3.– 6. September 2012
in Nürnberg

Herbstcampus

Wissenstransfer
par excellence

Die fünfte Generation

Das Entity Framework 5.0

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MATHEMA Software GmbH

Agenda

- (Architektur) Überblick
- Entitäten beschreiben
- CRUD
- Abfragesprachen
- Beziehungen
- Performance
- Zusammenfassung

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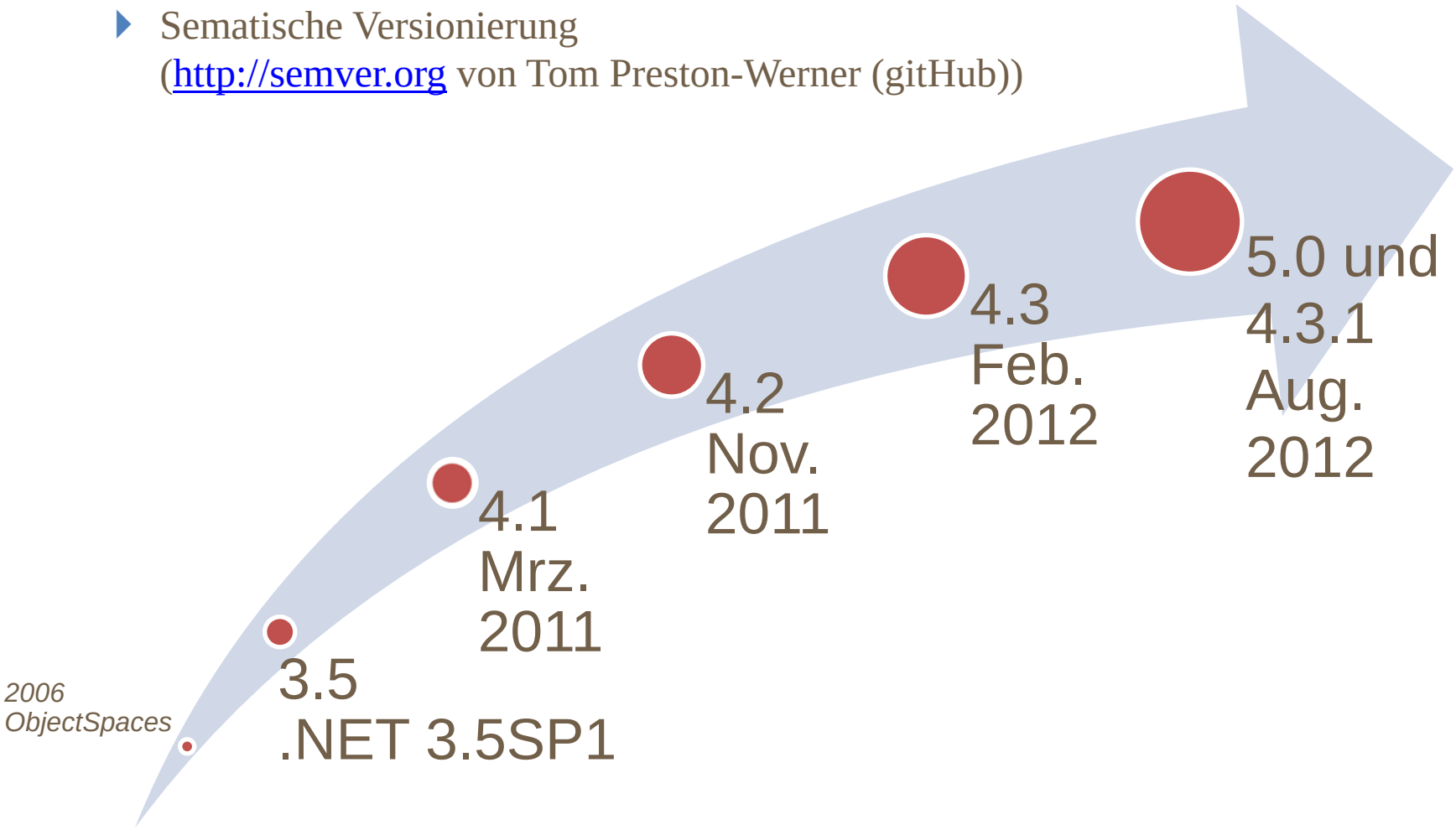
Überblick Entity Framework

- Aktuell Version 5.0
- Kapselt ADO.Net und SQL vor Entwickler
- Unterstützt SQL Server „*out-of-the-box*“
- (Transparente) Persistenz für (POCO) Klassen
- Unterstützung von Vererbungshierarchien und polymorphen Abfragen
- Transitive Persistenz für Objektgraphen
- Unterstützung für sog. Complex Types
- Unterstützung für ‚Lazy Loading‘ vs ‚Eager Fetching‘
- Optimistische Locking
- Unterstützung von abgekoppelten Objekten
- SQL Tracing ist Bestandteil, aber nur für Abfragen
  - Abhilfe schafft EFProviderWrapper

Überblick Entity Framework - Versionen

- Sematische Versionierung
  (http://semver.org von Tom Preston-Werner (gitHub))



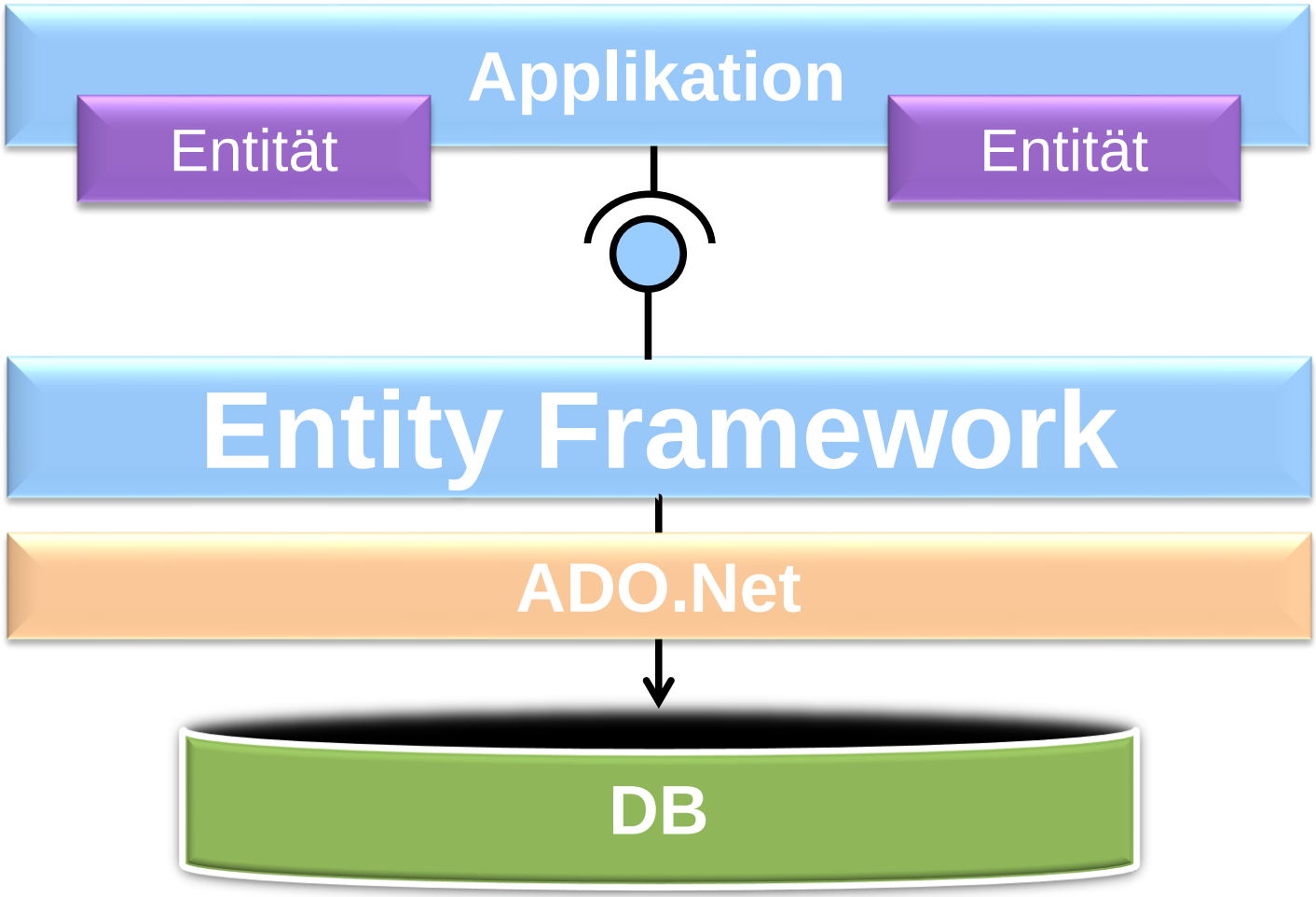
Überblick Entity Framework –Features 5.0

- Open Source (!)
  - Mono 2.11.3 enthält das Entity Framework
- Mehrere Diagramme pro Entity Modell
- Enum Unterstützung
- Spatial Types
  - DBGeography Typ
  - DbGeometry Typ
- Value-Typed Functions
- Performance Optimierungen

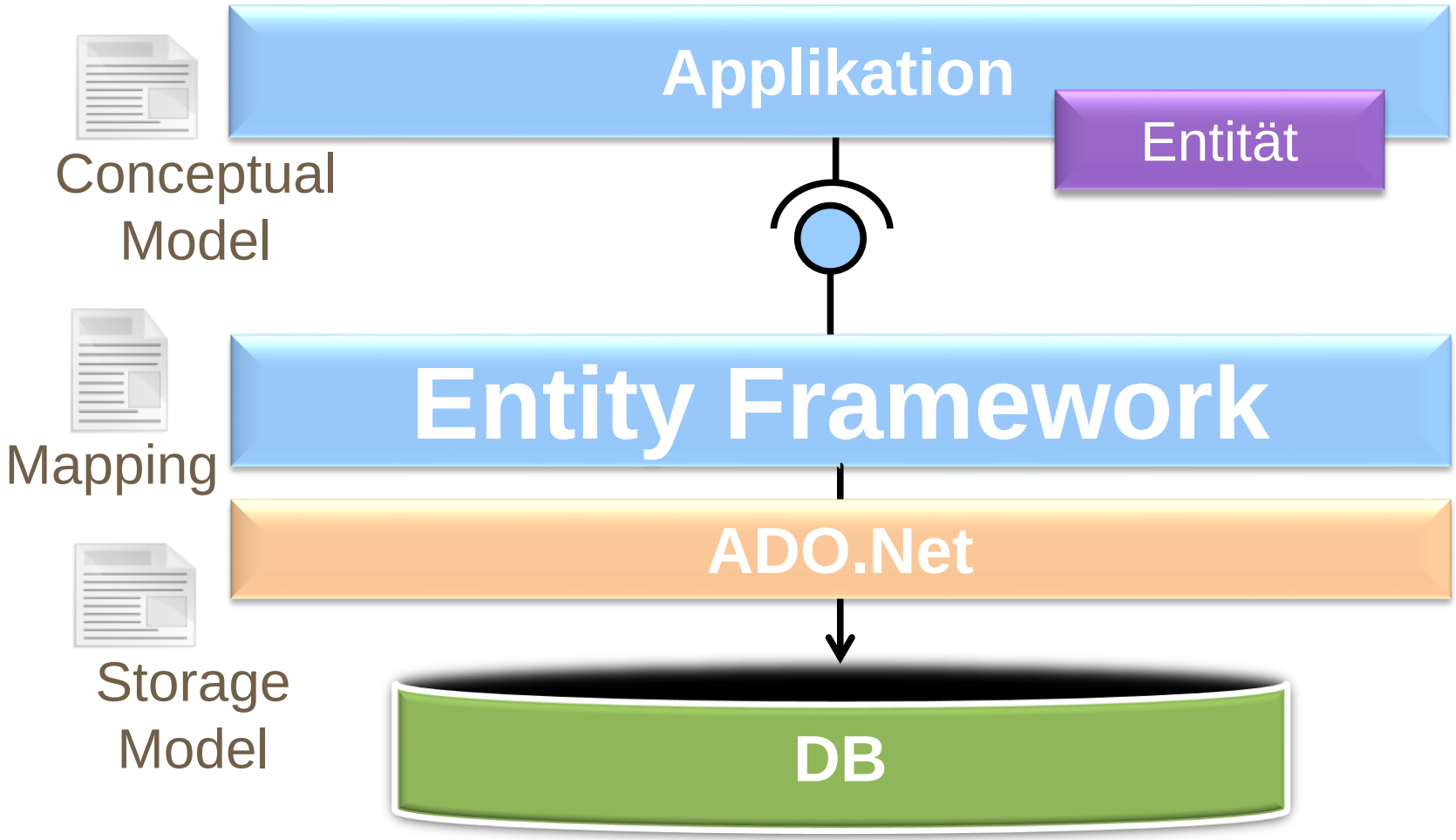
Vergleich

NHibernate	Entity Framework
Open Source	Open Source
Version 3.3.1 GA	Version 5.0
Unterstützt verschiedene Datenbanken	SQL Server, andere über Drittanbieter
NHibernate Attributes, Nhibernate.ByCode	Code First Annotations, Code First Fluent API
SQL Tracing leicht möglich	SQL Tracing eingeschränkt möglich (`ToTraceString()`)

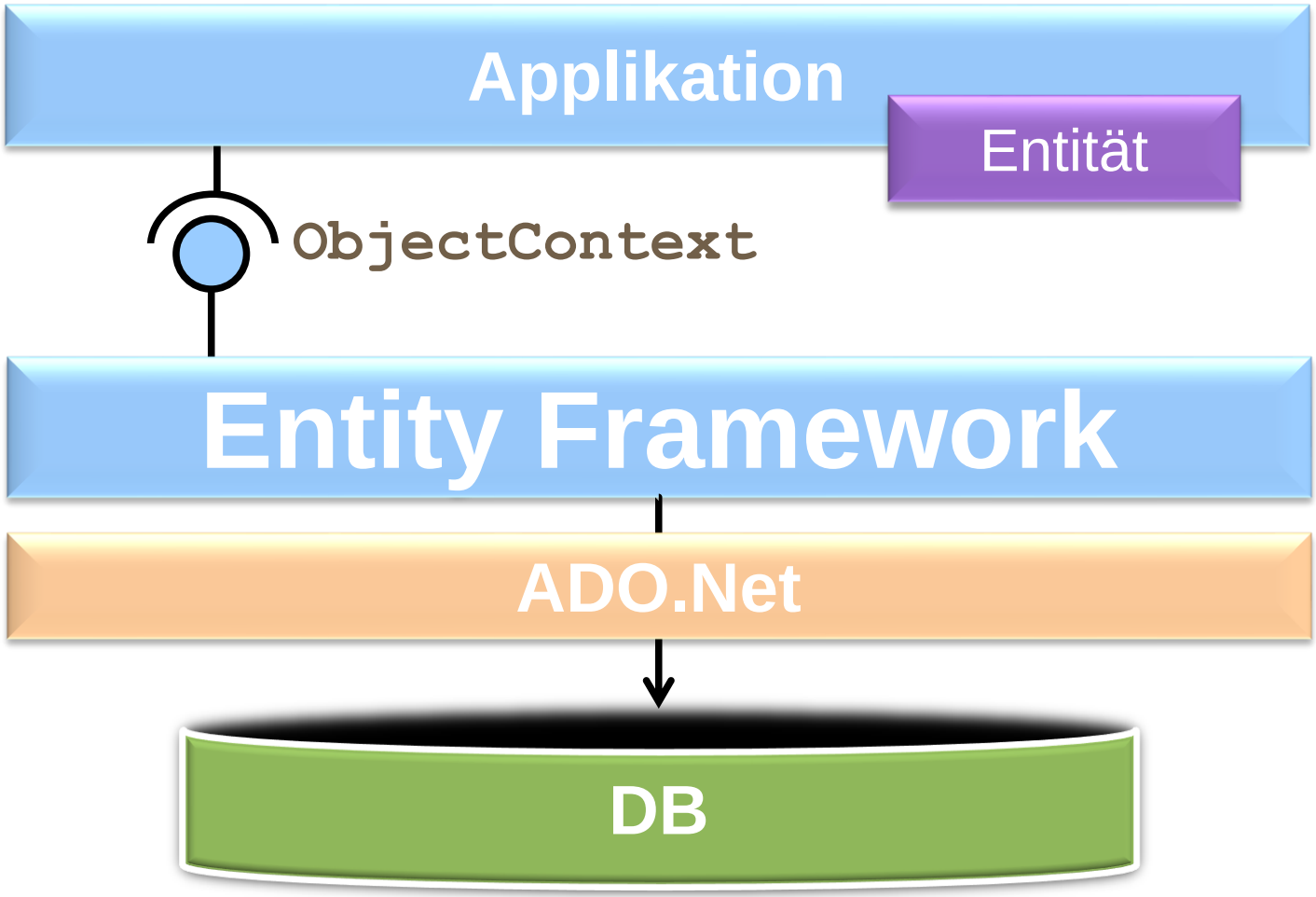
Entity Framework Architektur



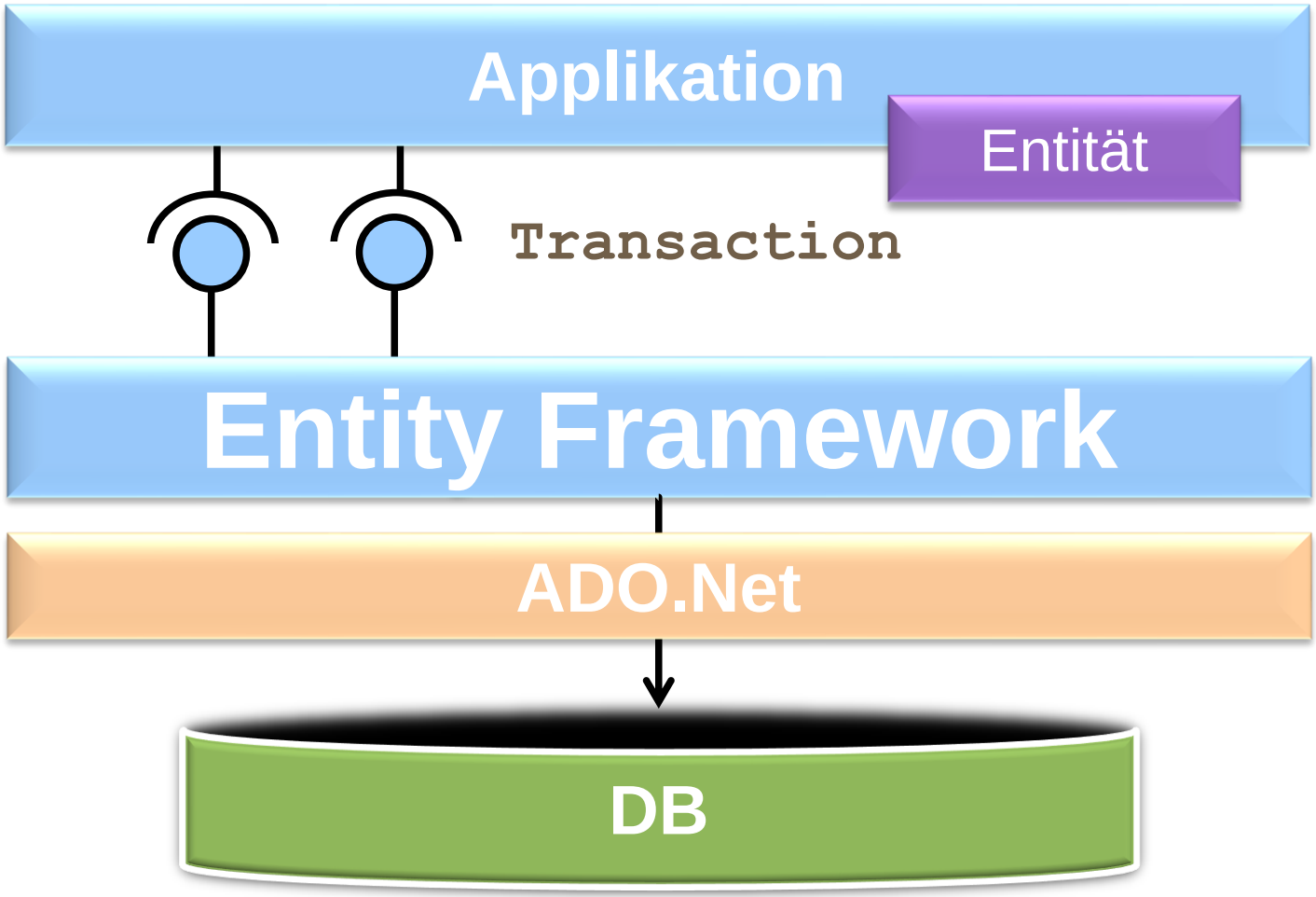
Entity Framework Architektur



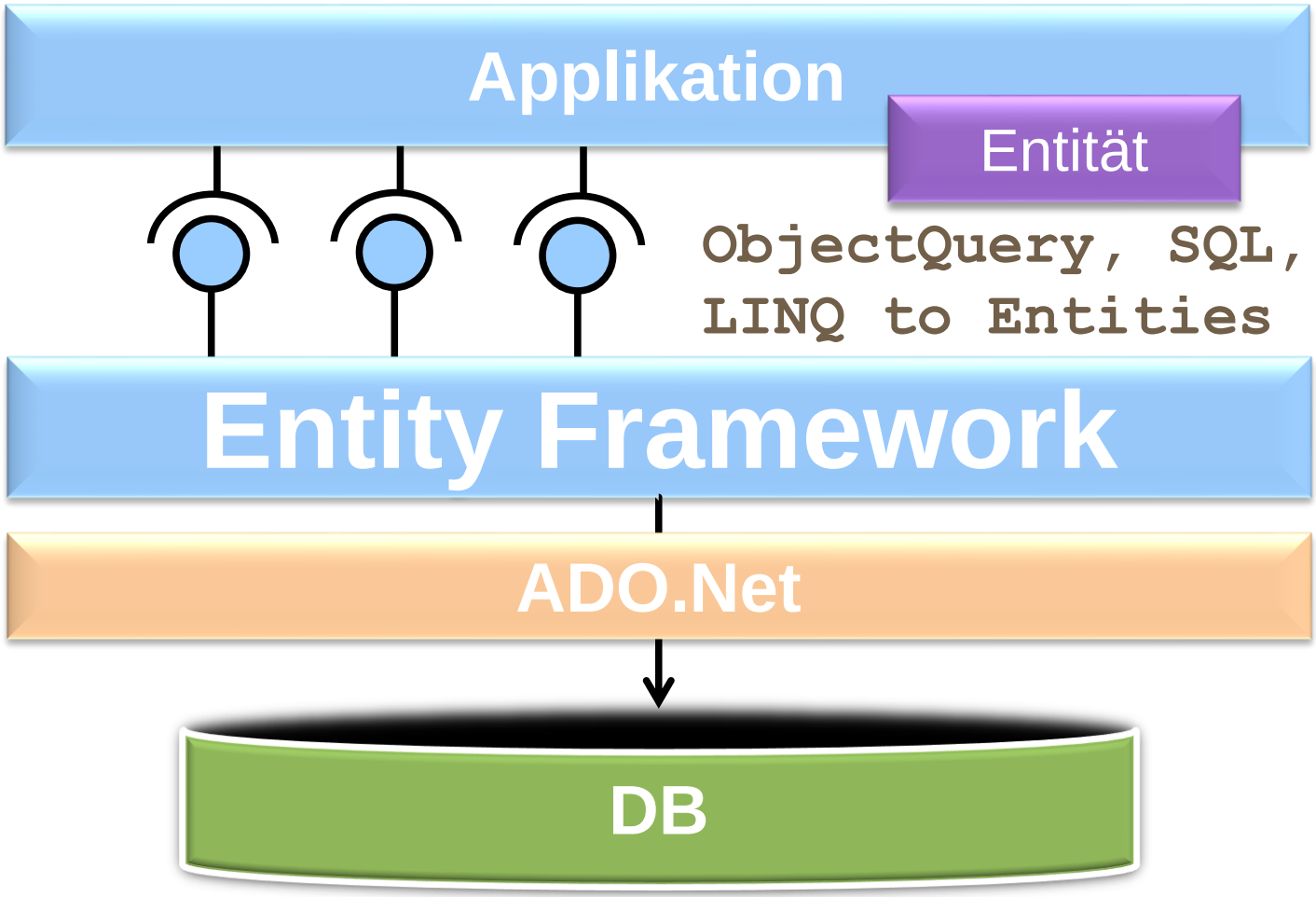
Entity Framework Architektur



Entity Framework Architektur



Entity Framework Architektur



Vergleich

NHibernate

- Configuration
- ISessionFactory
- ISession
- ITransaction
- Abfrage
  - ICriteria, QueryOver
  - IQuery
  - SQL
  - LINQ to NHibernate

Entity Framework

- Entity Data Model (EDMx)
- [ObjectContext]
- ObjectContext
- Transaction
- Abfrage
  - ObjectQuery
  - SQL
  - LINQ to Entities

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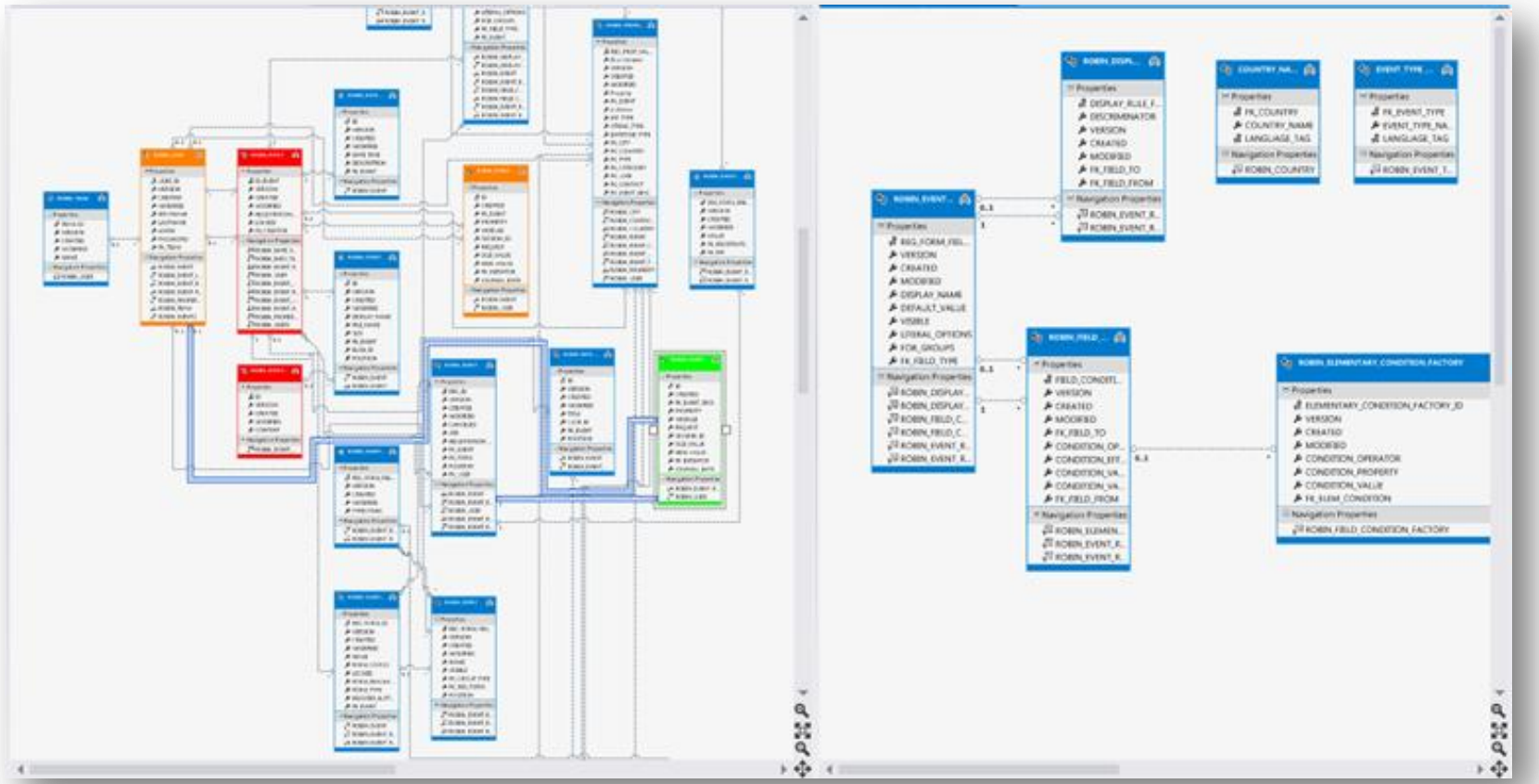
Entitäts-Persistenz beschreiben

- Database First
  - Datenbank existiert bereits
  - Entity Data Model wird aus Datenbank generiert
- Model First
  - Aus Modell werden
    - Entitätsklassen
    - Datenbankschema

  generiert
- Code First
  - EDM wird aus Code produziert

Entitäts-Persistenz beschreiben

- Database First



Entitäts-Persistenz beschreiben

NHibernate

```
<hibernate-mapping
  xmlns="urn:nhibernate-mapping-2.2">

   <class name="Entities.Category,
       NHBeispielMitXML"
       table="Simple_Categories" >

     <id name="CategoryID"
         column="CategoryID"
         type="integer">

        <generator class="native" />
     </id>

     <property name="Name"
               column="name"
               type="String"
               length="50"/>

     <!-- weitere Properties -->

   </class>

</hibernate-mapping>
```

Entity Framework

```
<edmx:Edmx Version="3.0" ...>

    <edmx:ConceptualModels>

            <Schema Namespace="EFvsNHModel" Alias="Self"
xmlns:store="http://schemas.microsoft.com/ado/2007/12/edm/EntityStoreSchemaGenerator"
xmlns="http://schemas.microsoft.com/ado/2008/09/edm">

        <EntityContainer Name="EFvsNHEntities">

          <EntitySet Name="Simple_Categories" EntityType="EFvsNHModel.Category" />

        </EntityContainer>

        <EntityType Name="Category">

          <Key>

            <PropertyRef Name="CategoryID" />

          </Key>

          <Property Name="CategoryID" Type="Int32" Nullable="false"
store:StoreGeneratedPattern="Identity" />

          <Property Name="Name" Type="String" Nullable="false" MaxLength="50" Unicode="true"
FixedLength="false" />

          <Property Name="Description" Type="String" MaxLength="200" Unicode="true"
FixedLength="false" />

        </EntityType>

      </Schema>

    </edmx:ConceptualModels>
```

Entitäts-Persistenz beschreiben

NHibernate

```
<hibernate-mapping
  xmlns="urn:nhibernate-mapping-2.2">

   <class name="Entities.Category,
       NHBeispielMitXML"
       table="Simple_Categories" >

     <id name="CategoryID"
         column="CategoryID"
         type="integer">

        <generator class="native" />
     </id>

     <property name="Name"
               column="name"
               type="String"
               length="50"/>

     <!-- weitere Properties -->

   </class>

</hibernate-mapping>
```

Entity Framework

```
<edmx:Edmx Version="3.0" ...>

  <edmx:Runtime>

     <edmx:StorageModels>

        <Schema Namespace="EFvsNHModel.Store" Alias="Self"
Provider="System.Data.SqlClient" ProviderManifestToken="2008"

       <EntityContainer Name="EFvsNHModelStoreContainer">

         <EntitySet Name="Simple_Categories"
EntityType="EFvsNHModel.Store.Simple_Categories" store:Type="Tables" Schema="dbo" />

       </EntityContainer>

       <EntityType Name="Simple_Categories">

         <Key>

           <PropertyRef Name="CategoryID" />

         </Key>

         <Property Name="CategoryID" Type="int" Nullable="false"
StoreGeneratedPattern="Identity" />

         <Property Name="name" Type="nvarchar" Nullable="false" MaxLength="50" />

         <Property Name="description" Type="nvarchar" MaxLength="200" />

       </EntityType>

     </Schema>

     </edmx:StorageModels>
```

Entitäts-Persistenz beschreiben

NHibernate

```
<hibernate-mapping
  xmlns="urn:nhibernate-mapping-2.2">

   <class name="Entities.Category,
       NHBeispielMitXML"
       table="Simple_Categories" >

     <id name="CategoryID"
         column="CategoryID"
         type="integer">

        <generator class="native" />
     </id>

     <property name="Name"
               column="name"
               type="String"
               length="50"/>

     <!-- weitere Properties -->

   </class>

</hibernate-mapping>
```

Entity Framework

```
edmx:Edmx Version="3.0" ...>

      <edmx:Mappings>

          <Mapping Space="C-S"
xmlns="http://schemas.microsoft.com/ado/2008/09/mapping/cs">

        <EntityContainerMapping
StorageEntityContainer="EFvsNHModelStoreContainer"
CdmEntityContainer="EFvsNHEntities">

          <EntitySetMapping Name="Categories"><EntityTypeMapping
TypeName="EFvsNHModel.Category"><MappingFragment
StoreEntitySet="Simple_Categories">

            <ScalarProperty Name="CategoryID" ColumnName="CategoryID"
/>

            <ScalarProperty Name="Name" ColumnName="name" />

            <ScalarProperty Name="Description"
ColumnName="description" />

          </MappingFragment></EntityTypeMapping></EntitySetMapping>

        </EntityContainerMapping>

      </Mapping>

      </edmx:Mappings>
```

Entitäts-Persistenz beschreiben

NHibernate (App.config)

```
<configuration>
  <configSections>
    <section name="hibernate-
        configuration" type="Nhibernate.Cfg.ConfigurationSectionHandler,
                              NHibernate"/>
  </configSections>

  <hibernate-configuration xmlns=".">
    <session-factory>
      <property name="connection.provider">
        NHibernate.Connection.DriverConnectionProvider
      </property>


      <property name="connection.driver_class">
        NHibernate.Driver.SqlClientDriver
      </property>

      <property name="show_sql">true</property>


...
```

Entitäts-Persistenz beschreiben

NHibernate (App.config, Fortsetzung)

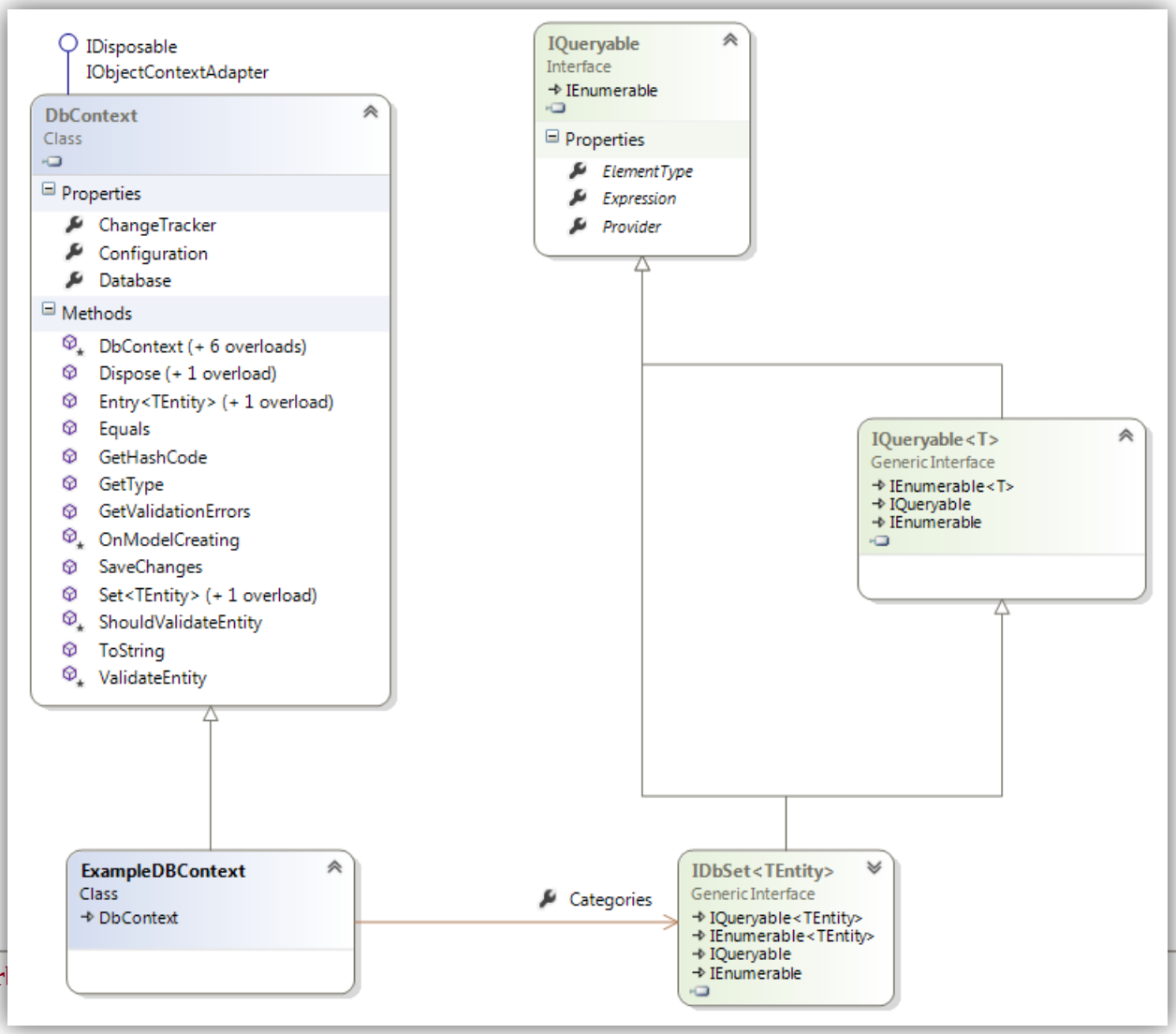
```
...
      <property name="connection.connection_string">
          server=localhost\SQLEXPRESS;
          Integrated Security=SSPI;
          database=EFvsNH
      </property>
      <property name="proxyfactory.factory_class">
         NHibernate.ByteCode.Castle.ProxyFactoryFactory,
         NHibernate.ByteCode.Castle
      </property>
    </session-factory>
  </hibernate-configuration>
  </configuration>
```

Code First - Beispiel

Simple_Categories

Column Name	Data Type	Nullable	Identity
CategoryID	int	No	☑
name	nvarchar(50)	No	☐
description	nvarchar(200)	Yes	☐
			☐

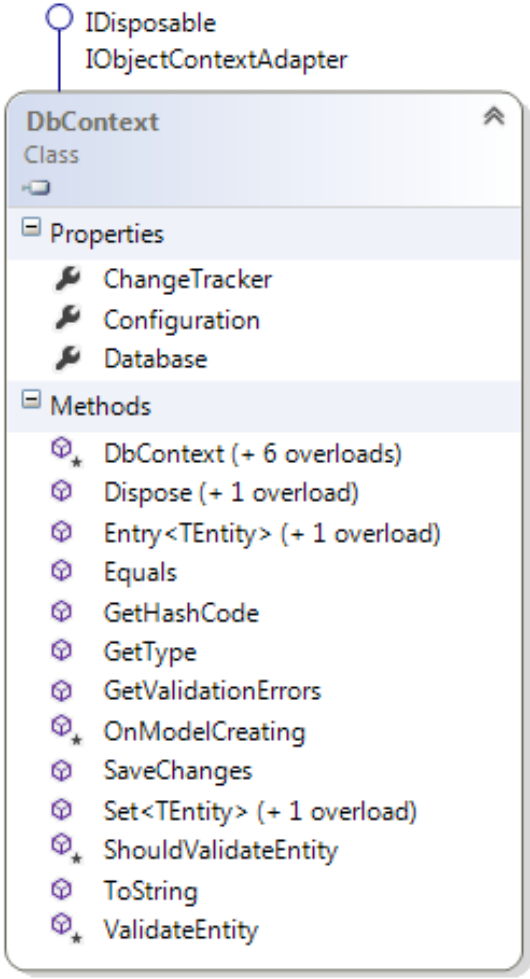
Code First - DbContext (EF 4.1)



Code First - DbContext

```
using (EfEntities ctx =
        new EfEntities()) {
    …
    ctx.SaveChanges();
}
```

```
string con = @"data source=
                …";
using (EfEntities ctx =
        new EfEntities(con)) {
    …
    ctx.SaveChanges();
}
```



Beispiel mit Code First

Entitäts-Persistenz Annotationen

NHibernate

```
[Class(Table="NH31_Category")]
public class Category
{

  [Id(Name = "CategoryId",
      Column="ID",
      Access = "nosetter.camelcase",
      UnsavedValue="-1")]
  [Generator(1,Class="native")]
  public virtual int Id {
    get { return id; }
  }

  [Property(Column = "NAME",
            Length=50,
            NotNull=true,
            Index="NAME_IDX")]
  public virtual string Name
                        { get;set; }

}
```

Entity Framework

```
[Table("Category", Schema = "Example")]
public class Category
{


    [Key]
    [Column("CAT_ID")]
    [DatabaseGenerated(
     DatabaseGeneratedOption.Identity)]
    public int Id { get; set; }



    [StringLength(20)]
    [Column("NAME")]
    [Required]
    public string Name { get; set; }

}
```

Entitäts-Persistenz Fluent API

NHibernate

```
public class CategoryMap :
                  ClassMap<Category> {

  public CategoryMap()

  {

     Id(c => c.Category_Id)
       .Column("Cat_Id")
       .GeneratedBy.Identity();

    Map(c => c. tName)
       .Not.Nullable()
       .Length(50)
       .Column("Cat_Name")

  }

}
```

Entity Framework

```
public class BugShopContext : DbContext {

  protected override void
     OnModelCreating(DbModelBuilder builder)

  {

    EntityTypeConfiguration<Category>
      catConfig = builder.Entity<Category>();

      catConfig.HasKey<int>(c =>
                              c.Category_Id);

      catConfig.Property(c => c.Category_Id)
        .HasDatabaseGeneratedOption(
             DatabaseGeneratedOption.Identity)
        .HasColumnName("Cat_Id");

      catConfig.Property(c => c.Name)
        .IsRequired()
        .HasMaxLength(50)
        .HasColumnName("Cat_Name");

  }

}
```

Entitäts-Persistenz Fluent API

NHibernate

```
public class Program {

  private ISessionFactory
            BuildSessionFactory() {

    string dbUrl= "…";

    FluentConfiguration cfg =
      Fluently.Configure()
      .Database(FluentNHibernate.Cfg.
      Db.MsSqlConfiguration.MsSql2008
     .ConnectionString(dbUrl)
     .Driver<NHibernate.Driver.
            SqlClientDriver>());


    return cfg.Mappings(m =>
           m.FluentMappings.
            Add(typeof(CategoryMap)))
          .BuildSessionFactory();
  }

}
```

Entity Framework

```
public class BugShopContext : DbContext {

  protected override void
     OnModelCreating(DbModelBuilder builder)

  {

    EntityTypeConfiguration<Category>
      catConfig = builder.Entity<Category>();

      catConfig.HasKey<int>(c =>
                            c.Category_Id);

      catConfig.Property(c => c.Category_Id)
        .HasDatabaseGeneratedOption(
             DatabaseGeneratedOption.Identity)
        .HasColumnName("Cat_Id");

      catConfig.Property(c => c.Name)
        .IsRequired()
        .HasMaxLength(50)
        .HasColumnName("Cat_Name");

  }
}
```

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CRUD

- **C)reate**
  Erzeugen und Persistieren
  einer Category Instanz

- **(R)ead**
  Lesen eines Category Objekts
  aus der Datenbank

- **(U)pdate**
  Modifizieren des Category
  Objekts in der Datenbank

- **(D)elete**
  Löschen der Category Instanz
  aus der Datenbank

Simple_Categories

	Column Name	Data Type	Nullable	Identity
🔑	CategoryID	int	No	☑
	name	nvarchar(50)	No	☐
	description	nvarchar(200)	Yes	☐
				☐

Create RUD

- **Create**
  Erzeugen und Persistieren einer Category-Instanz

```
using (EfEntities ctx =
           new EfEntities()) {
    Category myCat = new Category() {
        Name = "Motorteile"
    };

    // EF 3.5 (1.0) Variante, deprecated
    ctx.AddToCategories(myCat);

    ctx.Categories.Add(myCat);

    ctx.SaveChanges();
}
```

Create RUD

NHibernate

```
ISessionFactory sF =
    CreateSessionFactory();


using (ISession session =
         sF.OpenSession()){

   using (ITransaction tx =
     session.BeginTransaction()){

     Category myCat = new
           Category("Motorteile");

     myCat.Description = "Alles";

     session.Save(myCat);


     [session.Flush();]
     tx.Commit();

   }

}
```

Entity Framework

```
using (EFvsNHEntities ctx =
       new EfvsNHEntities()) {


   Category myCat = new
                    Category();

   myCat.Name = "Motorteile";


   ctx.Categories.
                Add(myCat);


   ctx.SaveChanges();

}
```

C **Read** UD

- **Read**
  Lesen eines Category-Objekts aus der Datenbank

```
using (EfEntities ctx =
        new EfEntities()) {
   EntityKey key = new EntityKey(
                              "EFvsNH.Categories",
                              "CategoryID",
                              myCat.CategoryID);

   // Variante 1 ObjectContext
   Category gefCat = (Category)
                        ctx.GetObjectByKey(key);

   // Variante 2 DbContext
   Category gefCat = ctx.Categories.Find(id);
}
```

C **Read** UD

NHibernate

```
using (ISession session =
        sF.OpenSession()){

   using (ITransaction tx =
     session.BeginTransaction()){


     Category gefCat =


      session.Load<Category>(myCat.
                             CategoryID);









    }
}
```

Entity Framework

```
using (EFvsNHEntities ctx =
       new EfvsNHEntities()) {

    EntityKey key =

    new EntityKey("EFvsNH.Categories"
                  , "CategoryID"
                , myCat.CategoryID);


      Category gefCat = (Category)
            ctx.GetObjectByKey(key);


        Category gefCat =
              ctx.Categories.Find
            (myCat.CategoryID);


}
```

CR **Update** D

- **Update**
  Modifizieren eines Category-Objekts in der Datenbank

```
using (EfEntities ctx = new EfEntities()) {

    // bereits existierende, aber
    // nicht 'attached' Entität
    ctx.Attach(myCat);
    myCat.Name = "neuer Name";

    ctx.SaveChanges();
}
```

CR **Update** D

NHibernate

```
using (ISession s =
         sF.OpenSession()){
   using (ITransaction tx =
     s.BeginTransaction()){
    // bereits existierende, aber
    // nicht 'attached' Entität

     myCat.Name = "neuer Name";

     // erste Alternative
     session.Update(myCat);

    // zweite Alternative
    session.SaveOrUpdate(myCat);

   }
}
```

Entity Framework

```
using (EFvsNHEntities ctx =
        new EfvsNHEntities()) {


   // bereits existierende, aber
   // nicht 'attached' Entität


  ctx.Attach(myCat);


  myCat.Name = "neuer Name";


  ctx.SaveChanges();
}
```

CR **Update** D

NHibernate

```
using (ISession s =
        sF.OpenSession()){
   using (ITransaction tx =
     s.BeginTransaction()){


     //dritte Alternative
     Category myCat =
     session.Load<Category>
            (myCat.CategoryID);


      myCat.Name = "neuer Name";
     tx.Commit();
   }
}
```

Entity Framework

```
using (EFvsNHEntities ctx =
       new EfvsNHEntities()) {


   // bereits existierende, aber
   // nicht 'attached' Entität


  ctx.Attach(myCat);


  myCat.Name = "neuer Name";


  ctx.SaveChanges();
}
```

CRU **Delete**

- **Delete**
  Löschen der Category-Instanz aus der Datenbank

```
using (EfEntities ctx =
                  new EfEntities()) {

   //Object muss im Context geladen sein!
   // mit Object Context
   ctx.DeleteObject(myCat);

   // mit DbContext
   ctx.Categories.Remove(myCat);
   ctx.SaveChanges();
}
```

CRU **Delete**

NHibernate

```
using (ISession session =
         sF.OpenSession()){
   using (ITransaction tx =
     session.BeginTransaction()){

     session.Delete(myCat);

     tx.Commit();
   }
}
```

Entity Framework

```
using (EFvsNHEntities ctx =
        new EfvsNHEntities()) {

   //Object in Context laden ...
   ctx.Categories.Remove(myCat);

   ctx.SaveChanges();
}
```

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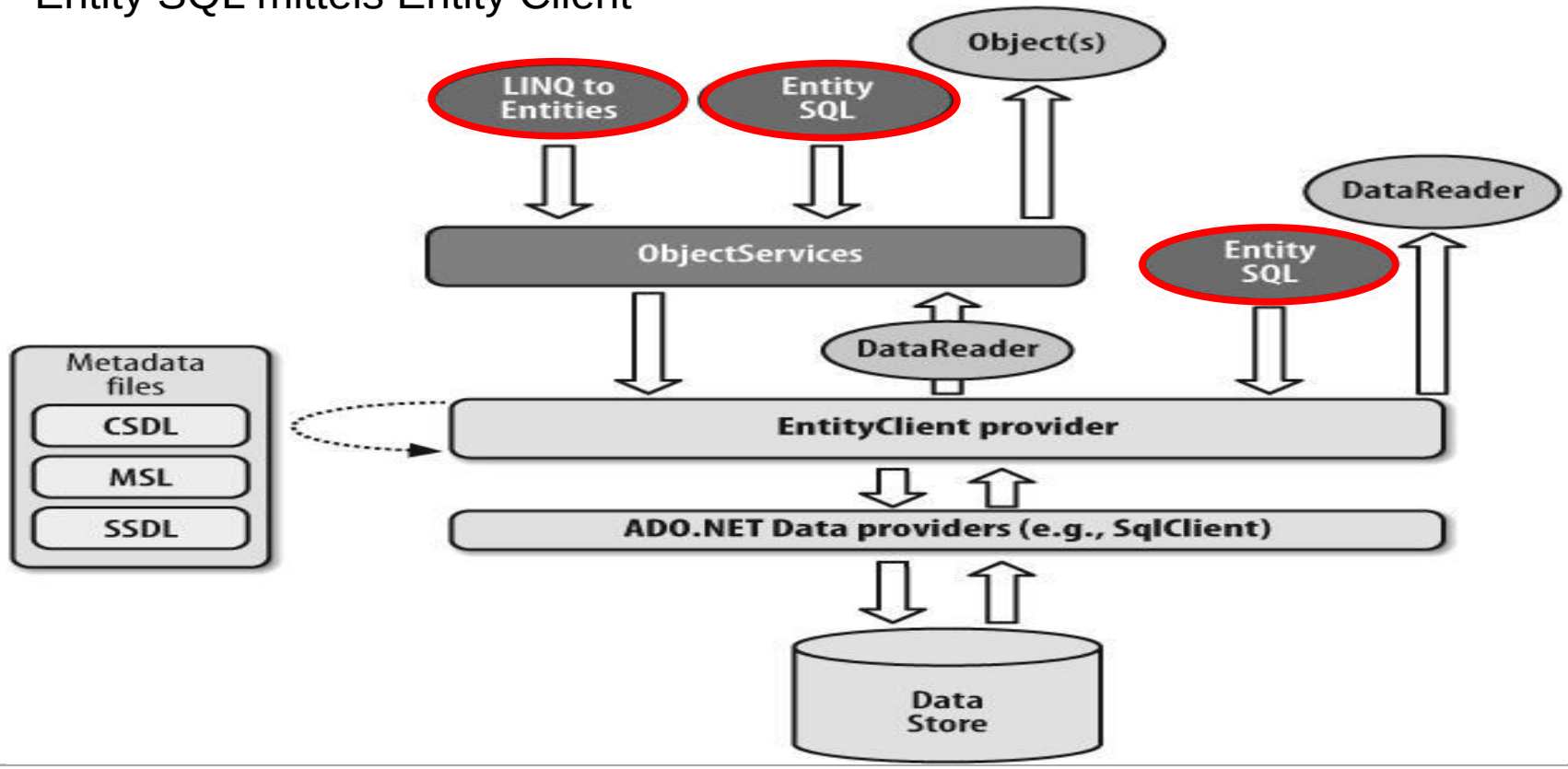
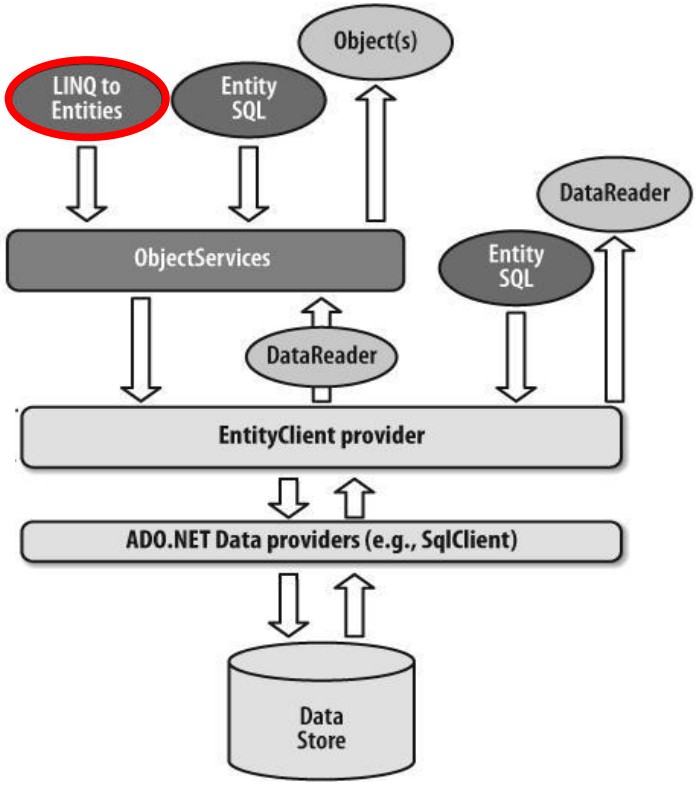
Abfragesprachen

- LINQ to Entities
- Entity SQL mittels Object Services
- Entity SQL mittels Entity Client



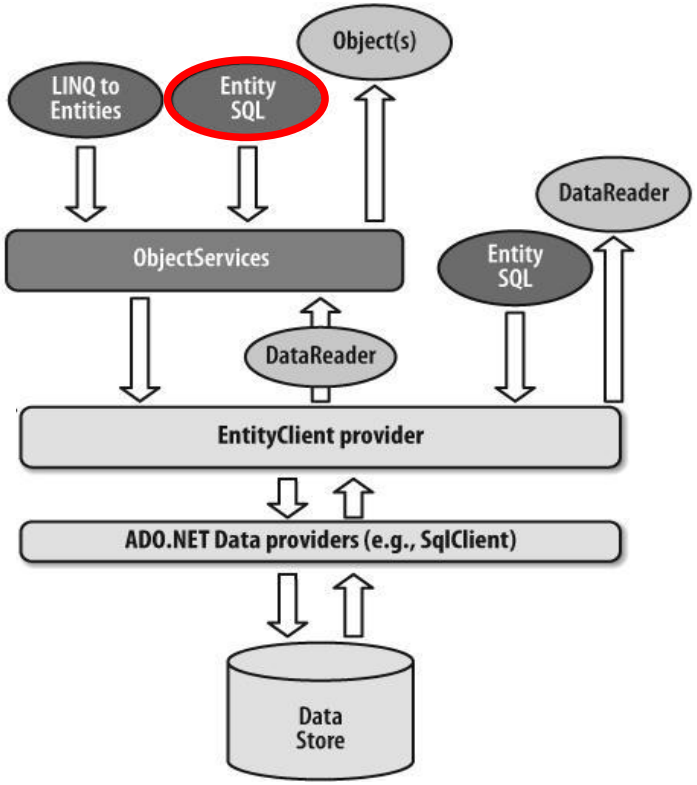
Abfragesprachen – LINQ to Entities

```
var cat =
  from categ in
    ctx.Categories
  where
    categ.Name.StartsWith("A")
  orderby categ.Name ascending
  select categ;


  // Projection
  select new {
     name = categ.Name,
     desc = categ.Description
};
```



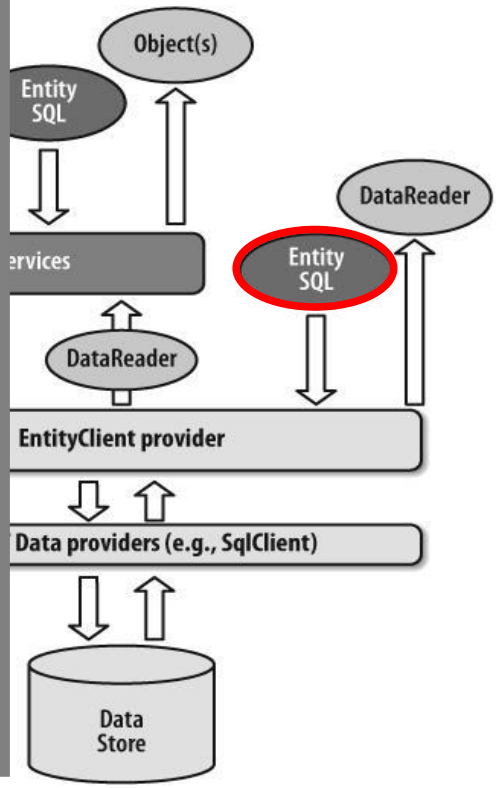
Abfragesprachen – Entity SQL over ObjectQuery

```
var qStr =
 @"SELECT VALUE c
   FROM Categories
   AS c WHERE c.Name='Motor'";

var entities = ctx.
  CreateQuery<Category>(qStr);
```



Abfragesprachen – Entity SQL over Entity Command

```
using (var con = new
  EntityConnection("name=EF4")) {

  con.Open();
  var qStr =
    "SELECT VALUE c
     FROM Categories AS c ";
  var cmd = con.CreateCommand();
  cmd.CommandText = qStr;
  using (var rdr = cmd.ExecuteReader(
    CommandBehavior.SequentialAccess)) {
    while (rdr.Read()) {
      Console.WriteLine(rdr.GetString(1));
    }
  }
}
```

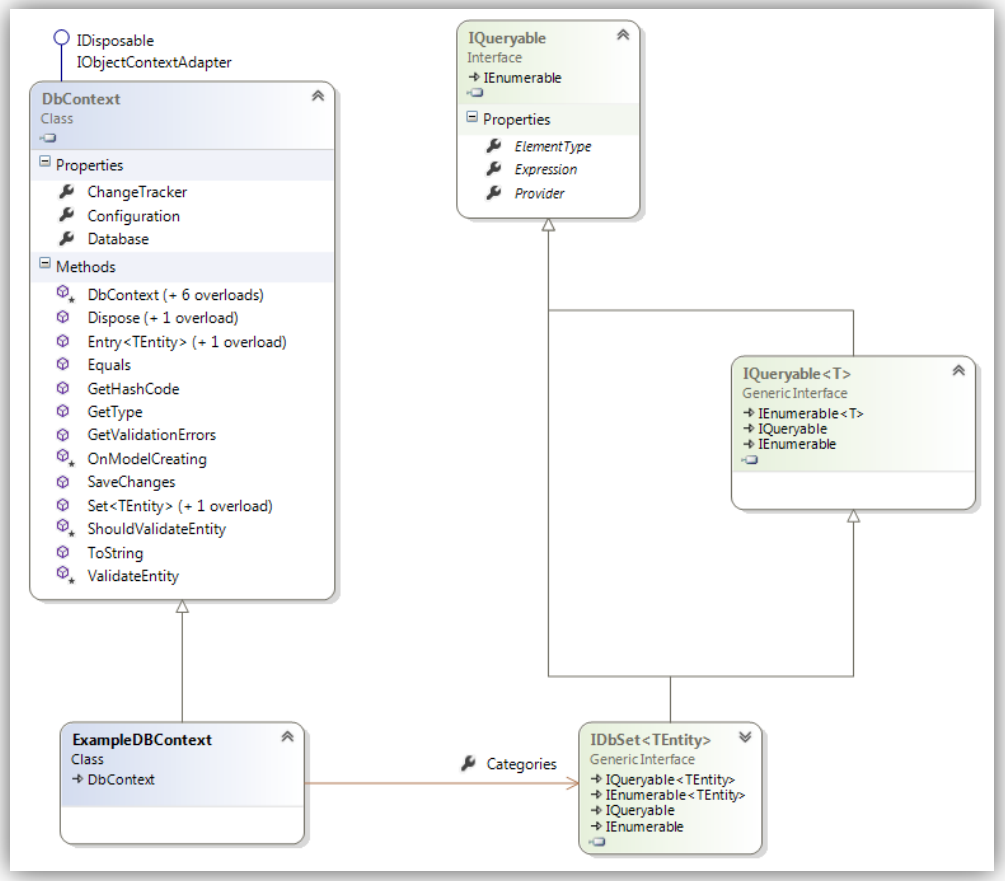


Abfragesprachen – DbSet Ausflug

- DbSet erlaubt die Abfrage von lokal geladenen Objekten (Query gegen Objekte im 1Level Cache)

```
ctx.Categories.Local
```

- Es werden unterschiedliche LINQ Provider genutzt
  - LINQ to Entities
  - LINQ to Objects
- Verhalten sich unterschiedlich
  - Last Operation existiert bei LINQ to Entities nicht
  - LINQ To Entities case insensistive



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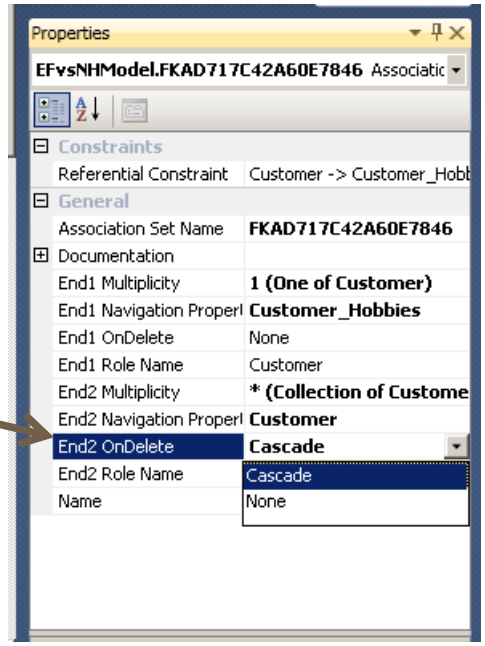
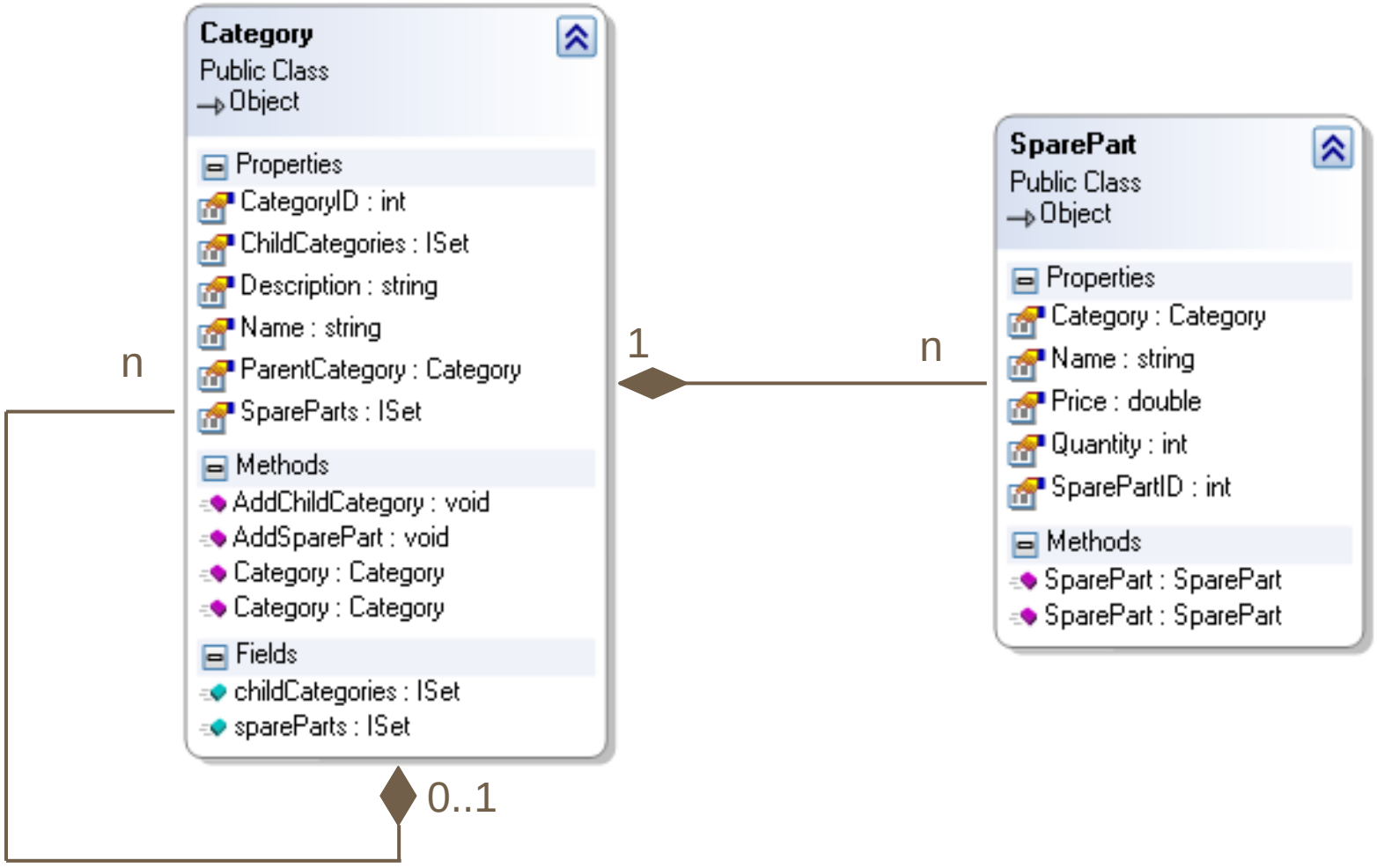
Beziehungskiste

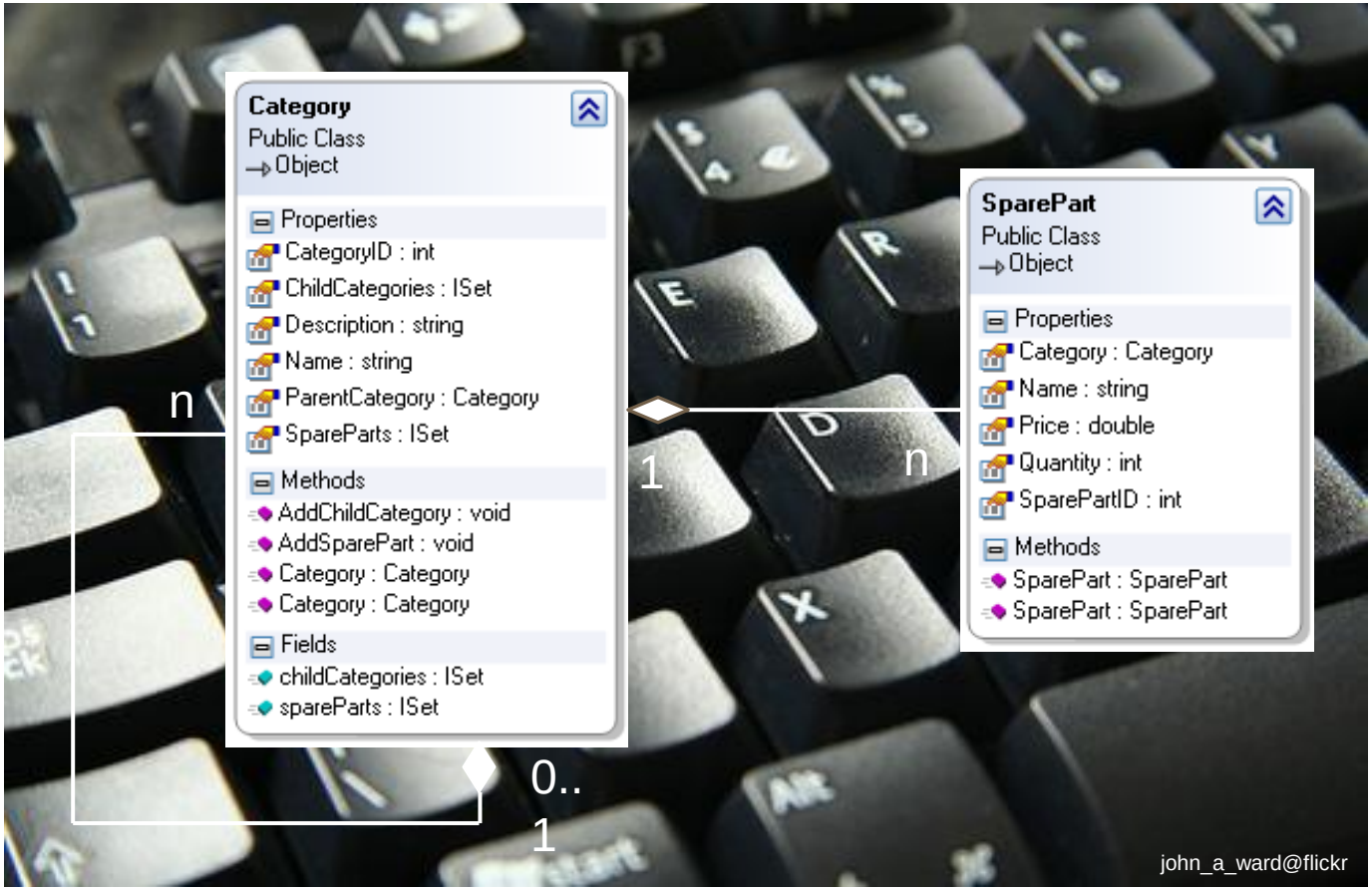
- Persistence-by-Reachability
  - Entity Framework
    - „save-update“ |
      delete
  - NHibernate
    - cascade = none |
      save-update |
      delete |
      all



Beziehungskiste – Beispiel



Beziehungskiste – Code First Beispiel

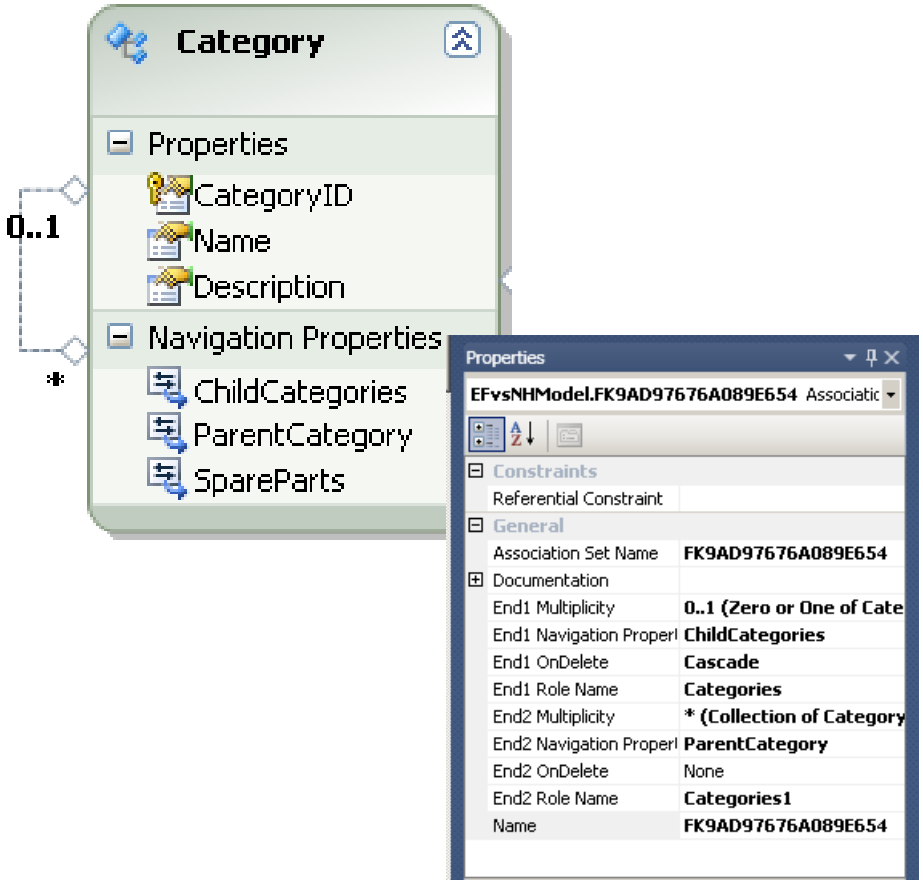


Beispiel - Konfiguration

NHibernate

```
<hibernate-mapping
   xmlns="urn:nhibernate-mapping-2.2">

   <class name="Entities.Category,
       NHBeispielMitXML"
       table="Categories" >

      <set name="ChildCategories"
           table="Categories"
           cascade="all"
           inverse="true">
        <key
          column="PARENT_CATEGORY_ID"/>
        <one-to-many
           class="Entities.Category" />
      </set>

      <many-to-one
           name="ParentCategory"
           class="Entities.Category"
           column="PARENT_CATEGORY_ID"
           cascade="none"/>
```

Entity Framework



Beispiel - Konfiguration

NHibernate

```
<hibernate-mapping
   xmlns="urn:nhibernate-mapping-2.2">

   <class name="Entities.Category,
       NHBeispielMitXML"
       table="Categories" >

      <set name="ChildCategories"
           table="Categories"
           cascade="all"
           inverse="true">
        <key
          column="PARENT_CATEGORY_ID"/>
        <one-to-many
           class="Entities.Category" />
      </set>

      <many-to-one
           name="ParentCategory"
           class="Entities.Category"
           column="PARENT_CATEGORY_ID"
           cascade="none"/>
```

Entity Framework

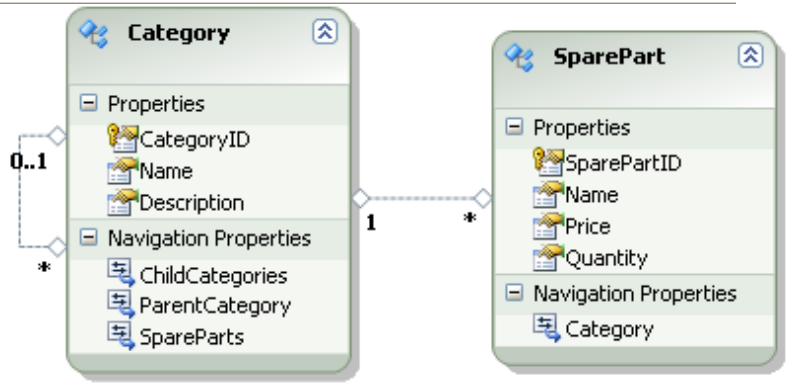
```
<edmx:Edmx Version="3.0" ...>

   <edmx:ConceptualModels>

      <AssociationSet Name="FK9..654"
Association="EFvsNHModel.FK9....654">
         <End Role="ChildCategories"
              EntitySet="Categories" />
         <End Role="ParentCategory"
              EntitySet="Categories" />
      </AssociationSet>

      <Association Name="FK9....654">
         <End Role="ChildCategories"
             Type="EFvsNHModel.Category"
             Multiplicity="0..1" >
            <OnDelete Action="Cascade"/>
         </End>
         <End Role="ParentCategory"
             Type="EFvsNHModel.Category"
             Multiplicity="*" />
      </Association>

   </edmx:ConceptualModels>
```

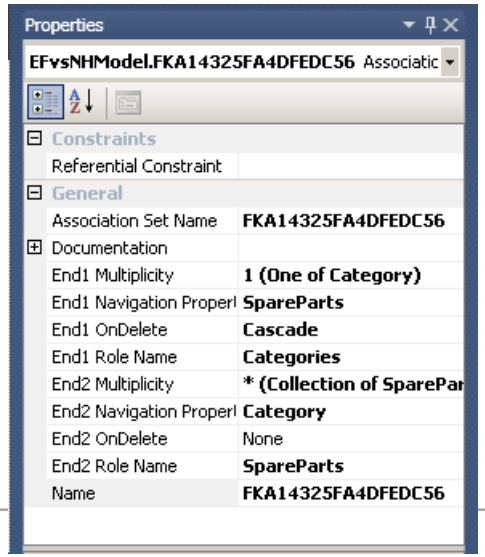
Beispiel - Konfiguration

NHibernate

```
<hibernate-mapping
    xmlns="urn:nhibernate-mapping-2.2">

  <class name="Entities.Category >

    <set name="SpareParts"
         table="SPARE_PART"
         cascade="all"
         inverse="true">
       <key column="CATEGORY_ID"/>
       <one-to-many
      class="Enitities.SparePart" />
    </set>


  <class name="Entities.SparePart >

    <many-to-one name="Category"
         class="Entities.Category"
         column="CATEGORY_ID"
         not-null="true"/>
```

Entity Framework





Beispiel - Konfiguration

NHibernate

```
<hibernate-mapping
    xmlns="urn:nhibernate-mapping-2.2">

  <class name="Entities.Category >

    <set name="SpareParts"
         table="SPARE_PART"
         cascade="all"
         inverse="true">
       <key column="CATEGORY_ID"/>
       <one-to-many
      class="Enitities.SparePart" />
    </set>


  <class name="Entities.SparePart >

    <many-to-one name="Category"
         class="Entities.Category"
         column="CATEGORY_ID"
         not-null="true"/>
```

Entity Framework

```
<edmx:Edmx Version="3.0" ...>

  <edmx:ConceptualModels>

    <AssociationSet Name="FKA...C56"
  Association="EFvsNHModel.FKA...C56">
        <End Role="Categories"
            EntitySet="Categories" />

        <End Role="SpareParts"
            EntitySet="SpareParts" />
    </AssociationSet>

    <Association Name="FKA...C56">
       <End Role="Categories"
          Type="EFvsNHModel.Category"
          Multiplicity="1" >
        <OnDelete Action="Cascade" />
       </End>
       <End Role="SpareParts"
         Type="EFvsNHModel.SparePart"
         Multiplicity="*" >
        </End>

  </edmx:ConceptualModels>
```

Beispiel – Speichern von Entitäten

NHibernate

```
Category motorCategory = new Category("Motorteile");
motorCategory.Description = "Alles für den Käfer Motor";

Category category1300er = new Category("Motorteile - 1300cc");
category1300er.Description = "Standard Teile für 1300cc Motor";

motorCategory.AddChildCategory(category1300er);

SparePart vergaser = new SparePart("Solex Vergaser 34PCI", 300.0, 1);
category1300er.AddSparePart(vergaser);

SparePart zuendverteiler = new SparePart("Zündverteiler", 200.0, 5);
category1300er.AddSparePart(zuendverteiler);

SparePart benzinPumpe = new SparePart("Benzinpumpe", 50.0, 3);
category1300er.AddSparePart(benzinPumpe);
```

```
using (ITransaction tx =
         session.BeginTransaction()) {

   session.Save(rootCategory);
   tx.Commit();

}
```

Entity Framework

```
using (EFvsNHEntities ctx =
             new EfvsNHEntities()) {

  ctx.Categories.AddObject(rootCategory);
  context.SaveChanges();

}
```

Beispiel – Speichern von Entitäten

NHibernate

Entity Framework

```
select * from Categories
select * from SpareParts
```

Results | Messages

	CategoryID	name	description	PARENT_CATEGORY_ID
1	1	Motorteile	Alles für den Käfer Motor	NULL
2	2	Motorteile - 1300cc	Standard Teile für 1300cc Motor	1

	SparePartID	NAME	PRICE	QUANTITY	CATEGORY_ID
1	1	Benzinpumpe	50	3	2
2	2	Solex Vergaser 34PCI	300	1	2
3	3	Zündverteiler Bosch 009	200	5	2

Beispiel – Eager Fetching

NHibernate

ICriteria

```
ICriteria criteria =
  session.CreateCriteria<Category>();

criteria.Add(Expression.Eq("Name",
             "Motorteile - 1300cc"));

IList<Category> list =
                    criteria.list();
```

QueryOver

```
IQueryOver<Category> queryOver =
       session.QueryOver<Category>();

queryOver.Where(c => c.Name ==
              "Motorteile - 1300cc");

IList<Category> list =
                   queryOver.List();
```

SQL

```
SELECT
  this_.CategoryID as CategoryID0_0_,
  this_.name as name0_0_,
  this_.description as descript3_0_0_,
  this_.PARENT_CATEGORY_ID as PARENT4_0_0_
FROM
  Categories this_
WHERE
  this_.name = @p0; @p0 = 'Motorteile - 1300cc'
SELECT
  spareparts0_.CATEGORY_ID as CATEGORY5_1_,
  spareparts0_.SparePartID as SparePar1_1_,
  spareparts0_.SparePartID as SparePar1_1_0_,
  spareparts0_.NAME as NAME1_0_,
  spareparts0_.PRICE as PRICE1_0_,
  spareparts0_.QUANTITY as QUANTITY1_0_,
  spareparts0_.CATEGORY_ID as CATEGORY5_1_0_
FROM
  SpareParts spareparts0_
WHERE spareparts0_.CATEGORY_ID=@p0; @p0 = 2
```

Beispiel – Eager Fetching

Entity Framework

Entity SQL

```
string query =
   @"select value c
     from Categories as c
     where c.Name =
           'Motorteile - 1300cc'";

ctx.CreateQuery<Category>(query)

   .Include("SpareParts");
```

LINQ to Entities

```
ctx.Categories.Include("SpareParts")
   .Where(c => c.Name ==
           "Motorteile - 1300cc");


ctx.Categories.Include("SpareParts")
   .Where("it.Name =
           'Motorteile - 1300cc '");
```

SQL

```
SELECT
[Project1].[CategoryID] AS [CategoryID],
[Project1].[name] AS [name],
[Project1].[description] AS [description],
[Project1].[PARENT_CATEGORY_ID] AS [PARENT_CATEGORY_ID],
[Project1].[C1] AS [C1],
[Project1].[SparePartID] AS [SparePartID],
[Project1].[name1] AS [name1],
[Project1].[PRICE] AS [PRICE],
[Project1].[QUANTITY] AS [QUANTITY],
[Project1].[CATEGORY_ID] AS [CATEGORY_ID]
FROM ( SELECT
            [Extent1].[CategoryID] AS [CategoryID],
       [Extent1].[name] AS [name],
       [Extent1].[description] AS [description],
       [Extent1].[PARENT_CATEGORY_ID] AS [PARENT_CATEGORY_ID],
       [Extent2].[SparePartID] AS [SparePartID],
       [Extent2].[NAME] AS [name1],
       [Extent2].[PRICE] AS [PRICE],
       [Extent2].[QUANTITY] AS [QUANTITY],
       [Extent2].[CATEGORY_ID] AS [CATEGORY_ID],
      CASE WHEN ([Extent2].[SparePartID] IS NULL) THEN CAST(NULL AS int) ELSE
1 END AS [C1]
FROM  [dbo].[Categories] AS [Extent1]
LEFT OUTER JOIN [dbo].[SpareParts] AS [Extent2] ON
[Extent1].[CategoryID] = [Extent2].[CATEGORY_ID]
         WHERE [Extent1].[name] =
                        'Motorteile - 1300cc'
)  AS [Project1]
ORDER BY [Project1].[CategoryID] ASC, [Project1].[C1] ASC;
```

Beispiel – Eager Fetching

NHibernate

Konfiguration angepasst

```
<class name="Entities.Category >

   <set name="SpareParts"
       table="SPARE_PART"
       cascade="all"
       fetch = "join"
       inverse="true">
       <key column="CATEGORY_ID"/>
       <one-to-many
       class="Enitities.SparePart" />
   </set>
```

QueryOver

```
IQueryOver<Category> queryOver =
       session.QueryOver<Category>();

queryOver.Where(c => c.Name ==
              "Motorteile - 1300cc");

IList<Category> list =
                    queryOver.List();
```

SQL

```
SELECT
   this_.CategoryID as CategoryID0_1_,
   this_.name as name0_1_,
   this_.description as descript3_0_1_,
   this_.PARENT_CATEGORY_ID as PARENT4_0_1_,
   spareparts2_.CATEGORY_ID as CATEGORY5_3_,
   spareparts2_.SparePartID as SparePar1_3_,
   spareparts2_.SparePartID as SparePar1_1_0_,
   spareparts2_.NAME as NAME1_0_,
   spareparts2_.PRICE as PRICE1_0_,
   spareparts2_.QUANTITY as QUANTITY1_0_,
   spareparts2_.CATEGORY_ID as CATEGORY5_1_0_
FROM Categories this_
left outer join SpareParts spareparts2_
on
   this_.CategoryID=spareparts2_.CATEGORY_ID
WHERE
   this_.name = @p0; @p0 = 'Motorteile - 1300cc'
```

Beispiel – Eager Fetching

NHibernate

HQL

```
(Ignoriert fetch Einstellung
 in der Konfiguration)

IQuery query = session.CreateQuery(
   "SELECT c FROM Category c
    left join fetch c.SpareParts part
    WHERE c.Name =
            'Motorteile - 1300cc'
   ");

IList<Category> list =
             query.List<Category>();
```

ABER...

SQL

```
select
  category0_.CategoryID as CategoryID0_0_,
  spareparts1_.SparePartID as SparePar1_1_1_,
  category0_.name as name0_0_,
  category0_.description as descript3_0_0_,
category0_.PARENT_CATEGORY_ID as PARENT4_0_0_,
  spareparts1_.NAME as NAME1_1_,
  spareparts1_.PRICE as PRICE1_1_,
  spareparts1_.QUANTITY as QUANTITY1_1_,
  spareparts1_.CATEGORY_ID as CATEGORY5_1_1_,
  spareparts1_.CATEGORY_ID as CATEGORY5_0__,
  spareparts1_.SparePartID as SparePar1_0__
from
    Categories category0_
left outer join
    SpareParts spareparts1_
        on
category0_.CategoryID=spareparts1_.CATEGORY_ID
where
    category0_.name='Motorteile - 1300cc'
```

Beispiel – Eager Fetching

NHibernate

ABER…

HQL

```
IList<Category> list =
              query.List<Category>();
```

QueryOver

```
IList<Category> list =
                    queryOver.List();
```

```
Console.WriteLine("Anzahl: {0}",
                  list.Count);
```

→ **Ausgabe : 3**

SQL

```
select
  category0_.CategoryID as CategoryID0_0_,
  spareparts1_.SparePartID as SparePar1_1_1_,
  category0_.name as name0_0_,
  category0_.description as descript3_0_0_,
category0_.PARENT_CATEGORY_ID as PARENT4_0_0_,
  spareparts1_.NAME as NAME1_1_,
  spareparts1_.PRICE as PRICE1_1_,
  spareparts1_.QUANTITY as QUANTITY1_1_,
  spareparts1_.CATEGORY_ID as CATEGORY5_1_1_,
  spareparts1_.CATEGORY_ID as CATEGORY5_0__,
  spareparts1_.SparePartID as SparePar1_0__
from
    Categories category0_
left outer join
    SpareParts spareparts1_
        on
category0_.CategoryID=spareparts1_.CATEGORY_ID
where
    category0_.name='Motorteile - 1300cc'
```

Beispiel – Eager Fetching

SQL

```
select
  category0_.CategoryID as CategoryID0_0_,
  ...
  spareparts1_.SparePartID as SparePar1_0__
from
    Categories category0_
left outer join
    SpareParts spareparts1_
        on
category0_.CategoryID=spareparts1_.CATEGORY_ID
where
    category0_.name='Motorteile - 1300cc'
```

Results | Messages

	CategoryID0_0_	SpareP...	name0_0_	descript3_0_0_	PARENT4_0_0_	NAME1_1_	PRICE1_1_	QUANTITY1_1_	CATEGORY5_1_1_	CATEGORY5_0__	SparePar1_0__
1	2	1	Motorteile - 1300cc	Standard Teile für 1300cc Motor	1	Benzinpumpe	50	3	2	2	1
2	2	2	Motorteile - 1300cc	Standard Teile für 1300cc Motor	1	Solex Vergaser 34PCI	300	1	2	2	2
3	2	3	Motorteile - 1300cc	Standard Teile für 1300cc Motor	1	Zündverteiler Bosch 009	200	5	2	2	3

Beispiel – Eager fetching

NHibernate

HQL

```
IQuery query = session.CreateQuery("
  SELECT DISTINCT c
  FROM Category c
  left join fetch c.SpareParts part
  WHERE c.Name =
            'Motorteile - 1300cc'");
```

ICriteria

```
ICriteria criteria =
  session.CreateCriteria<Category>()
        .Add(Expression.Like("Name",
            "Motorteile - 1300cc"));

IList<Category> list =
     criteria.SetResultTransformer(

CriteriaSpecification.DistinctRootEntity)
     .List<Category>();
```

In NHibernate müssen Duplikate „manuell" entfernt werden

Entity Framework

LINQ to Entities

```
ctx.Categories.Include("SpareParts")
   .Where(c => c.Name ==
              "Motorteile - 1300cc");
```

Das Entity Framework entfernt Duplikate automatisch

Beispiel – Lazy Loading

NHibernate

Konfiguration angepasst

```
<class name="Entities.Category >

   <set name="SpareParts"
       table="SPARE_PART"
       cascade="all"
       lazy = "true"
       inverse="true">
       <key column="CATEGORY_ID"/>
       <one-to-many
       class="Enitities.SparePart" />
   </set>
```

QueryOver

```
IQueryOver<Category> queryOver =
       session.QueryOver<Category>();

queryOver.Where(c => c.Name ==
              "Motorteile - 1300cc");

IList<Category> list =
                    queryOver.List();
```

SQL

```
SELECT
  this_.CategoryID as CategoryID0_0_,
  this_.name as name0_0_,
  this_.description as descript3_0_0_,
  this_.PARENT_CATEGORY_ID as PARENT4_0_0_
FROM
  Categories this_
WHERE
  this_.name = @p0; @p0 = 'Motorteile - 1300cc'
```

Beispiel – Lazy Loading

NHibernate

QueryOver

```
IQueryOver<Category> queryOver =
       session.QueryOver<Category>();

queryOver.Where(c => c.Name ==
              "Motorteile - 1300cc");

IList<Category> list =
                    queryOver.List();


foreach (Category category in list) {


   Console.WriteLine("Category
                  name = {0} hat {1}
                  Ersatzteile",
                  category.Name,
          category.SpareParts.Count);

 }
```

SQL

```
SELECT
  this_.CategoryID as CategoryID0_0_,
  this_.name as name0_0_,
  this_.description as descript3_0_0_,
  this_.PARENT_CATEGORY_ID as PARENT4_0_0_
FROM
  Categories this_
WHERE
  this_.name = @p0; @p0 = 'Motorteile - 1300cc'

SELECT
   spareparts0_.CATEGORY_ID as CATEGORY5_1_,
   spareparts0_.SparePartID as SparePar1_1_,
   spareparts0_.SparePartID as SparePar1_1_0_,
   spareparts0_.NAME as NAME1_0_,
   spareparts0_.PRICE as PRICE1_0_,
   spareparts0_.QUANTITY as QUANTITY1_0_,
   spareparts0_.CATEGORY_ID as CATEGORY5_1_0_
FROM
   SpareParts spareparts0_
WHERE spareparts0_.CATEGORY_ID=@p0; @p0 = 2
```

Beispiel – Lazy Loading

Entity Framework

Entity Query

```
string query = "select value c
 from Categories as c where c.name =
              'Motorteile - 1300cc'";

var cats =
    ctx.CreateQuery<Category>(query);


foreach (Category cat in cats) {

  cat.SpareParts.Load();
  Console.WriteLine("Name : {0}
                    #SpareParts {1}",
                    cat.Name,
               cat.SpareParts.Count);

}
```

SQL

```
SQL SELECT
[Extent1].[CategoryID] AS [CategoryID],
[Extent1].[name] AS [name],
[Extent1].[description] AS [description],
[Extent1].[PARENT_CATEGORY_ID] AS
[PARENT_CATEGORY_ID]
FROM [dbo].[Categories] AS [Extent1]
WHERE [Extent1].[name] =
                      'Motorteile - 1300cc'
```

Agenda

- (Architektur) Überblick
- Entitäten beschreiben
- CRUD
- Abfragesprachen
- Beziehungen
- Performance
- Zusammenfassung

Performance – Entitäts-Caching

- ObjectContext (DBContext) hält einen Objekt Cache
  - Ähnlich First Level Cache in NHibernate

- Bei Abfragen (LINQ to Entities, Entity SQL) wird

  nach der Abfrage gegen die Datenbank

  vor dem Materialisieren der Entität

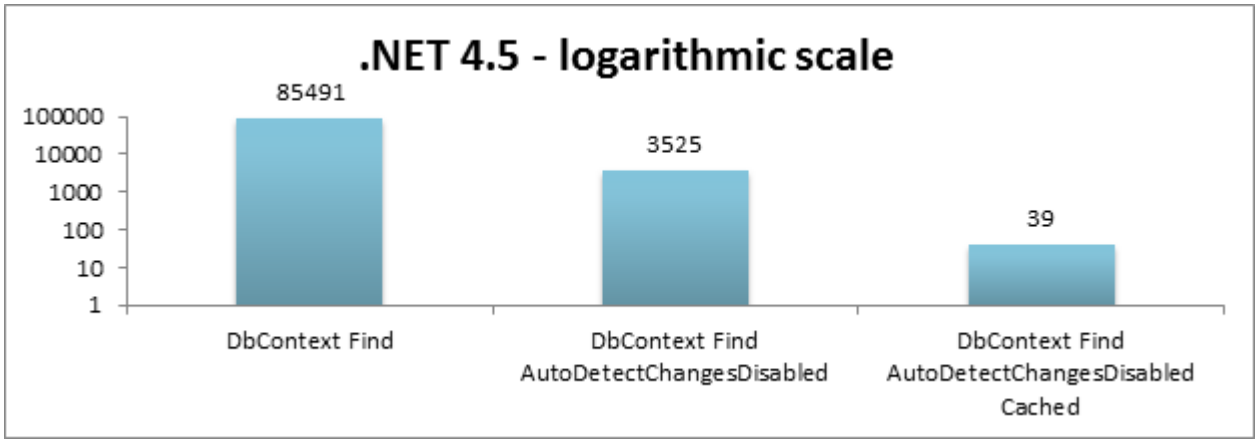
  geprüft, ob die Objekte des Results bereits im Objekt Cache des Context vorhanden sind

- Falls ja, werden die Objekte aus Cache zurückgeliefert
  - Unnötiges Materialisieren der Objekte wird vermieden

Performance – Entitäts-Caching

- Find prüft ob Objekt in Cache vorliegt bevor eine Abfrage gegen die Datenbank ausgeführt wird
  - Hierbei wird beprüft, ob es noch anstehende Änderungen gibt, die Commited werden müssen
  - Dies kann bei vielen Objekten im Cache „langsam“ sein
  - Kann deaktiviert werden:

```
ctx.Configuration.AutoDetectChangesEnabled = false;
Category category = context.Categories.Find(catId);
```



Performance – Query Plan Caching

- Abfragen werden über den Query Plan Compiler in SQL umgewandelt (T-SQL bei SQL Server)
- Wenn Caching aktiviert, wird dieses SQL Command wiederverwendet
- Der Query Plan Cache wird über alle ObjectContext Instanzen in einer AppDomain genutzt
- Der Query Plan Cache kann für alle Abfrage-Typen genutzt werden
  - Enity SQL
  - CompiledQuery
  - LINQ (seit Entity Framework 5.0)

Performance – Query Plan Caching

- Der Query Plan Cache wird bei parametrisierten Queries genutzt, sofern sich nur Werte ändern
  - Änderungen an Facetten (Größen, Genauigkeit, ..)
  - Bei Entity SQL ist die Query Teil des Cache-Schlüssels (auch Case-sensitive und Whitespaces)
  - Bei LINQ wird die produzierte Query als Teil des Cache-Schlüssels genutzt

- Cache Eviction
  - Der Cache trägt maximal 800 Einträge
  - Wird diese Zahl erreicht wird pro Minute eine Bereinigung (Sweep) gestartet.
  - Cache Einträge werden nach dem *Least frequently – recently used* (LFRU) Algorithmus entfernt
  - Alle Cache Einträge werden gleich behandelt.

Performance – Query Plan Caching

- Beispiel

Test	Caching Enabled?	Results
Enumerating all 18723 queries	No	Elapsed Seconds=238.14
	Yes	Elapsed Seconds=240.31
Avoiding sweep (just the first 800 queries, regardless of complexity)	No	Elapsed Seconds=61.62
	Yes	Elapsed Seconds=0.84
Just the AggregatingSubtotals queries (178 total - which avoids sweep)	No	Elapsed Seconds=63.22
	Yes	Elapsed Seconds=0.41

- Fazit
  - *“In fact, if an app has lots of dynamic Entity SQL queries, filling the cache with queries will also effectively cause CompiledQueries to “decompile” when they are flushed from the cache. In this scenario, performance may be improved by disabling caching on the dynamic queries to prioritize the CompiledQueries. Better yet, of course, would be to rewrite the app to use parameterized queries instead of dynamic queries.*
  - *when executing lots of distinct queries (for example, dynamically created queries), caching doesn't help and the resulting flushing of the cache can keep the queries that would benefit the most from plan caching form actually using it.”*

Performance – Vorkompilierte Abfragen

- PreCompiledQueries

```
public class EfExample : DbContext {
      private static readonly Func<EfExample, string,
IEnumerable<Categories>> categoryCQ = CompiledQuery.Compile(
          (EfExample context, string categoryName) =>
              context.Categories.Where(c => c.Name == categoryName)
          );

      public IEnumerable<Categories> GetCategories(string categoryName)
      {
          return categoryCQ.Invoke(this, categoryName).ToList();
      }
      ...
```

- Laut Microsoft bis zu 7% Performance Gewinn gegenüber autocompiled Queries

Agenda

- (Architektur) Überblick
- Entitäten beschreiben
- CRUD
- Abfragesprachen
- Beziehungen
- Performance
- Zusammenfassung

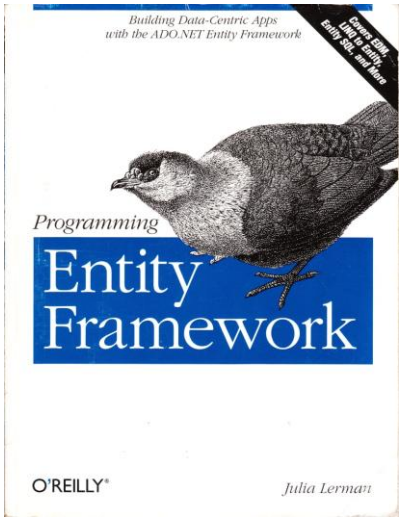
Zusammenfassung

- Entity Framework und NHibernate
  sind im Kern
  ähnlich
- Wesentliche Unterschiede
  - Handhabung von Beziehungen
  - Datenbank Support
  - CASCADE Funktionalität
  - *Unterstützung von verschiedenen Collection Typen*
  - *Logging*

  - ABER:

    Viele Aspekte wurden nicht beleuchtet: z. B. Einbetten von Funktionen, Vererbung, Performance, T4, Self-tracking, ...

Literatur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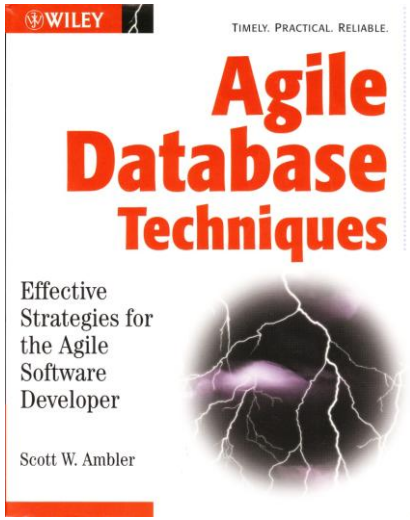
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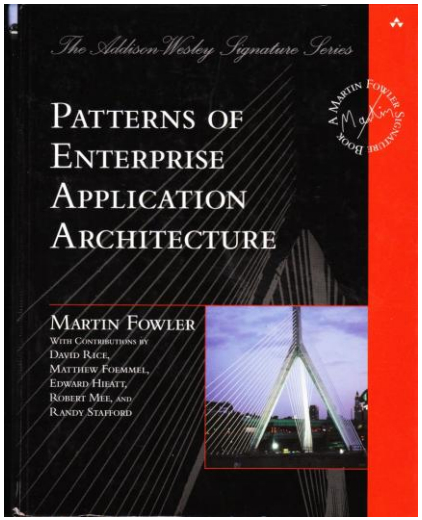
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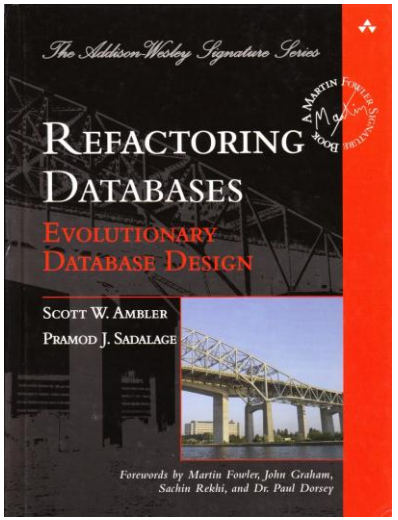
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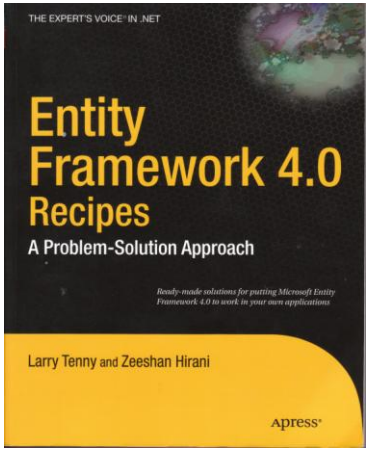
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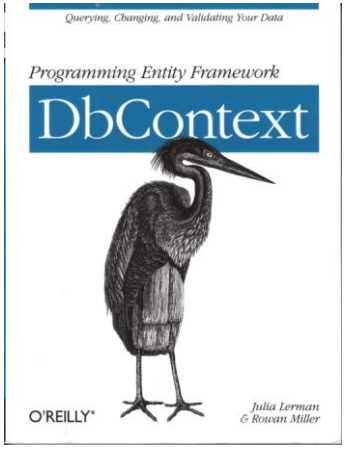
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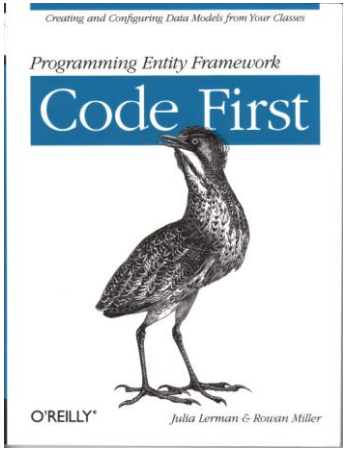
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Vielen Dank!

Thomas Haug
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