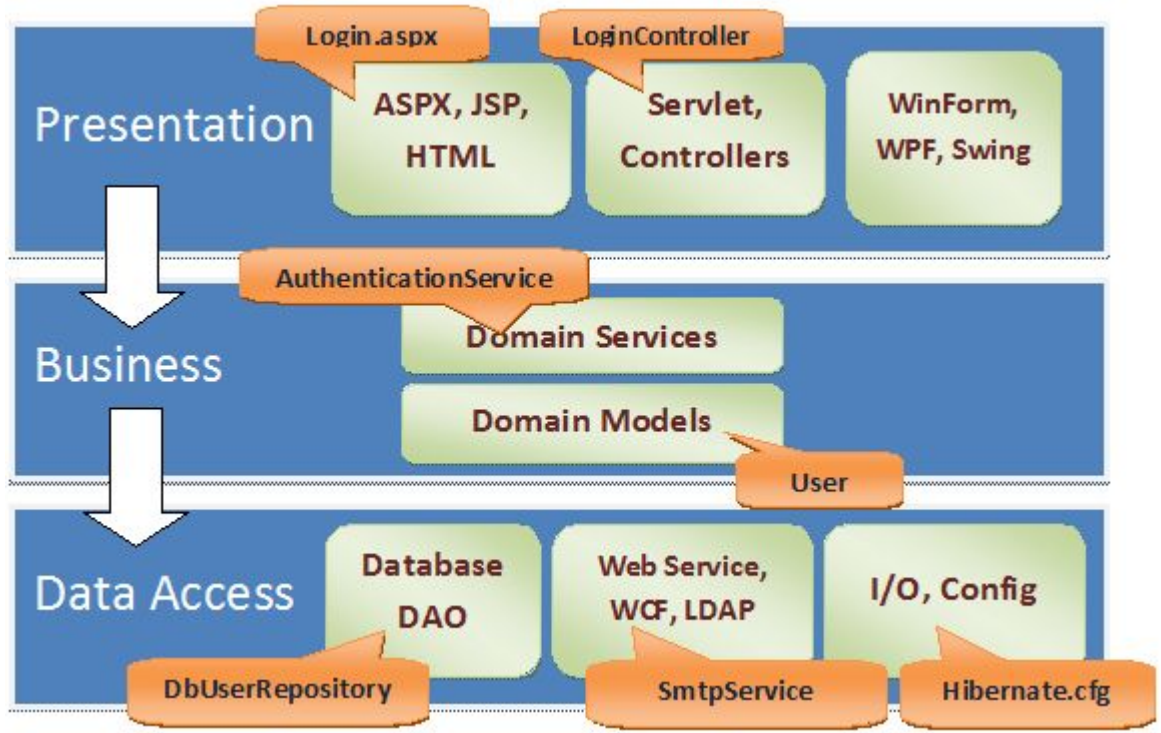
Repository and Unit of Work

Design Patterns

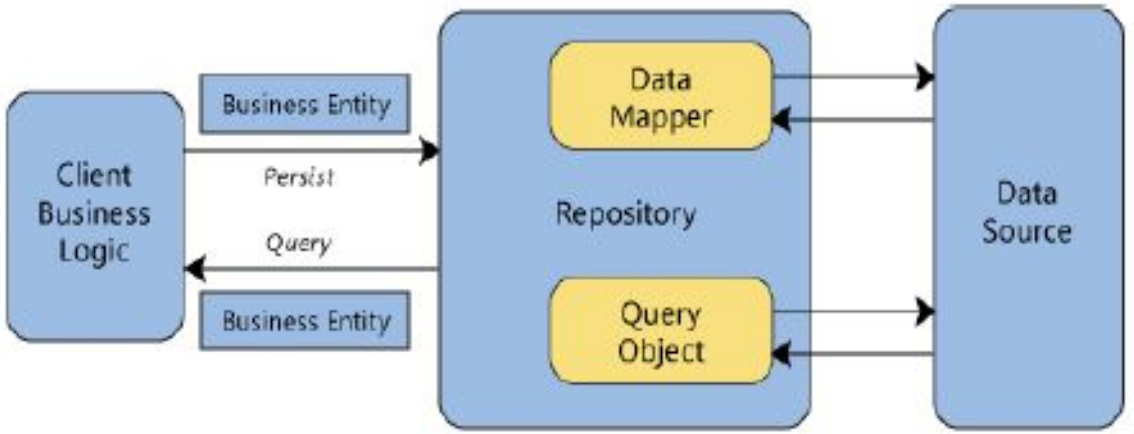
with Entity Framework

- Патерн Repository
- Патерн Unit of Work


Login.aspx
LoginController
Presentation
ASPX, JSP, HTML
Servlet, Controllers
WinForm, WPF, Swing
AuthenticationService
Business
Domain Services
Domain Models
User
Data Access
Database DAO
Web Service, WCF, LDAP
I/O, Config
DbUserRepository
SmtpService
Hibernate.cfg

Repository Pattern

- Посередник між BLL та DAL(Data Source) рівнями
- Це рівень, який роздвляє Дані та Рівень Domain



Для чого потрібен Repositorie ?

- Рівень абстракції між Business Logic рівнемта Data Access рівнем.
- Ізолює програму від змін джерела даних.
- Полегшує автоматизоване юніт тестування, Test Driven Development.
- Джерело даних може бути змінено без будь-яких змін в бізнес логіці і з мінімальними змінами в Репозиторії.
- Легко створювати mock репозиторію.

EF DbContext implementer

```
public class SchoolContext : DbContext
{
    public DbSet<Course> Courses {get;set;}
    public DbSet<Department> Departments {get;set;}
    public DbSet<Enrollment> Enrollments {get;set;}
    public DbSet<Instructor> Instructors {get;set;}
    public DbSet<Student> Students {get;set;}

    protected override void OnModelCreating(DbModelBuilder modelBuilder)
    {
     //...
    }
}
```

IGenericRepository<TEntity>

```
public interface IGenericRepository<TEntity> where TEntity : class
{
    IEnumerable<TEntity> Get( Expression<Func<TEntity, bool>> filter = null,
Func<IQueryable<TEntity>, IOrderedQueryable<TEntity>> orderBy
                        = null,string includeProperties = "");
    TEntity GetByID(object id);
    void Insert(TEntity entity);
    void Delete(object id);
    void Delete(TEntity entityToDelete);
    void Update(TEntity entityToUpdate);
}
```

GenericRepository<TEntity> constructor

```
public class GenericRepository<TEntity> :
IGenericRepository<Tentity> where TEntity : class
{
     internal SchoolContext context;
     internal DbSet<TEntity> dbSet;

     public GenericRepository(SchoolContext context)
     {
          this.context = context;
          this.dbSet = context.Set<TEntity>();
     }
```

```
public virtual IEnumerable<TEntity> Get( Expression<Func<TEntity, bool>> filter = null,
                                         Func<IQueryable<TEntity>,
                                                      IOrderedQueryable<TEntity>> orderBy = null,
                                         string includeProperties = "")
{
    IQueryable<TEntity> query = dbSet;
    if (filter != null)
    {
       query = query.Where(filter);
    }
    foreach (var includeProperty in includeProperties.Split
            (new char[] { ',' }, StringSplitOptions.RemoveEmptyEntries))
    {
       query = query.Include(includeProperty);
    }

    if (orderBy != null)
    {
       return orderBy(query).ToList();
    }
    else
    {
       return query.ToList();
    }
}
```

IEnumerable<TEnitity> Get(…)

Імплементація CRUD методів

```
public virtual TEntity GetByID(object id)
{
    return dbSet.Find(id);
}
public virtual void Insert(TEntity entity)
{
    dbSet.Add(entity);
}
public virtual void Delete(object id)
{
    TEntity entityToDelete = dbSet.Find(id);
    Delete(entityToDelete);
}
public virtual void Delete(TEntity entityToDelete)
{
    if (context.Entry(entityToDelete).State == EntityState.Detached)
    {
        dbSet.Attach(entityToDelete);
    }
    dbSet.Remove(entityToDelete);
}
```

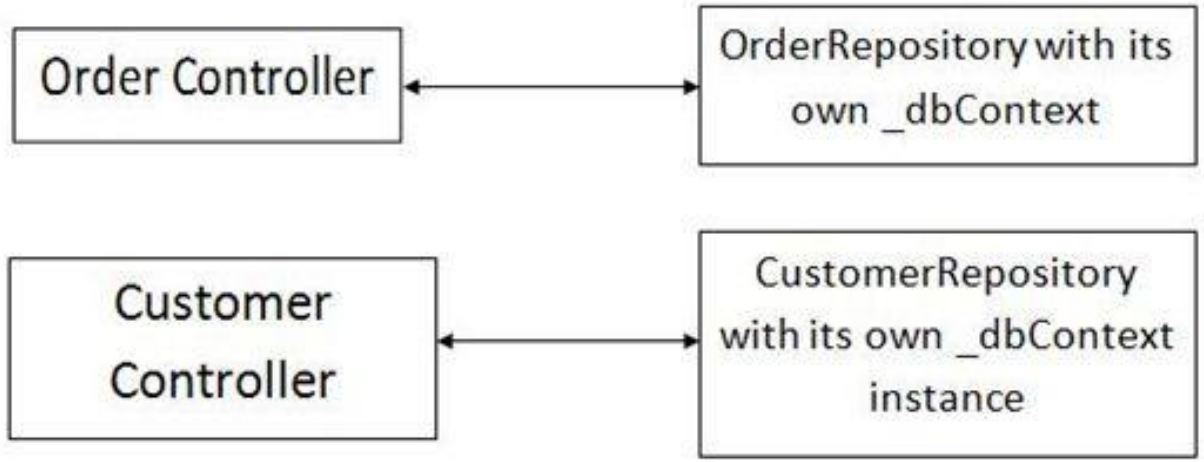
Імплементація CRUD методів

```
public virtual void Update(TEntity entityToUpdate)
{
    dbSet.Attach(entityToUpdate);
    context.Entry(entityToUpdate).State = EntityState.Modified;
}
```

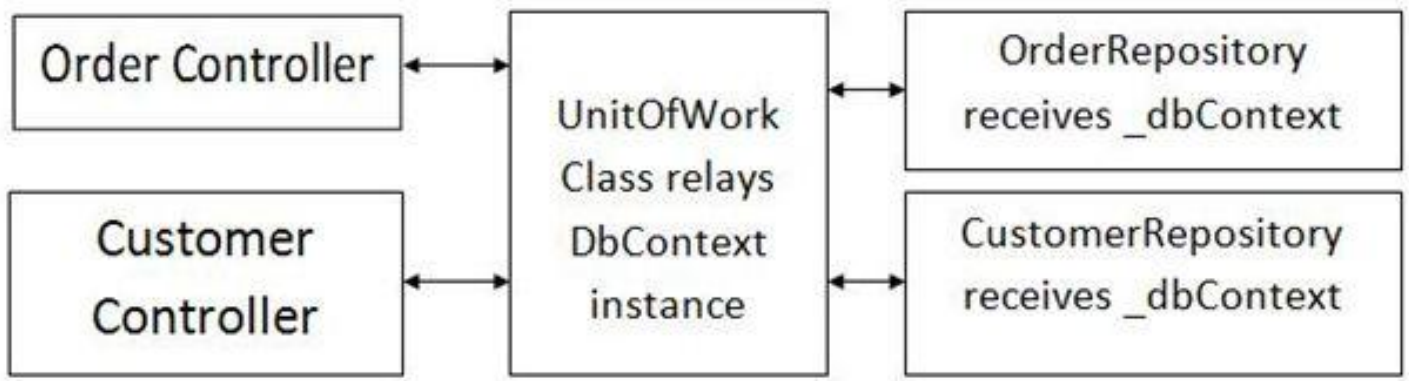
Unit of Work (UoW)

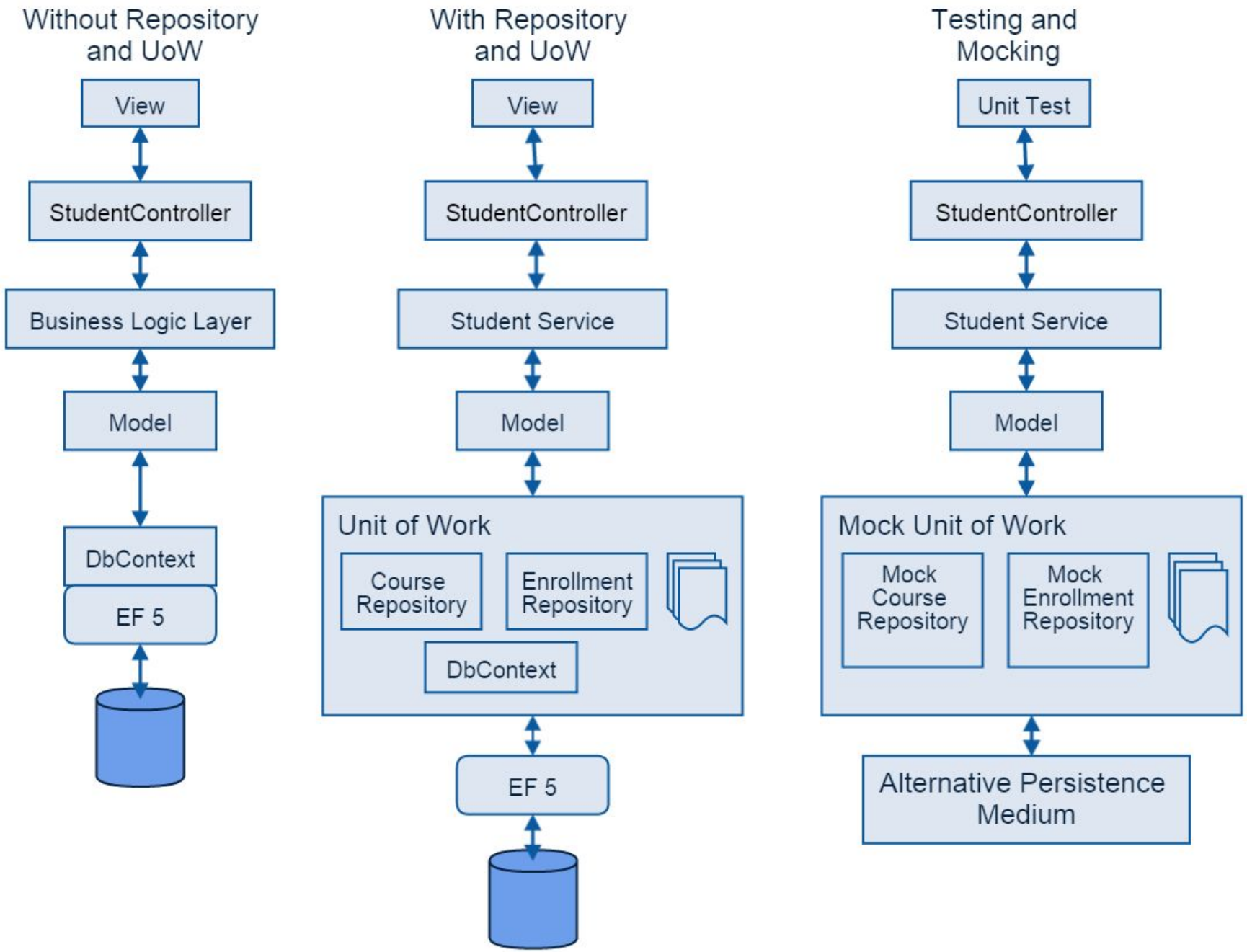
- Патерни об’єктно-реляційної поведінки:
  - Unit of Work
  - Identity Map
  - Lazy Load
- UnitOfWork покликаний відслідковувати всі зміни даних, які ми здійснюємо з доменною моделлю в рамках бізнес-транзакції. Після того, як бізнес-транзакція закривається, всі зміни потрапляють в БД у вигляді єдиної транзакції.

Without UnitOfWork

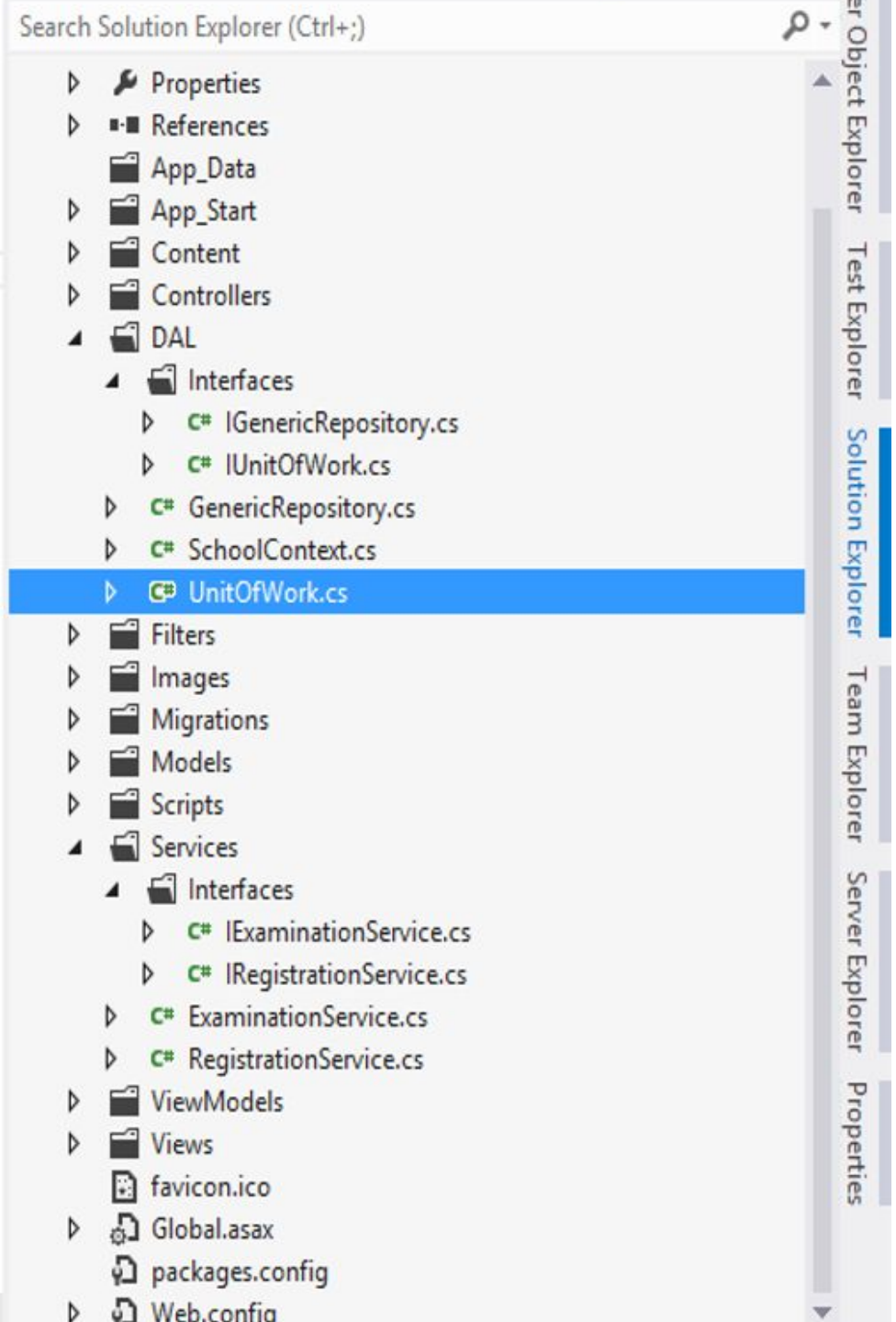


With UnitOfWork




Without Repository and UoW
View
StudentController
Business Logic Layer
Model
DbContext
EF 5
With Repository and UoW
View
StudentController
Student Service
Model
Unit of Work
Course Repository
Enrollment Repository
DbContext
EF 5
Testing and Mocking
Unit Test
StudentController
Student Service
Model
Mock Unit of Work
Mock Course Repository
Mock Enrollment Repository
Alternative Persistence Medium

ble project structure



IUnitOfWork interface

```
public interface IUnitOfWork
{
    GenericRepository<Department> DepartmentRepository {get;}
    GenericRepository<Course> CourseRepository {get;}
    GenericRepository<Person> PersonRepository{get;}
    GenericRepository<Student> StudentRepository{get;}
    GenericRepository<Instructor> InstructorRepository{get;}
}
```

UnitofWork.cs

```
public class UnitOfWork : IUnitOfWork, IDisposable
{
     private SchoolContext context = new SchoolContext();
     private GenericRepository<Department> departmentRepository;
     private GenericRepository<Course> courseRepository;
     private GenericRepository<Person> personRepository;
     private GenericRepository<Student> studentRepository;
     private GenericRepository<Instructor> instructorRepository;

    //Generic repository instantiation for every entity-set in
domain
    //   using a single shared DbContext object within a UoW
wrapper
    //…
}
```

```
public GenericRepository<Department> DepartmentRepository
{
      get
      {
         if (this.departmentRepository == null)
         {
                this.departmentRepository = new GenericRepository<Department>(context);
         }
         return departmentRepository;
      }
}

public GenericRepository<Course> CourseRepository
{
      get
      {
          if (this.courseRepository == null)
          {
                 this.courseRepository = new GenericRepository<Course>(context);
          }
          return courseRepository;
      }
}
```

Persist DbContext changes and clean up resources

```
public void Save()
{
     context.SaveChanges();
}
```

```
private bool disposed = false;

protected virtual void Dispose(bool disposing)
{
     if (!this.disposed)
     {
          if (disposing)
          {
               context.Dispose();
          }
     }
     this.disposed = true;
}

public void Dispose()
{
      Dispose(true);
      GC.SuppressFinalize(this);
}
```

How does the architectural wiring come live in the controller ?

```
public class CourseController
   {
       private UnitOfWork unitOfWork = new UnitOfWork();

      public ViewResult Index()
       {
           var courses = unitOfWork.CourseRepository.Get(includeProperties: "Department");
           return View(courses.ToList());
       }

       public ViewResult Details(int id)
       {
           Course course = unitOfWork.CourseRepository.GetByID(id);
           return View(course);
       }
    //...
    }
}
```

Sample Edit, Get(…) calls

```
public ActionResult Edit( [Bind(Include = "CourseID,Title,Credits,DepartmentID")]
Course course)
{
    try
    {
        if (ModelState.IsValid)
        {
            unitOfWork.CourseRepository.Update(course);
            unitOfWork.Save();
            return RedirectToAction("Index");
        }
    }
    catch (DataException  dex)
    {
        ModelState.AddModelError("", "Unable to save changes. Try again, and if the
problem persists, see your system administrator.");
    }
    PopulateDepartmentsDropDownList(course.DepartmentID);
    return View(course);
}
```

```
private void PopulateDepartmentsDropDownList(object selectedDepartment = null)
{
    var departmentsQuery = unitOfWork.DepartmentRepository.Get( orderBy: q =>
q.OrderBy(d => d.Name));
    ViewBag.DepartmentID = new SelectList(departmentsQuery, "DepartmentID",
"Name", selectedDepartment);
}
```

References

1) http://www.asp.net/mvc/overview/older-versions/getting-started-with-ef-5-using-mvc-4/implementing-the-repository-and-unit-of-work-patterns-in-an-asp-net-mvc-application
2) http://www.asp.net/mvc/overview/getting-started/getting-started-with-ef-using-mvc/advanced-entity-framework-scenarios-for-an-mvc-web-application#repo

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