Castle Windsor

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Who am I?

- Senior student at Bogazici University
- (Passive) committer at Castle and NHibernate
- Blogger at his own blog and also on devlicio.us
- Has an interest in Robotics and its applications

What is DI all about?

- It is a pattern in Martin Fowler's book
- Depends on the principle of providing dependencies from the outside
- Made up of 3 components
  - Dependent
  - Dependency
  - Dependency provider

Why should we use DI?

- Loosely coupled components/services
- Increased testability
- Reduced cost of changes in later stages of development
- Ability to change implementations between testing and deployment

Why should not we use DI?

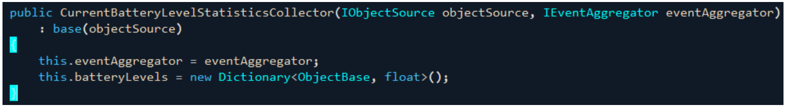
- ...

Dependency Injection Methods

- Constructor Injection
- Property Injection
- Method Injection

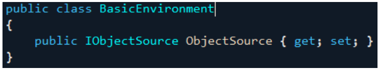
Dependency Injection Methods - Examples

- Constructor Injection



```
public CurrentBatteryLevelStatisticsCollector(IObjectSource objectSource, IEventAggregator eventAggregator)
    : base(objectSource)
{
    this.eventAggregator = eventAggregator;
    this.batteryLevels = new Dictionary<ObjectBase, float>();
}
```

- Property Injection



```
public class BasicEnvironment
{
    public IObjectSource ObjectSource { get; set; }
}
```

- Method Injection

Inversion of Control Container

- A point where all components are registered and being accessed
- A component which resolves dependencies of a requested component automatically
- Enables us to change implementations without much trouble

Why Castle Windsor?

- A popular framework
- Active development
    - 118 commits between October 2009 and February 2010.
    - 2nd version
- Extensibility points

Castle Windsor Configuration

- XML Configuration
- Fluent Configuration
- Binsor/Boo Configuration

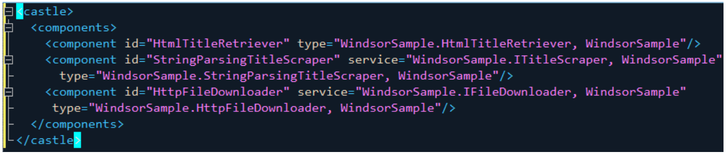
XML Configuration

Cons

- Old school
- Error-prone

Pros

- Ability to change without compilation



```
<castle>
  <components>
    <component id="HtmlTitleRetriever" type="WindsorSample.HtmlTitleRetriever, WindsorSample"/>
    <component id="StringParsingTitleScraper" service="WindsorSample.ITitleScraper, WindsorSample"
      type="WindsorSample.StringParsingTitleScraper, WindsorSample"/>
    <component id="HttpFileDownloader" service="WindsorSample.IFileDownloader, WindsorSample"
     type="WindsorSample.HttpFileDownloader, WindsorSample"/>
  </components>
</castle>
```

Fluent/Programmatic Configuration

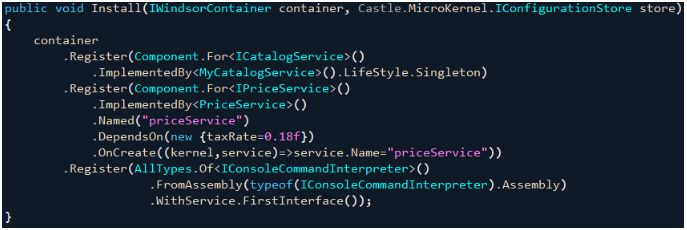
Cons

- Very hard, if not impossible, to change after compilation

Pros

- Compile time checking
- Intellisense
- AllTypes Of
- Convention over Configuration

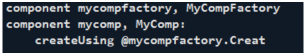
Fluent/Programmatic Configuration - Cont'd



```
public void Install(IWindsorContainer container, Castle.MicroKernel.IConfigurationStore store)
{
    container
        .Register(Component.For<ICatalogService>()
            .ImplementedBy<MyCatalogService>().LifeStyle.Singleton)
        .Register(Component.For<IPriceService>()
            .ImplementedBy<PriceService>()
            .Named("priceService")
            .DependsOn(new {taxRate=0.18f})
            .OnCreate((kernel,service)=>service.Name="priceService"))
        .Register(AllTypes.Of<IConsoleCommandInterpreter>()
                    .FromAssembly(typeof(IConsoleCommandInterpreter).Assembly)
                    .WithService.FirstInterface());
}
```

Boo/Binsor Configuration

- Compile/Runtime checking
- Intellisense (MonoDevelop)
- Easy to change after compilation of application
- Easier configuration with the help of Boo extensibility(macros)



```
component mycompfactory, MyCompFactory
component mycomp, MyComp:
    createUsing @mycompfactory.Creat
```

Extensibility points

- Facilities
- Events
- Dependency resolution control mechanisms
    - Subdependency Resolver
    - Handler Selector
    - Interceptor Selector
- Lifestyle control mechanisms
- Object initialization control mechanisms

Facilities

- MK/Windsor's points of configurations
- A point where a group of related configuration (microkernel) tasks take place

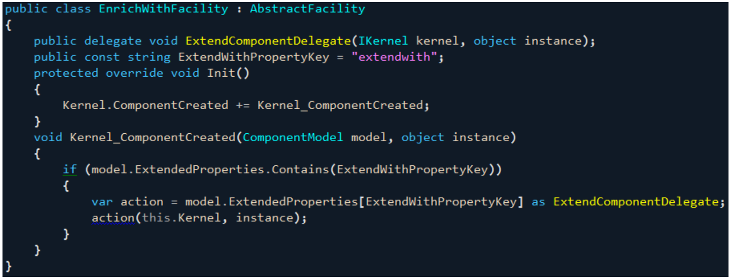
Available Facilities

- Active Record Integration
- Automatic Transaction Management
- Batch Registration - Obselete
- Event Wiring
- Factory Support
- Nhibernate Integration
- Synchronize
- WCF Facility

Eventler

- ComponentRegistered
- ComponentUnregistered
- ComponentModelCreated
- ComponentCreated
- ComponentDestroyed
- DependencyResolving
- and several others

Eventler - Code



```
public class EnrichWithFacility : AbstractFacility
{
    public delegate void ExtendComponentDelegate(IKernel kernel, object instance);
    public const string ExtendWithPropertyKey = "extendwith";
    protected override void Init()
    {
        Kernel.ComponentCreated += Kernel_ComponentCreated;
    }
    void Kernel_ComponentCreated(ComponentModel model, object instance)
    {
        if (model.ExtendedProperties.Contains(ExtendWithPropertyKey))
        {
            var action = model.ExtendedProperties[ExtendWithPropertyKey] as ExtendComponentDelegate;
            action(this.Kernel, instance);
        }
    }
}
```

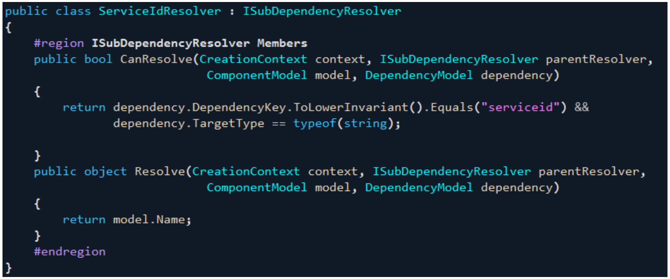
Dependency resolution control mechanisms

- Subdependency Resolver
- Handler Selector
- Interceptor Selector

Subdependency Resolver

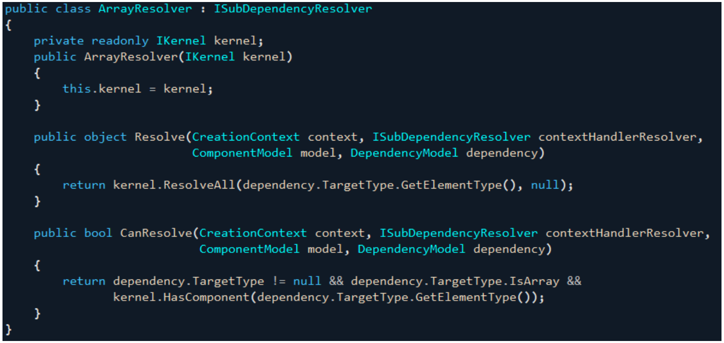
- Tells how a specific dependency of a component should be resolved
- We can either use an existing component or create a new one as the dependency
- Does not affect previously initialized components (MEF can do it)

Subdependency Resolver - Code



```
public class ServiceIdResolver : ISubDependencyResolver
{
    #region ISubDependencyResolver Members
    public bool CanResolve(CreationContext context, ISubDependencyResolver parentResolver,
                           ComponentModel model, DependencyModel dependency)
    {
        return dependency.DependencyKey.ToLowerInvariant().Equals("serviceid") &&
               dependency.TargetType == typeof(string);

    }
    public object Resolve(CreationContext context, ISubDependencyResolver parentResolver,
                           ComponentModel model, DependencyModel dependency)
    {
        return model.Name;
    }
    #endregion
}
```

Subdependency Resolver - Code 2



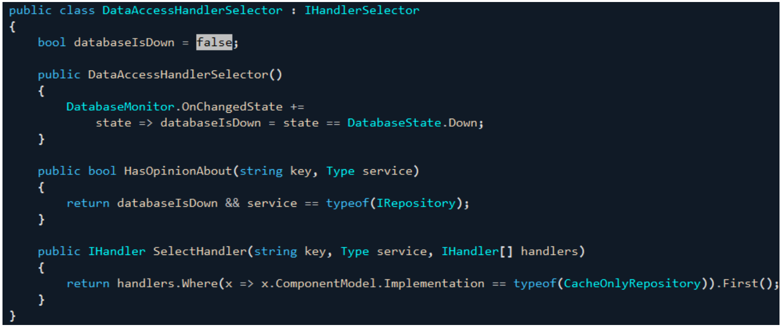
```
public class ArrayResolver : ISubDependencyResolver
{
    private readonly IKernel kernel;
    public ArrayResolver(IKernel kernel)
    {
        this.kernel = kernel;
    }

    public object Resolve(CreationContext context, ISubDependencyResolver contextHandlerResolver,
                          ComponentModel model, DependencyModel dependency)
    {
        return kernel.ResolveAll(dependency.TargetType.GetElementType(), null);
    }

    public bool CanResolve(CreationContext context, ISubDependencyResolver contextHandlerResolver,
                           ComponentModel model, DependencyModel dependency)
    {
        return dependency.TargetType != null && dependency.TargetType.IsArray &&
               kernel.HasComponent(dependency.TargetType.GetElementType());
    }
}
```

Spot the potential problem

Handler Selector

- Allows us to specify what to return as a result of .Resolve<T> calls depending on context
- Does not affect previously initialized components

Handler Selector - Code



```
public class DataAccessHandlerSelector : IHandlerSelector
{
    bool databaseIsDown = false;

    public DataAccessHandlerSelector()
    {
        DatabaseMonitor.OnChangedState +=
            state => databaseIsDown = state == DatabaseState.Down;
    }

    public bool HasOpinionAbout(string key, Type service)
    {
        return databaseIsDown && service == typeof(IRepository);
    }

    public IHandler SelectHandler(string key, Type service, IHandler[] handlers)
    {
        return handlers.Where(x => x.ComponentModel.Implementation == typeof(CacheOnlyRepository)).First();
    }
}
```

Interceptor Selector/Interceptor Model Selector/IProxyGeneration Hook

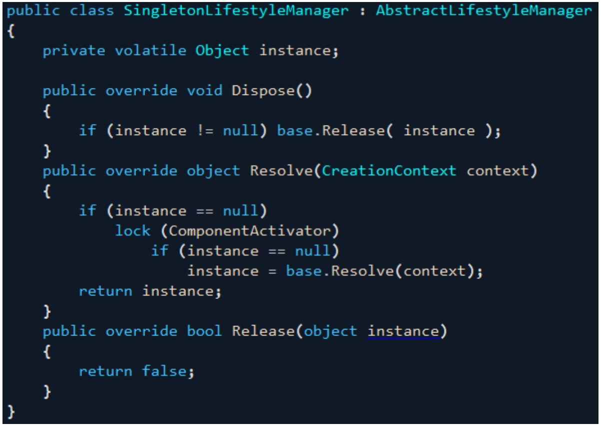
- Allows us to change cross-cutting concerns at runtime
- We can specify what interceptors should be attached
- Allows us to specify what methods to intercept

Lifestyle control mechanisms

Decides when to create a component

- Singleton
- PerThread
- PerWebRequest
- Transient
- Poolable
- Custom

Available Lifestyles - Singleton



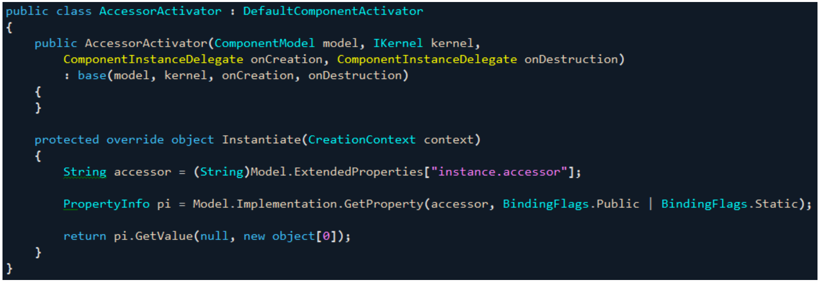
```
public class SingletonLifestyleManager : AbstractLifestyleManager
{
    private volatile Object instance;

    public override void Dispose()
    {
        if (instance != null) base.Release( instance );
    }
    public override object Resolve(CreationContext context)
    {
        if (instance == null)
            lock (ComponentActivator)
                if (instance == null)
                    instance = base.Resolve(context);
        return instance;
    }
    public override bool Release(object instance)
    {
        return false;
    }
}
```

Component initialization control mechanisms

Contains the logic related to creation of components. They are called Activators in Castle terms.

- Default Activator (The place where dependency injection basically takes place)
- Accessor/Factory Activator (Used by Factory Support Facility)

Component initialization control mechanisms - Accessor Activator



```
public class AccessorActivator : DefaultComponentActivator
{
    public AccessorActivator(ComponentModel model, IKernel kernel,
        ComponentInstanceDelegate onCreation, ComponentInstanceDelegate onDestruction)
        : base(model, kernel, onCreation, onDestruction)
    {
    }

    protected override object Instantiate(CreationContext context)
    {
        String accessor = (String)Model.ExtendedProperties["instance.accessor"];

        PropertyInfo pi = Model.Implementation.GetProperty(accessor, BindingFlags.Public | BindingFlags.Static);

        return pi.GetValue(null, new object[0]);
    }
}
```

DI Advantages

- Reduced cost of change
- Increased testability
- Allows us to think in terms of component

Windsor

- A framework that is developed as a result of needs
- Easy integration with other frameworks
- Active development

Resources

- http://castleproject.org
- http://groups.google.com/group/castle-project-users/
- http://ayende.com