Software Reuse

4. Fortgeschrittene .NET-Techniken

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Motivation

- Grundmechanismen für die Erstellung von Komponenten
  - Festlegung der Schnittstellen
  - Pattern Fassade und Factory
- Weitere Fragestellungen
  - Assembly-Varianten
  - Versionierung
  - Signieren
  - Verwaltung und Konfiguration
  - Komplexe Assemblies

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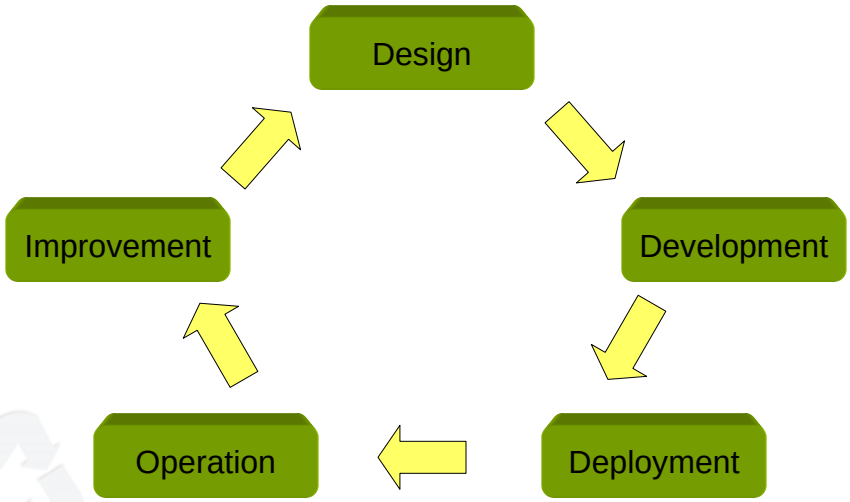
Lebenszyklus einer Komponente



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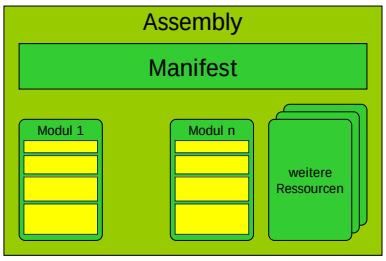
Assemblies

- Einheit für Reuse, Versionierung und Sicherheit
- „Singlefile“ und „Multifile“ Assemblies
  - Singlefile können von Visual Studio erzeugt werden
  - Multifile geht über den Assembly Linker



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Singlefile Assemblies

- Assembly-Informationen
  - Allgemeine Angaben
  - Versionsnummer
  - Signierung einer Assembly
- Siehe Datei AssemblyInfo.cs (Projektbestandteil)

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AssemblyInfo.cs (1)

- Allgemeine Informationen

```
using System.Reflection;
using System.Runtime.CompilerServices;

//
// General Information about an assembly is controlled through the following
// set of attributes. Change these attribute values to modify the information
// associated with an assembly.
//
[assembly: AssemblyTitle("")]
[assembly: AssemblyDescription("")]
[assembly: AssemblyConfiguration("")]
[assembly: AssemblyCompany("")]
[assembly: AssemblyProduct("")]
[assembly: AssemblyCopyright("")]
[assembly: AssemblyTrademark("")]
[assembly: AssemblyCulture("")]
```

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AssemblyInfo.cs (2)

- Versionsnummer

```
// Version information for an assembly consists of the following four values:
//
//      Major Version
//      Minor Version
//      Build Number
//      Revision
//
// You can specify all the values or you can default the Revision and Build Numbers
// by using the '*' as shown below:

[assembly: AssemblyVersion("1.0.*")]
```

- Signatur

```
[assembly: AssemblyDelaySign(false)]
[assembly: AssemblyKeyFile("")]
[assembly: AssemblyKeyName("")]
```

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Versionsnummer

- Major Number und Minor Number sind sichtbar
- Build Number und Revision Number
  - Interne Versionen des „Builts“
  - Generell gilt: Gleiche Funktionalität und Semantik bei gleicher Major Number und Minor Numer

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Namen einer Assembly

- Zwei strukturell identische Varianten
- Strongly Named
  - Assembly wurde vom Hersteller signiert
  - Public-Key-Verfahren
  - Kann “privately deployed” werden
  - Kann “globally deployed” werden (GAC)
  - Werkzeug SN.exe
- Weakly Named
  - Kann nur “privately deployed” werden

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SN.exe

```
Usage: SN [-q(uiet)] <option> [<parameters>]
 Options:
  -c [<csp>]
    Set/reset the name of the CSP to use for MSCORSN operations.
  -d <container>
    Delete key container named <container>.
  -D <assembly1> <assembly2>
    Verify <assembly1> and <assembly2> differ only by signature.
  -e <assembly> <outfile>
    Extract public key from <assembly> into <outfile>.
  -i <infile> <container>
    Install key pair from <infile> into a key container named <container>.
  -k <outfile>
    Generate a new key pair and write it into <outfile>.
  -m [y|n]
    Enable (y), disable (n) or check (no parameter) whether key containers
    are machine specific (rather than user specific).
  -o <infile> [<outfile>]
    Convert public key in <infile> to text file <outfile> with comma separated
    list of decimal byte values.
    If <outfile> is omitted, text is copied to clipboard instead.
  -p <infile> <outfile>
    Extract public key from key pair in <infile> and export to <outfile>.
  -pc <container> <outfile>
    Extract public key from key pair in <container> and export to <outfile>.
  -q
    Quiet mode. This option must be first on the command line and will suppress
    any output other than error messages.
  -R <assembly> <infile>
    Re-sign signed or partially signed assembly with the key pair in <infile>.
  -Rc <assembly> <container>
    Re-sign signed or partially signed assembly with the key pair in the key
    container named <container>.
  -t[p] <infile>
    Display token for public key in <infile> (together with the public key
    itself if -tp is used).
  -T[p] <assembly>
    Display token for public key of <assembly> (together with the public key
    itself if -Tp is used).
  -v[f] <assembly>
    Verify <assembly> for strong name signature self consistency. If -vf is
    specified, force verification even if disabled in the registry.
  -Vl
    List current settings for strong name verification on this machine.
  -Vr <assembly> [<userlist>]
    Register <assembly> for verification skipping (with an optional, comma
    separated list of usernames for which this will take effect). <assembly>
    can be specified as * to indicate all assemblies or *,<public key token> to
    indicate that all assemblies with the given public key token. Public key
    tokens should be specified as a string of hex digits.
  -Vu <assembly>
    Unregister <assembly> for verification skipping. The same rules for
    <assembly> naming are followed as for -Vr.
  -Vx
    Remove all verification skipping entries.
```

Signieren einer Assembly

- Hersteller braucht ein Public-Key-Paar
  - SN.exe –k BestSoftwareEver.keys
- Anschauen
  - SN.exe –p BSE.keys BSE.public_key
  - SN.exe –tp BSE.keys

```
Microsoft (R) .NET Framework Strong Name Utility  Version 1.1.4322.573
Copyright (C) Microsoft Corporation 1998-2002. All rights reserved.

Public key is
00240000048000009400000006020000002400005253413100040000010001009941121ddffbf4
1ee0b5efee2dd1eb91a8d1f831c793314335ad30e85e111379df4f96258c396147f94a8006faa3
21ea2adb3a7923b65649aa52d11c0a0fcdf583ad2c7a4b022db08dedbc6dac520c117ce5529e6e
87a54c038bdb1efe07565363dab41346ad1a1bffa5fe9b9318017622ed64e939b1ead8d3c7111f
5c1bc9cb

Public key token is 5a727441da01ba0d
```

Public Key Token = 64 Bit Hash des öffentlichen Schlüssels

- Angabe der Key-Datei in AssemblyInfo.cs

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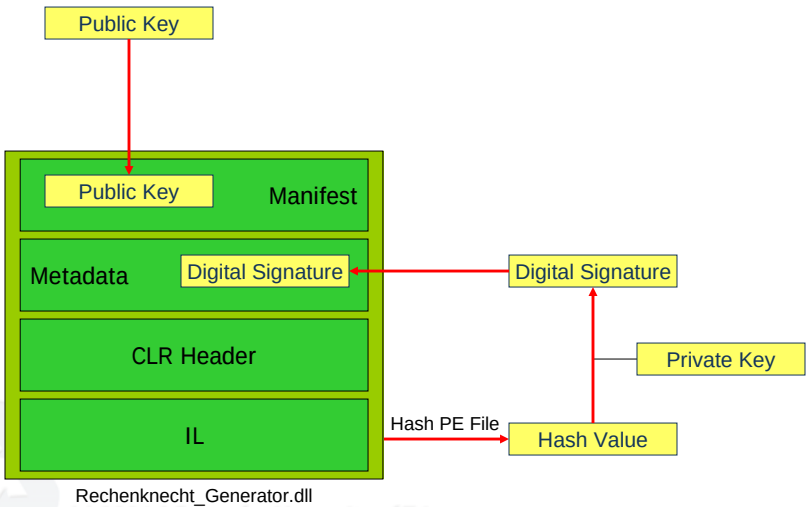
Was passiert beim Signieren?



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Delayed Signing

- Signieren erfordert den privaten Schlüssel
  - Schutz dieses Schlüssels ist extrem wichtig
  - Microsofts privater Schlüssel ist im Tresor und nur Bill darf dran
- Während der Entwicklung privater Schlüssel nicht zwingend notwendig
  - Attribut DelaySign auf true setzen
  - Assembly enthält Public-Key
  - Assembly kann in GAC (Umgehung der Verifikation)
  - Referenz über Public-Key funktioniert ebenfalls
  - Beim Laden wird Verifikationstest übersprungen
- Nur bei Veröffentlichung der Assembly explizites Signieren mit privatem Schlüssel

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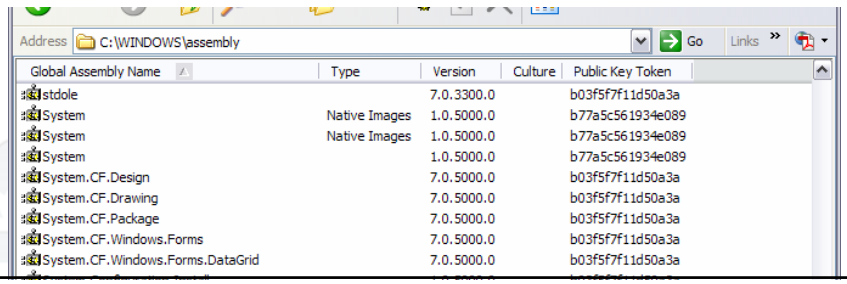
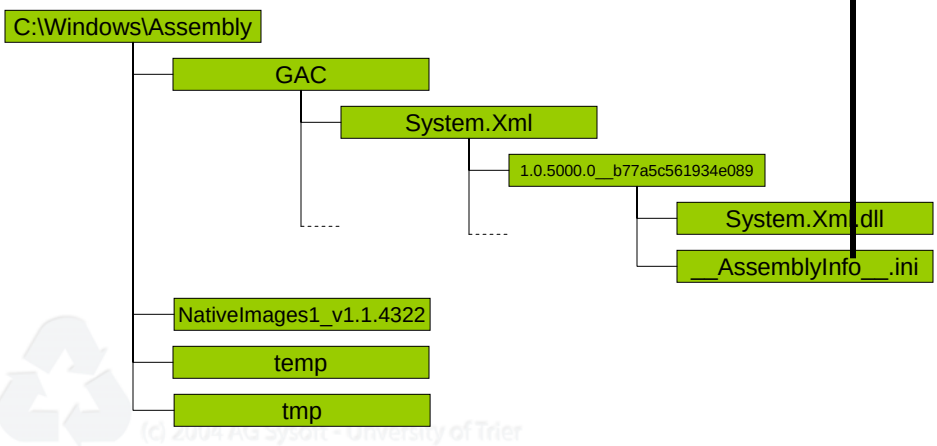
Globally Deployed Assembly

- Aufnahme einer strongly named Assembly in den globalen Cache
  - Verborgene Directory-Struktur unter C:\Windows\Assembly\GAC
- Tool-Unterstützung
  - Gacutil.exe
  - Explorer Shell Extension (ShFusion.dll)
    - Wird mit .NET Framework installiert



Struktur des GAC

```
[AssemblyInfo]
Signature=93c2087fa9dc30f1cea58fe8cd15565489ca9e30
MVID=2118767ade4dcc42b5c19a416198f600
DisplayName=System.Xml, Version=1.0.5000.0, Culture=neutral, PublicKeyToken=b77a5c561934e089
```



Gacutil.exe

```
Microsoft (R) .NET Global Assembly Cache Utility.  Version 1.1.4322.573
Copyright (C) Microsoft Corporation 1998-2002. All rights reserved.

Usage: Gacutil <command> [ <options> ]
Commands:
  /i <assembly_path> [ /r <...> ] [ /f ]
    Installs an assembly to the global assembly cache.

  /il <assembly_path_list_file> [ /r <...> ] [ /f ]
    Installs one or more assemblies to the global assembly cache.

  /u <assembly_display_name> [ /r <...> ]
    Uninstalls an assembly from the global assembly cache.

  /ul <assembly_display_name_list_file> [ /r <...> ]
    Uninstalls one or more assemblies from the global assembly cache.

  /ungen <assembly_name>
    Uninstalls a native image installed via the NGEN utility.

  /l [ <assembly_name> ]
    List the global assembly cache filtered by <assembly_name>

  /lr [ <assembly_name> ]
    List the global assembly cache with all traced references.

  /cdl
    Deletes the contents of the download cache

  /ldl
    Lists the contents of the download cache

  /?
    Displays a detailed help screen

Options:
  /r <reference_scheme> <reference_id> <description>
    Specifies a traced reference to install (/i, /il) or uninstall (/u, /ul).

  /f
    Forces reinstall of an assembly.

  /nologo
    Suppresses display of the logo banner

  /silent
    Suppresses display of all output
```

Privately Deployed Assembly

- Referenzierte Assemblies befinden sich im Verzeichnis der Anwendung
- Weitergehende Konfiguration ist möglich
  - XML-Datei <AssemblyName>.config
  - Zugriff auf Konfiguration im Programm selbst möglich (System.Configuration)
- Beispiel
  - Komponenten Generator und Tutor in eigenes Unterverzeichnis Assemblies schieben

```
<?xml version="1.0" encoding="utf-8" ?>

<configuration>
    <runtime>
        <assemblyBinding xmlns="urn:schemas-microsoft-com:asm.v1">
            <probing privatePath="Assemblies" />
        </assemblyBinding>
    </runtime>
</configuration>
```

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Weitere Konfigurationsmöglichkeiten

- **`privatePath`** (privately deployed assemblies)
  - Zusätzliche Suchverzeichnisse beim Zugriff auf Assemblies
- codeBase
  - Wo befinden sich die Dateien der Assembly
  - Syntax: URL
  - Insbesondere auch URLs im WWW möglich
- Änderungen beim Referenzieren anderer Assemblies
  - bindingRedirect (Manueller Eingriff bei der Abbildung auf bestimmte Versionen)
    - Z.B. 3.0.0.0-3.5.0.0 auf 4.1.0.0
- Entsprechende Änderungen auch mit dem Konfigurationstool möglich

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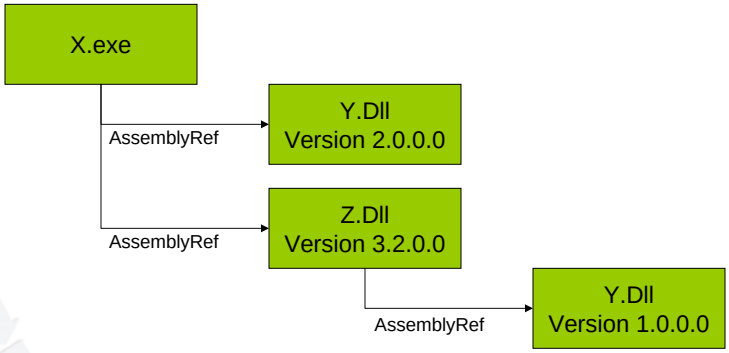
Side-by-Side Execution

- Nutzung verschiedener Versionen einer Komponente in einer Anwendung



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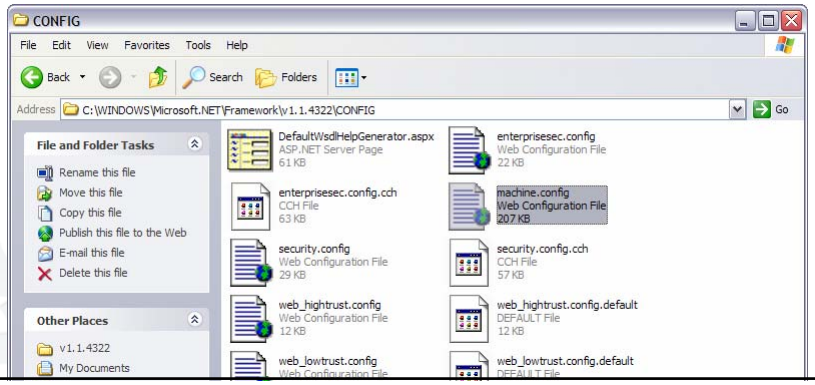
Konfiguration

- Assembly-spezifisch über entsprechende XML-Datei
- Systemweite Konfigurationsdateien
  - Modifikationen vorzugsweise über das Konfigurationstool mscorcfg.msc



Security

- Zugriffskontrolle auf geschützte Ressourcen
- 3 Ebenen
  - Enterprise
  - Machine
  - User
- Innerhalb jeder Ebene
  - Code Groups
    - Baumstruktur für Zugriffsrechte (Initial All_Code)
  - Permission Sets
    - Zusammenfassen von Rechten
    - Vorhanden sind: FullTrust, Execution, Intranet, Nothing, …
    - Neue Sets definierbar
  - Policy Assemblies
    - Unterstützen und Ergänzen Zugriffskontrolle
    - Anwendung kann eigene schützenswerte Ressourcen realisieren

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Al.exe

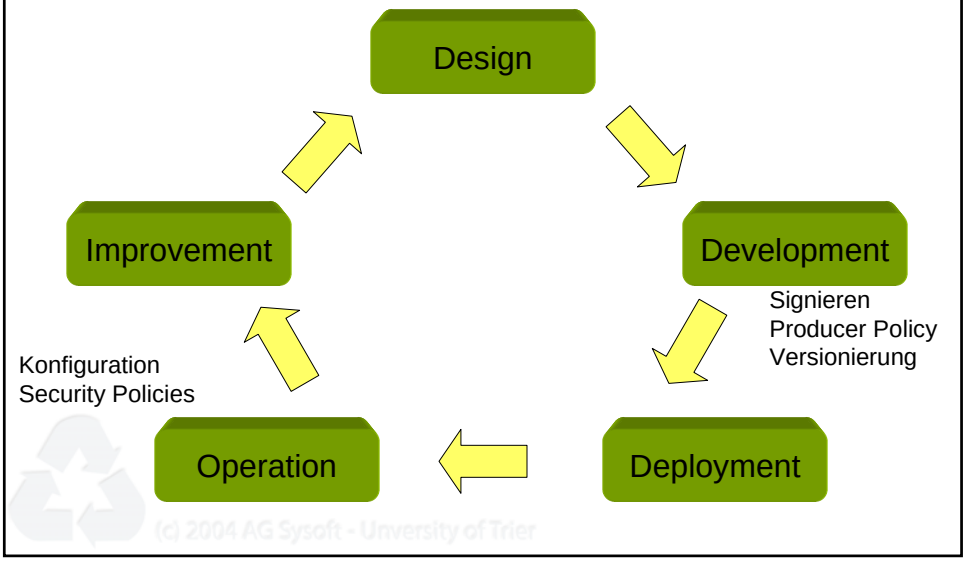
```
Microsoft (R) Assembly Linker version 7.10.3077
for Microsoft (R) .NET Framework version 1.1.4322
Copyright (C) Microsoft Corporation 2001-2002. All rights reserved.

Usage: al [options] [sources]
Options: ('/out' must be specified)

  /? or /help               Display this usage message
  @<filename>               Read response file for more options
  /algid:<id>               Algorithm used to hash files (in hexadecimal)
  /base[address]:<addr>     Base address for the library
  /bugreport:<filename>     Create a 'Bug Report' file
  /comp[any]:<text>         Company name
  /config[uration]:<text>   Configuration string
  /copy[right]:<text>       Copyright message
  /c[ulture]:<text>         Supported culture
  /delay[sign][+|-]         Delay sign this assembly
  /descr[iption]:<text>     Description
  /e[vidence]:<filename>    Security evidence file to embed
  /fileversion:<version>    Optional Win32 version (overrides assembly version)
  /flags:<flags>            Assembly flags  (in hexadecimal)
  /fullpaths                Display files using fully-qualified filenames
  /keyf[ile]:<filename>     File containing key to sign the assembly
  /keyn[ame]:<text>         Key container name of key to sign assembly
  /main:<method>            Specifies the method name of the entry point
  /nologo                   Suppress the startup banner and copyright message
  /out:<filename>           Output file name for the assembly manifest
  /prod[uct]:<text>         Product name
  /productv[ersion]:<text>  Product version
  /t[arget]:lib[rary]       Create a library
  /t[arget]:exe             Create a console executable
  /t[arget]:win[exe]        Create a Windows executable
  /template:<filename>      Specifies an assembly to get default options from
  /title:<text>             Title
  /trade[mark]:<text>       Trademark message
  /v[ersion]:<version>      Version (use * to auto-generate remaining numbers)
  /win32icon:<filename>     Use this icon for the output
  /win32res:<filename>      Specifies the Win32 resource file

Sources: (at least one source input is required)
  <filename>[,<targetfile>] add file to assembly
  /embed[resource]:<filename>[,<name>[,Private]]
                            embed the file as a resource in the assembly
  /link[resource]:<filename>[,<name>[,<targetfile>[,Private]]]
                            link the file as a resource to the assembly
```

Lebenszyklus einer Komponente (.NET)



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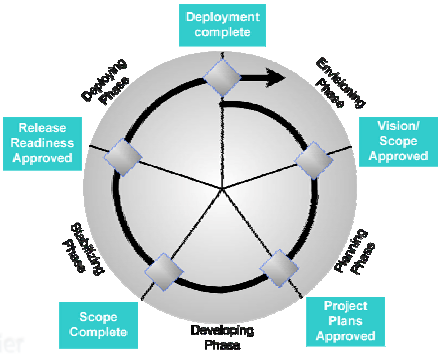
Microsoft Solutions Framework (MSF)

- Softwareentwicklung wie Microsoft sie sich vorstellt
- Enthält unterschiedliche Modelle
  - Prozeß-Modell: Abläufe
  - Team-Modell: Zusammenspiel und Rollen
  - …
- Idee
  - Reproduzierbare Erfolge
  - Best Practice
- Entsprechende Frameworks gewinnen an Bedeutung



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Literatur

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