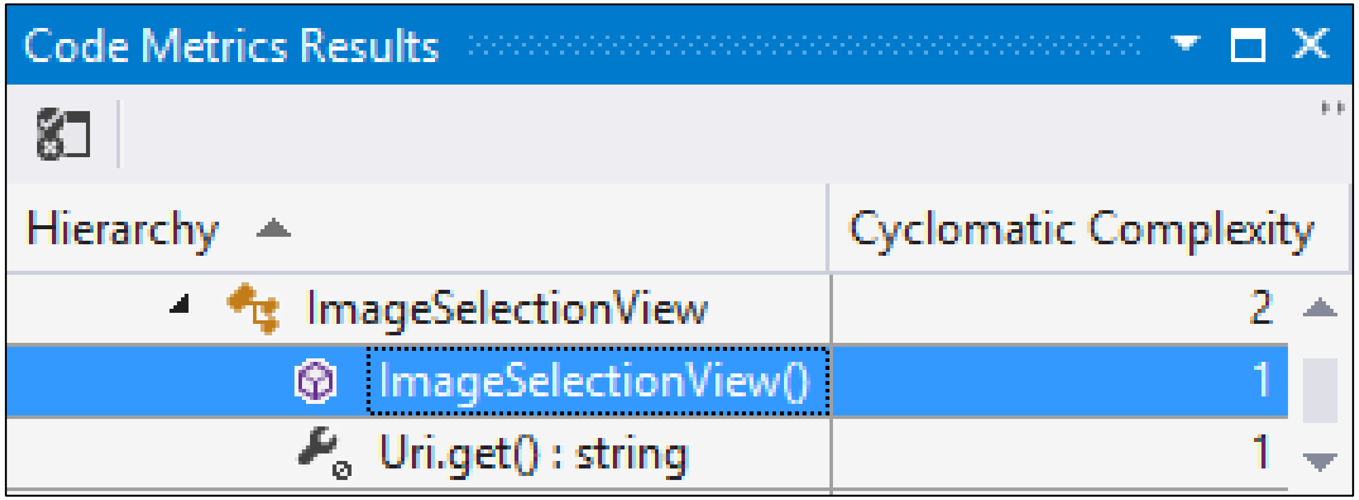
Hierachieebene <= 6

Cyclomatic Complexity

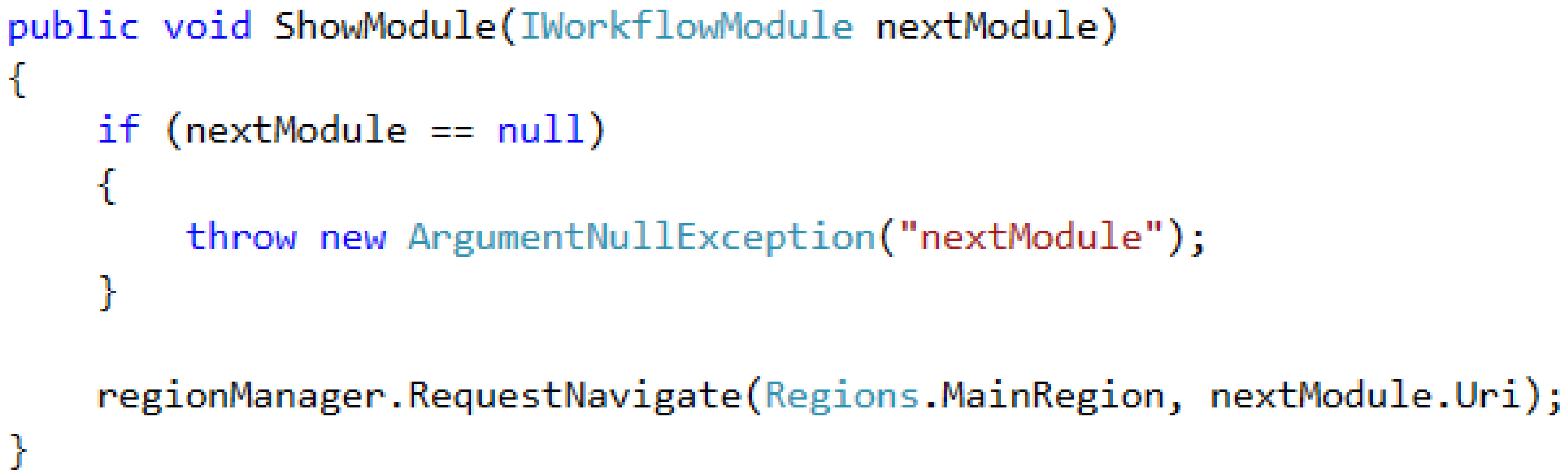


Hierarchy	Cyclomatic Complexity
ImageSelectionView	2
ImageSelectionView()	1
Uri.get() : string	1

```
public partial class ImageSelectionView : UserControl, IWorkflowModule
{
    public ImageSelectionView()
    {
        InitializeComponent();
    }

    public string Uri { get { return "ImageSelection"; } }
}
```

Cyclomatic Complexity



```
public void ShowModule(IWorkflowModule nextModule)
{
    if (nextModule == null)
    {
        throw new ArgumentNullException("nextModule");
    }

    regionManager.RequestNavigate(Regions.MainRegion, nextModule.Uri);
}
```

Komplexität == 2

Cyclomatic Complexity

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für Typen

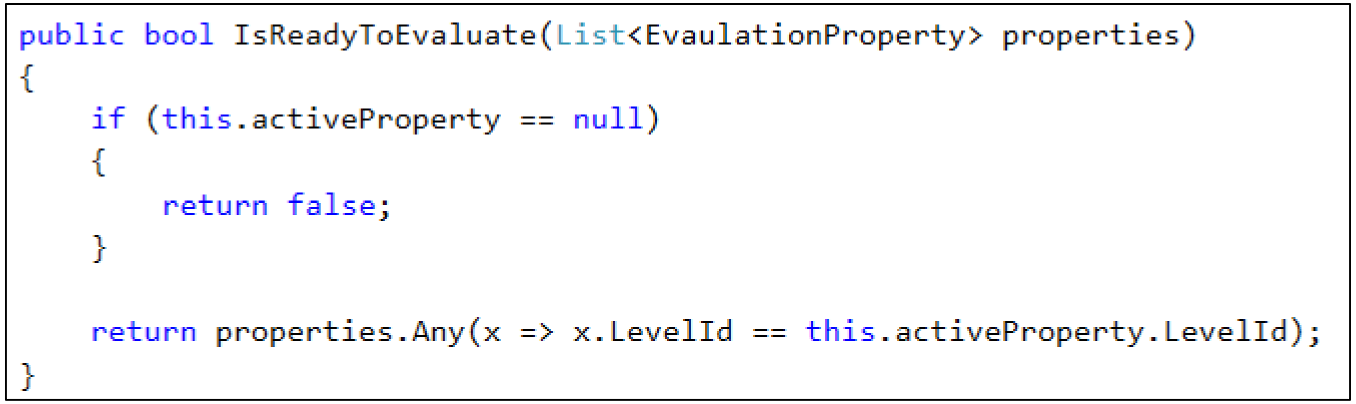
1 bis 10 = normal

11 bis 20 = moderat

21 bis 50 = riskant

> 50 = instabil

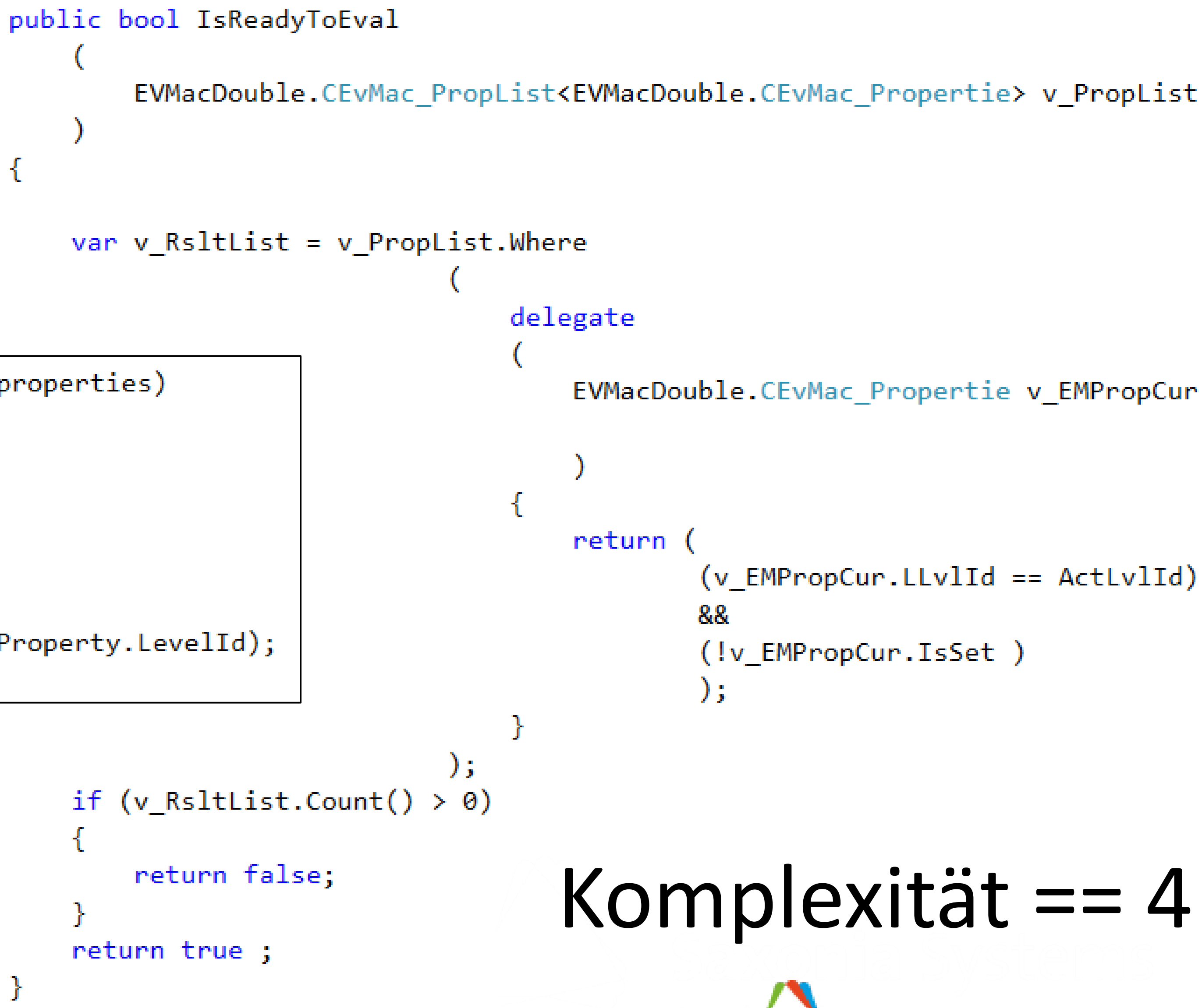
Cyclomatic Complexity



```
public bool IsReadyToEvaluate(List<EvaulationProperty> properties)
{
    if (this.activeProperty == null)
    {
        return false;
    }

    return properties.Any(x => x.LevelId == this.activeProperty.LevelId);
}
```

Komplexität == 4



```
public bool IsReadyToEval
    (
        EVMacDouble.CEvMac_PropList<EVMacDouble.CEvMac_Propertie> v_PropList
    )
{

    var v_RsltList = v_PropList.Where
                            (
                                delegate
                                (
                                    EVMacDouble.CEvMac_Propertie v_EMPropCur

                                    )
                                {
                                    return (
                                            (v_EMPropCur.LLvlId == ActLvlId)
                                            &&
                                            (!v_EMPropCur.IsSet )
                                            );
                                }
                            );
    if (v_RsltList.Count() > 0)
    {
        return false;
    }
    return true ;
}
```

Komplexität == 4

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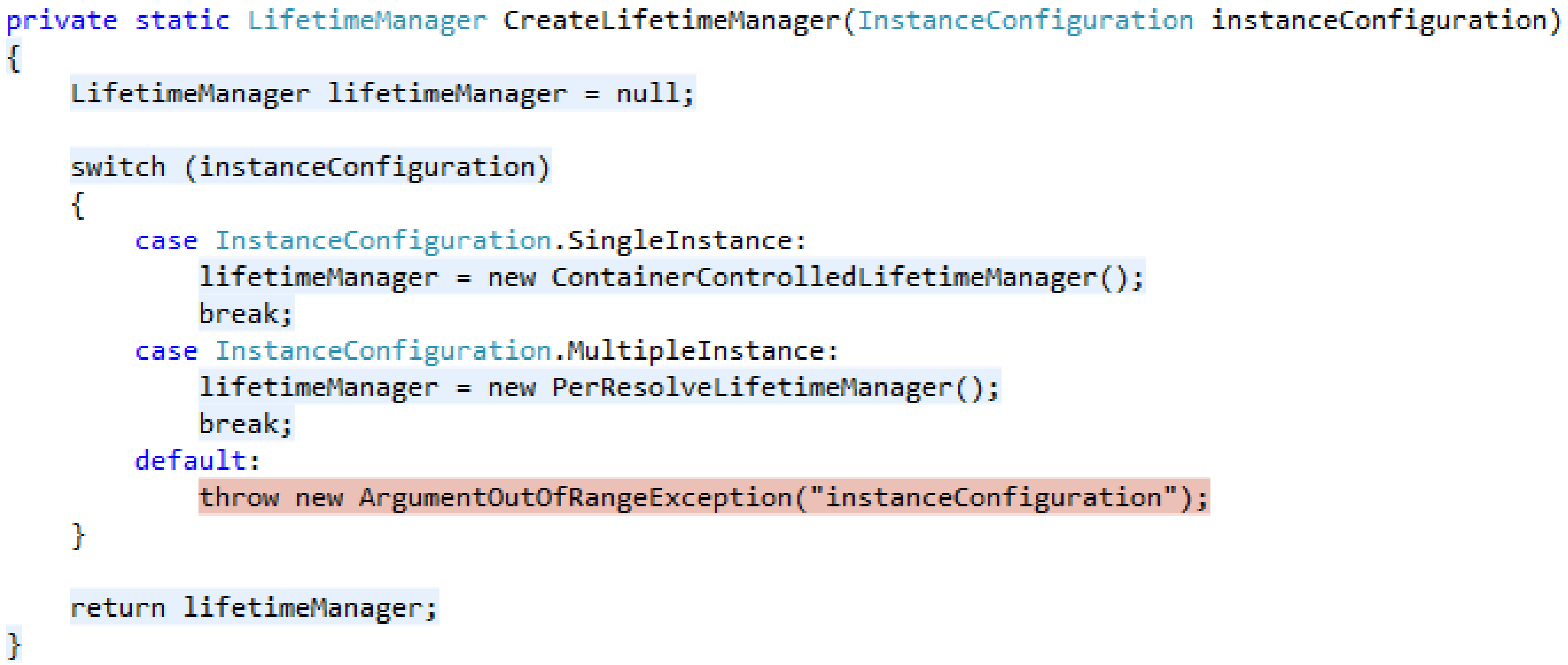
Code Coverage aka Test Coverage



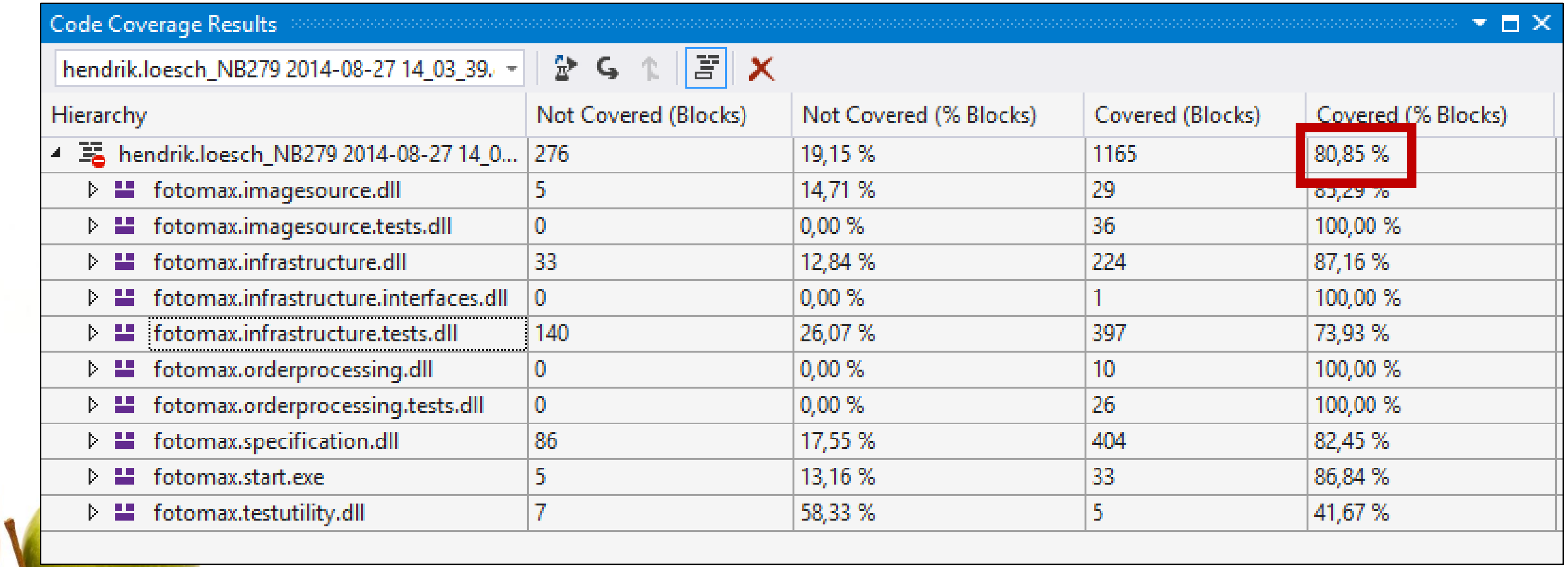
```
private static LifetimeManager CreateLifetimeManager(InstanceConfiguration instanceConfiguration)
{
    LifetimeManager lifetimeManager = null;

    switch (instanceConfiguration)
    {
        case InstanceConfiguration.SingleInstance:
            lifetimeManager = new ContainerControlledLifetimeManager();
            break;
        case InstanceConfiguration.MultipleInstance:
            lifetimeManager = new PerResolveLifetimeManager();
            break;
        default:
            throw new ArgumentOutOfRangeException("instanceConfiguration");
    }

    return lifetimeManager;
}
```

Komplexität == 3

Code Coverage aka Test Coverage



Code Coverage Results

hendrik.loesch_NB279 2014-08-27 14_03_39.

Hierarchy	Not Covered (Blocks)	Not Covered (% Blocks)	Covered (Blocks)	Covered (% Blocks)
hendrik.loesch_NB279 2014-08-27 14_0...	276	19,15 %	1165	80,85 %
fotomax.imagesource.dll	5	14,71 %	29	85,29 %
fotomax.imagesource.tests.dll	0	0,00 %	36	100,00 %
fotomax.infrastructure.dll	33	12,84 %	224	87,16 %
fotomax.infrastructure.interfaces.dll	0	0,00 %	1	100,00 %
fotomax.infrastructure.tests.dll	140	26,07 %	397	73,93 %
fotomax.orderprocessing.dll	0	0,00 %	10	100,00 %
fotomax.orderprocessing.tests.dll	0	0,00 %	26	100,00 %
fotomax.specification.dll	86	17,55 %	404	82,45 %
fotomax.start.exe	5	13,16 %	33	86,84 %
fotomax.testutility.dll	7	58,33 %	5	41,67 %

C.R.A.P.

C.R.A.P.(m) = CC(m)^2 * (1 – Coverage(m)/100)^3 + CC(m)

> “The C.R.A.P. (Change Risk Analysis and Predictions) index is designed to analyze and predict the amount of effort, pain, and time required to maintain an existing body of code.”
>
> Alberto Savoia

Quelle: http://www.artima.com/weblogs/viewpost.jsp?thread=210575

C.R.A.P.

$$\text{C.R.A.P.}(m) = CC(m)^2 * (1 - Coverage(m)/100)^3 + CC(m)$$

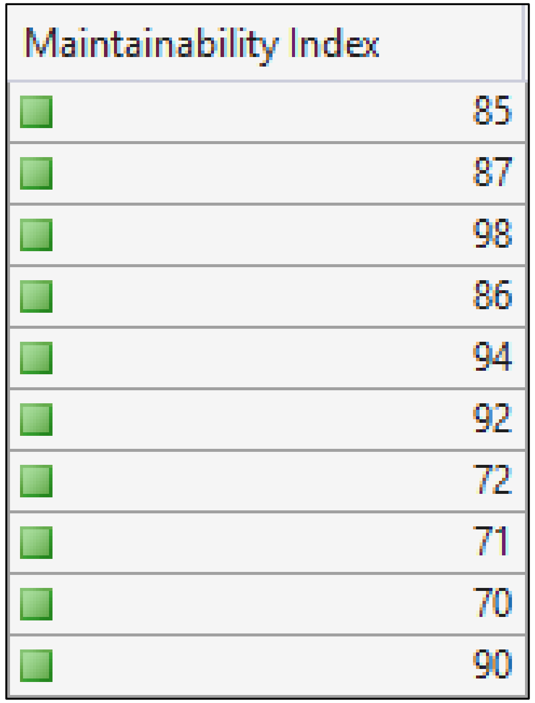
Method’s CC	% of coverage required to be below CRAPpy threshold
0 – 5	0%
10	42%
15	57%
20	71%
25	80%
30	100%
31+	No amount of testing will keep methods this complex out of CRAP territory.

π • 👍

30

Quelle: https://www.artima.com/weblogs/viewpost.jsp?thread=215899

Maintainability Index



Maintainability Index	
🟩	85
🟩	87
🟩	98
🟩	86
🟩	94
🟩	92
🟩	72
🟩	71
🟩	70
🟩	90

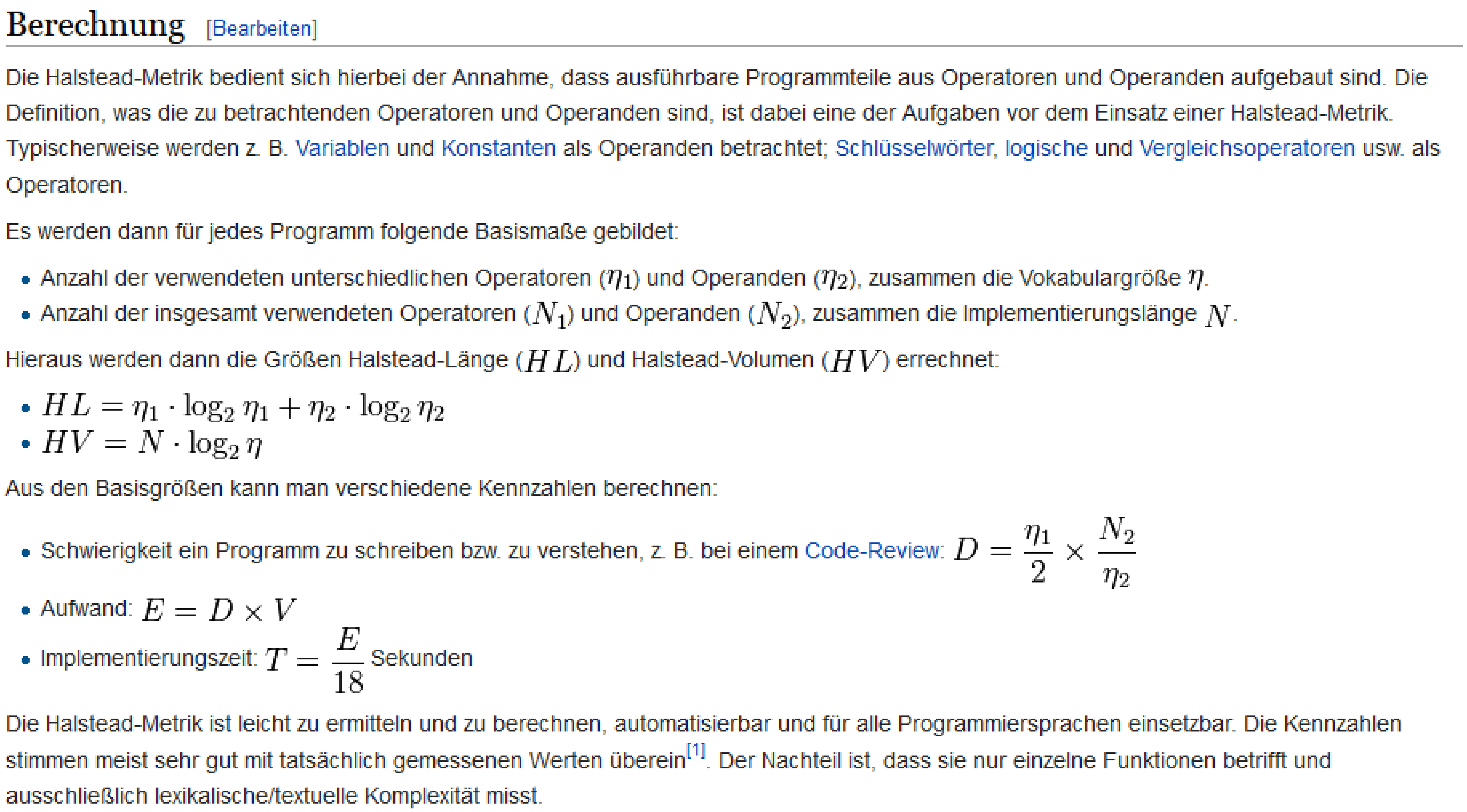
🟩 20 bis 100

△ 9 bis 20

🔴 0 bis 9

Maintainability Index = MAX(0,(171 - 5.2 * log(**Halstead Volume**)
- 0.23 * (**Cyclomatic Complexity**)
- 16.2 * log(**Lines of Code**))*100 / 171)

Halstead Volume



Berechnung [Bearbeiten]

Die Halstead-Metrik bedient sich hierbei der Annahme, dass ausführbare Programmteile aus Operatoren und Operanden aufgebaut sind. Die Definition, was die zu betrachtenden Operatoren und Operanden sind, ist dabei eine der Aufgaben vor dem Einsatz einer Halstead-Metrik. Typischerweise werden z. B. Variablen und Konstanten als Operanden betrachtet; Schlüsselwörter, logische und Vergleichsoperatoren usw. als Operatoren.

Es werden dann für jedes Programm folgende Basismaße gebildet:

- Anzahl der verwendeten unterschiedlichen Operatoren (η_1) und Operanden (η_2), zusammen die Vokabulargröße η.
- Anzahl der insgesamt verwendeten Operatoren (N_1) und Operanden (N_2), zusammen die Implementierungslänge N.

Hieraus werden dann die Größen Halstead-Länge (HL) und Halstead-Volumen (HV) errechnet:

- $HL = \eta_1 \cdot \log_2 \eta_1 + \eta_2 \cdot \log_2 \eta_2$
- $HV = N \cdot \log_2 \eta$

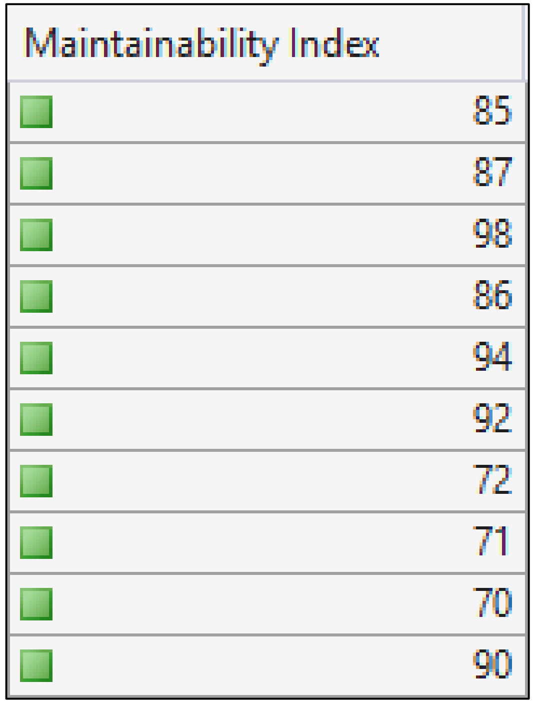
Aus den Basisgrößen kann man verschiedene Kennzahlen berechnen:

- Schwierigkeit ein Programm zu schreiben bzw. zu verstehen, z. B. bei einem Code-Review: $D = \frac{\eta_1}{2} \times \frac{N_2}{\eta_2}$
- Aufwand: $E = D \times V$
- Implementierungszeit: $T = \frac{E}{18}$ Sekunden

Die Halstead-Metrik ist leicht zu ermitteln und zu berechnen, automatisierbar und für alle Programmiersprachen einsetzbar. Die Kennzahlen stimmen meist sehr gut mit tatsächlich gemessenen Werten überein[1]. Der Nachteil ist, dass sie nur einzelne Funktionen betrifft und ausschließlich lexikalische/textuelle Komplexität misst.

Quelle: http://de.wikipedia.org/wiki/Halstead-Metrik

Maintainability Index



Maintainability Index	
🟩	85
🟩	87
🟩	98
🟩	86
🟩	94
🟩	92
🟩	72
🟩	71
🟩	70
🟩	90

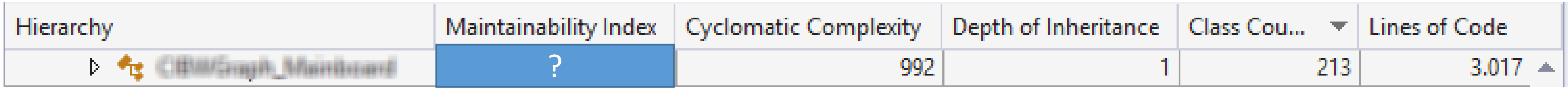
🟩 20 bis 100

△ 9 bis 20

🔴 0 bis 9

Maintainability Index = MAX(0,(171 - 5.2 * log(**Halstead Volume**)
- 0.23 * (**Cyclomatic Complexity**)
- 16.2 * log(**Lines of Code**))*100 / 171)

Maintainability Index



Hierarchy	Maintainability Index	Cyclomatic Complexity	Depth of Inheritance	Class Cou...	Lines of Code
[redacted]	?	992	1	213	3.017

Komplexität

1 bis 10 = normal
11 bis 20 = moderat
21 bis 50 = riskant
> 50 = instabil

LoC

Klasse < 500
Methode < 50

Kopplung

Methode <= 9

Clean Code am Beispiel

FAZIT

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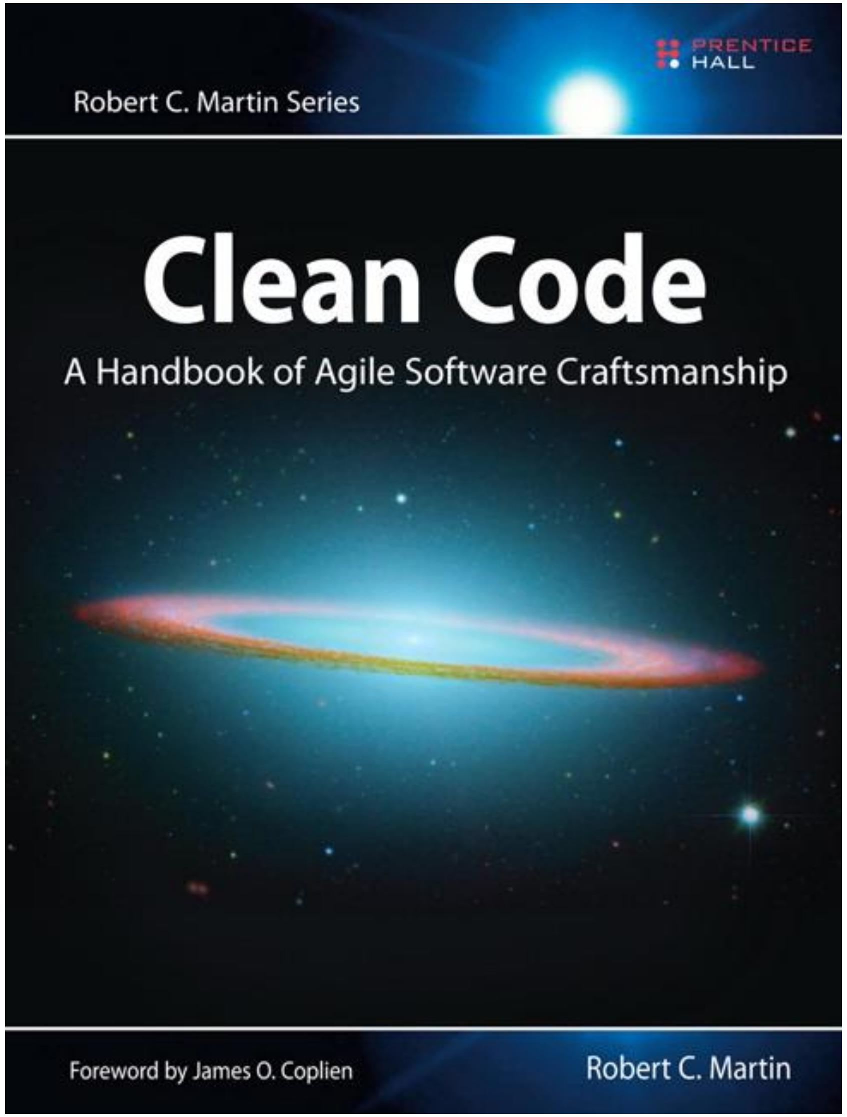
Clean Code



PRENTICE HALL
Robert C. Martin Series
Clean Code
A Handbook of Agile Software Craftsmanship
Foreword by James O. Coplien
Robert C. Martin

„Man sollte versuchen…“

!=

„Mann muss unbedingt, in jedem Fall und darf es in keinster Weise irgend wie anders machen!!!!11!1!1!“

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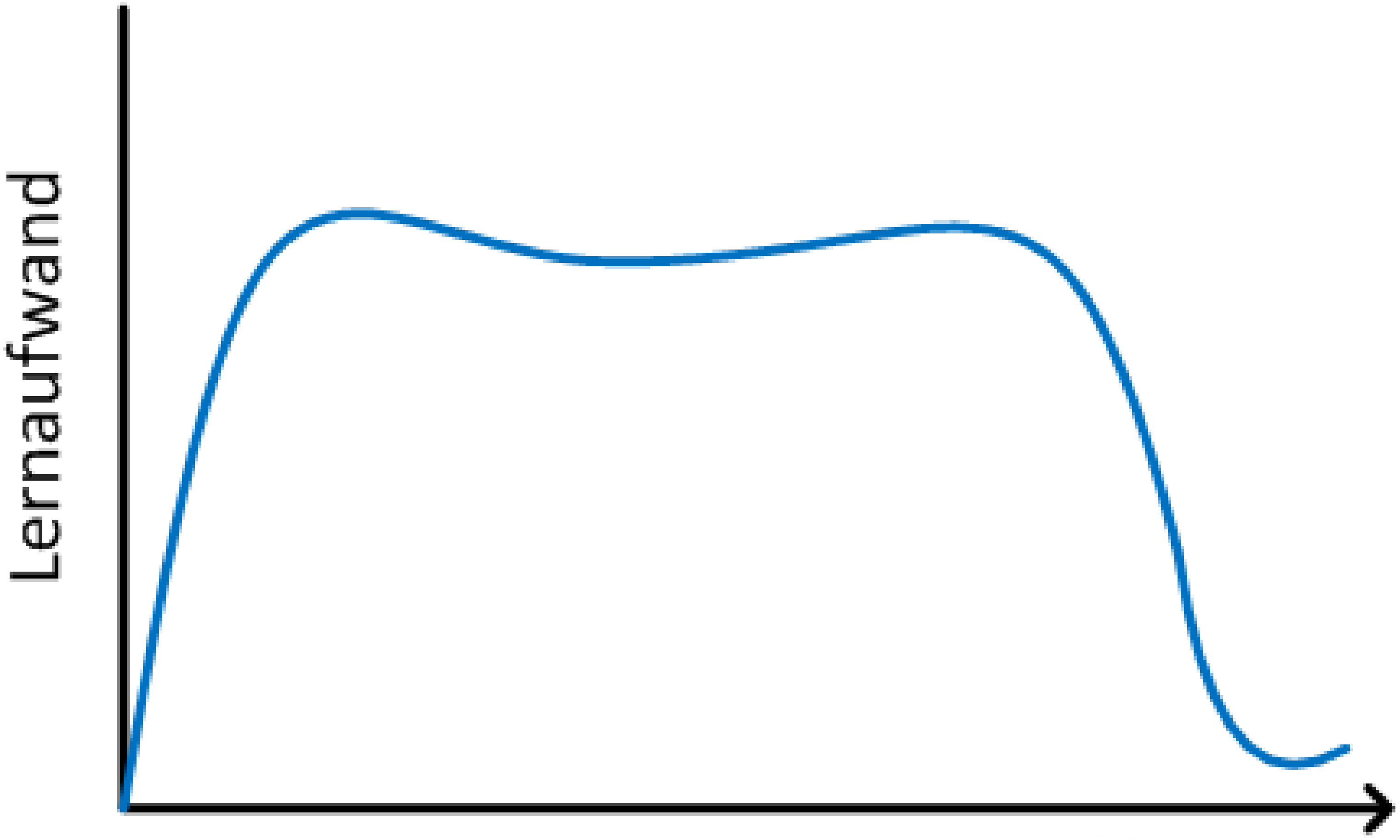
Hump of Pain



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Hendrik Lösch

Senior Consultant

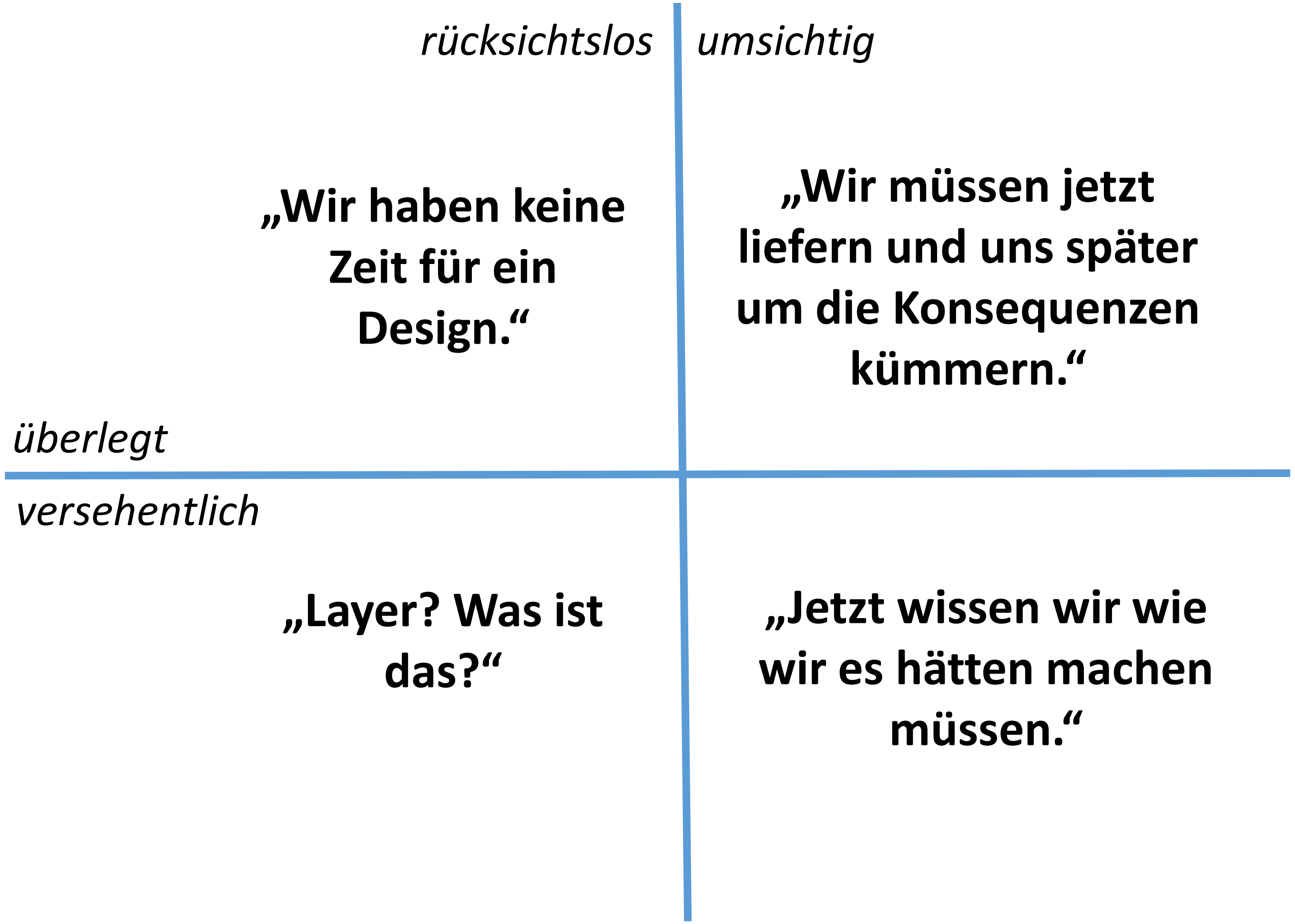
Coach

@HerrLoesch

Hendrik.Loesch@saxsys.de

Just-About.Net

Technische Schuld



rücksichtslos

umsichtig

„Wir haben keine Zeit für ein Design.“

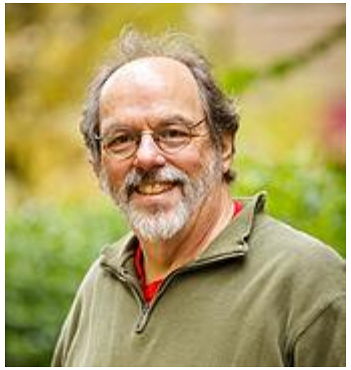
„Wir müssen jetzt liefern und uns später um die Konsequenzen kümmern.“

überlegt

versehentlich

„Layer? Was ist das?“

„Jetzt wissen wir wie wir es hätten machen müssen.“



Ward Cunningham

Saxonia Systems
So geht Software.

Quelle: Martin Fowler http://martinfowler.com/bliki/TechnicalDebtQuadrant.html

Methoden statt Kommentare

```
public IContainer CreateDependencyContainer()
{
    var builder = new ContainerBuilder();

    // Register modules
    builder.RegisterModule<InMemoryModule>();
    builder.RegisterModule<SapStoreModule>();

    // Register infrastructure
    builder.RegisterType<BingMapService>().As<IMapService>().SingleInstance();
    builder.RegisterType<SettingsHandler>().As<ISettingsHandler>().SingleInstance();
    builder.RegisterType<UserAuthorization>().As<IUserAuthorization>();

    // Page View Models
    builder.RegisterType<LoginPageViewModel>().As<LoginPageViewModel>().SingleInstance();
    builder.RegisterType<RouteSelectionPageViewModel>().As<RouteSelectionPageViewModel>().SingleInstance();
    builder.RegisterType<RoutePageViewModel>().As<RoutePageViewModel>().SingleInstance();
    builder.RegisterType<MapViewPageViewModel>().As<MapViewPageViewModel>().SingleInstance();
    builder.RegisterType<ConnectionObjectPageViewModel>().As<ConnectionObjectPageViewModel>().SingleInstance();
    builder.RegisterType<ReadingPageViewModel>().As<ReadingPageViewModel>().SingleInstance();

    // Settings View Models
    builder.RegisterType<GeneralSettingsFlyoutViewModel>().As<GeneralSettingsFlyoutViewModel>();

    // Map ViewModel
    builder.RegisterType<MapServiceControlViewModel>().As<MapServiceControlViewModel>().SingleInstance();

    return builder.Build();
}
```

Methoden statt Kommentare

```
public IContainer CreateDependencyContainer()
{
    var builder = new ContainerBuilder();

    RegisterModules(builder);
    RegisterInfrastructure(builder);
    RegisterViewModels(builder);

    return builder.Build();
}

private static void RegisterModules(ContainerBuilder builder)
{
     …
}

private static void RegisterInfrastructure(ContainerBuilder builder)
{
    …
}

private static void RegisterViewModels(ContainerBuilder builder)
{
    …
}
```