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ADO.NET TEXNOLOGIYASI VA ENTITY FRAMEWORK TEXNOLOGIYALARI FARQI, AFZALLIKLARI, KAMCHILIKLARI

Annotatsiya: Ushbu maqola C# dasturlash tilida ma’lumotlar bazasi bilan ishlash uchun ishlatiladigan ikki asosiy texnologiya – ADO.NET va Entity Frameworkning nazariy taqqoslashini, afzalliklari va kamchiliklarini tahlil qiladi. ADO.NETning past darajali, yuqori samarali yondashuvi va Entity Frameworkning obyekt-relatsion xaritalash (ORM) asosidagi soddalashtirilgan usuli solishtiriladi. Maqola har bir texnologiyaning xususiyatlarini, moslashuvchanligini va qo‘llanilish sohasini ko‘rib chiqadi. Qo‘shimcha ravishda, ma’lumotlar bazasida o‘qish, qo‘shish, yangilash va o‘chirish kabi asosiy operatsiyalarni amalga oshirish uchun ADO.NET va Entity Framework yordamida bir nechta amaliy misollar keltirilgan.

Kalit so‘zlar: ADO.NET, Entity Framework, Ma’lumotlar bazasi, C# dasturlash tili, Obyekt-relatsion xaritalash (ORM), SQL so‘rovlari, Samaradorlik, Xavfsizlik, Kod soddaligi, Ma’lumotlarni o‘qish, Ma’lumotlarni qo‘shish, Ma’lumotlarni yangilash, Ma’lumotlarni o‘chirish.

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THE DIFFERENCE, ADVANTAGES AND DISADVANTAGES OF ADO.NET AND ENTITY FRAMEWORK TECHNOLOGIES

Annotation: This article analyzes the theoretical comparison, advantages, and disadvantages of two primary technologies used for working with databases in the C# programming language – ADO.NET and Entity Framework. The low-

level, high-performance approach of ADO.NET is compared with the simplified object-relational mapping (ORM) approach of Entity Framework. The article examines the characteristics, flexibility, and application areas of each technology. Additionally, several practical examples are provided, demonstrating basic database operations such as reading, inserting, updating, and deleting using ADO.NET and Entity Framework.

Key words: ADO.NET, Entity Framework, Database, C# programming, Object-Relational Mapping (ORM), SQL queries, Performance, Security, Code simplicity, Data reading, Data insertion, Data updating, Data deletion.

Ma’lumotlar bazasi bilan ishlash zamonaviy dasturiy ta’minot ishlab chiqishda muhim ahamiyatga ega. C# dasturlash[1] tilida ma’lumotlar bazasi bilan ishlash uchun bir nechta texnologiyalar mavjud bo‘lcib, ulardan eng muhimlari ADO.NET va Entity Framework hisoblanadi. Ushbu maqola ADO.NET va Entity Framework texnologiyalarining farqlari, afzalliklari va kamchiliklarini nazariy jihatdan tahlil qiladi va kengaytirilgan amaliy misollar orqali ularning qo‘llanilishini ko‘rsatadi. Maqola oliy ta’lim darajasidagi talabalar va dasturchilar uchun mo‘ljallangan bo‘lib, texnik jihatlarni aniq va tushunarli tarzda ochib beradi.

ADO.NET haqida umumiy ma’lumot. ADO.NET (ActiveX Data Objects .NET) Microsoft tomonidan .NET Framework doirasida ma’lumotlar bazasi bilan ishlash uchun ishlab chiqilgan past darajali texnologiyadir. U ma’lumotlar bazasiga to‘g‘ridan-to‘g‘ri ulanish, SQL so‘rovlarni bajarish va ma’lumotlarni qayta ishlash imkonini beradi. ADO.NET asosan quyidagi asosiy komponentlardan iborat. Masalan: **Connection**: Ma’lumotlar bazasiga ulanishni ta’minlaydi (masalan, SqlConnection), **Command**: SQL so‘rovlarni bajarish uchun ishlatiladi (SqlCommand), **DataReader**: Ma’lumotlarni o‘qish uchun tezkor, faqat oldinga yo‘naltirilgan oqim sifatida ishlaydi, **DataAdapter**:

[1] Buriyev J. N. (2024). WINDOWS FORMS .NET ILOVALARNING DIZAYNIDA UI/UX FRAMEWORKLARINING AFZALLIKLARI. Ekonomika va Sotsium Jurnali.c

Ma’lumotlar bazasi va DataSet yoki DataTable o‘rtasida ko‘prik vazifasini o‘taydi, **DataSet**: Ma’lumotlar bazasidan mustaqil[2] ravishda ma’lumotlarni xotirada saqlash va qayta ishlash uchun ishlatiladi.

ADO.NET past darajali bo‘lib, dasturchiga ma’lumotlar bazasi bilan ishlashda to‘liq nazoratni ta’minlaydi, ammo bu ko‘proq kod yozishni talab qiladi.

Afzalliklariga yuqori samaradorlik, moslashuvchanlik, to‘liq nazorat, resurslardan samarali foydalanish kbi xususiyatlari misol bo‘la oladi.

Kamchiliklariga murakkabli, xavfsizlik muammolari, obyektga yo‘naltirilgan emasligini misol qilib aytishimiz mumkin.

Entity Framework haqida umumiy ma’lumot. Entity Framework (EF) Microsoft tomonidan ishlab chiqilgan obyekt-relatsion xaritalash (ORM - Object-Relational Mapping) texnologiyasidir. U ma’lumotlar bazasi bilan ishlashni soddalashtirish uchun mo‘ljallangan bo‘lib, dasturchilarga ma’lumotlar bazasi bilan ishlashda obyektga yo‘naltirilgan yondashuvni qo‘llash imkonini beradi. EF ma’lumotlar bazasi tuzilmasini C# klasslari sifatida ifodalaydi va SQL so‘rovlarni avtomatik ravishda generatsiya qiladi.

Entity Frameworkning asosiy yondashuvlari bu Code First(Ma’lumotlar bazasi tuzilmasi C# kodidan generatsiya qilinadi), Database First(Mavjud ma’lumotlar bazasidan model yaratiladi), Model First(Dizayner yordamida model yaratiladi va undan ma’lumotlar bazasi generatsiya qilinadi)

Afzalliklari bu soddalashtirilgan ishlab chiqish, xavfsizlik, avtomatlashtirish, obyektga yo‘naltirilgan yondashuv.

Kamchiliklari bu samaradorlik, murakkab so‘rovlar, o‘rganishning murakkabligi.

1-jadval.

Jihatlari	ADO.NET	Entity Framework
Yondashuv	Past darajali, SQL-ga	Yuqori darajali, obyekt-

[2] Kholyorov Erkin, Turayev Dilmurod, Buriyev Javokhir (2024). Numerical solution of boundary inverse problem for fluid relaxation filtration in porous media

	asoslangan	relatsion xaritalash
Kod miqdori	Ko‘p kod yozish talab qilinadi	Kamroq kod, avtomatlashtirilgan so‘rovlar
Samaradorlik	Yuqori, optimallashtirilgan so‘rovlar	O‘rtacha, avtomatik so‘Acq so‘rovlar optimalligi past
Xavfsizlik	SQL Injection xavfi yuqori	SQL Injection xavfi past
Moslashuvchanlik	Har qanday ma’lumotlar bazasi bilan ishlaydi	Ko‘proq SQL Server bilan integratsiyalashgan
Obyektga yo‘naltirilganlik	Yo‘q, qo‘lda konvertatsiya talab qilinadi	Ha, ma’lumotlar C# obyektlari sifatida ishlatiladi

Quyida ADO.NET va Entity Framework yordamida ma’lumotlar bazasi bilan ishlashning bir nechta sodda misollarni keltirib o‘tamiz. Ushbu misollar turli operatsiyalarni (o‘qish, qo‘shish, yangilash va o‘chirish) ko‘rsatadi.

ADO.NET bilan ma’lumotlarni o‘qishga misollar. Quyida SQL Server ma’lumotlar bazasidan Students jadvalidan ma’lumotlarni o‘qish uchun ADO.NET yordamida misol keltiramiz:

```
using System;
using System.Data.SqlClient;
internal class Program1
{
   static void Main()
   {
      string connectionString = "Server=localhost;Database=SchoolDB;Trusted_Connection=True;";
      using (SqlConnection connection = new SqlConnection(connectionString))
      {
         try
         {
            connection.Open();
            string query = "SELECT Id, FirstName, LastName FROM Students";
            SqlCommand command = new SqlCommand(query, connection);

            using (SqlDataReader reader = command.ExecuteReader())
            {
               while (reader.Read())
               {
```

```
                Console.WriteLine($"ID: {reader["Id"]}, Name: {reader["FirstName"]} {reader["LastName"]}");
            }
        }
    }
    catch (Exception ex)
    {
        Console.WriteLine("Error: " + ex.Message);
    }
  }
}
```

Ushbu misolda SqlConnection orqali ma’lumotlar bazasiga ulanadi, SqlCommand yordamida SQL so‘rovi bajariladi va SqlDataReader yordamida natijalar o‘qiladi. Kod past darajali bo‘lib, har bir qadam dasturchi tomonidan qo‘lda boshqariladi.

Ma’lumot qo‘shish. Quyida yangi talaba ma’lumotini Students jadvaliga qo‘shish uchun ADO.NET misoli keltirilgan:

```
using System;
using System.Data.SqlClient;
class Program
{
  static void Main()
  {
    string connectionString = "Server=localhost;Database=SchoolDB;Trusted_Connection=True;";

    using (SqlConnection connection = new SqlConnection(connectionString))
    {
      try
      {
        connection.Open();
        string query = "INSERT INTO Students (FirstName, LastName) VALUES (@FirstName, @LastName)";
        SqlCommand command = new SqlCommand(query, connection);

        command.Parameters.AddWithValue("@FirstName", "Ali");
        command.Parameters.AddWithValue("@LastName", "Valiyev");

        int rowsAffected = command.ExecuteNonQuery();
        Console.WriteLine($"{rowsAffected} row(s) inserted.");
      }
```

```
        catch (Exception ex)
        {
            Console.WriteLine("Error: " + ex.Message);
        }
    }
  }
}
```

Bu misolda SqlCommand obyektiga parametrlashtirilgan so‘rov yuboriladi, bu SQL Injection xavfini kamaytiradi. ExecuteNonQuery metodi ma’lumot qo‘shish kabi o‘zgartirish operatsiyalari uchun ishlatiladi.

Ma’lumotni yangilash. Quyida Students jadvalidagi talabaning ismini yangilash misoli keltirilgan:

```
using System;
using System.Data.SqlClient;
class Program
{
  static void Main()
  {
    string connectionString = "Server=localhost;Database=SchoolDB;Trusted_Connection=True;";
    using (SqlConnection connection = new SqlConnection(connectionString))
    {
      try
      {
        connection.Open();
        string query = "UPDATE Students SET FirstName = @FirstName WHERE Id = @Id";
        SqlCommand command = new SqlCommand(query, connection);

        command.Parameters.AddWithValue("@FirstName", "Bobur");
        command.Parameters.AddWithValue("@Id", 1);

        int rowsAffected = command.ExecuteNonQuery();
        Console.WriteLine($"{rowsAffected} row(s) updated.");
      }
      catch (Exception ex)
      {
        Console.WriteLine("Error: " + ex.Message);
      }
    }
  }
```

```
}
```

Ushbu misolda ma’lumotni yangilash uchun UPDATE so‘rovi ishlatiladi. Parametrlashtirilgan so‘rovlar xavfsizlikni[3] oshiradi va kodni yanada mustahkam qiladi.

Endi xuddi shu amallarni Entity Framework texnologiyasi orqali amalga oshirishni ko‘rib chiqishimiz mumkin. Quyida Students jadvalidan ma’lumotlarni o‘qish uchun Entity Framework (Code First) misoli keltirilgan:

```
using System;
using System.Linq;
using Microsoft.EntityFrameworkCore;
public class Student
{
   public int Id { get; set; }
   public string FirstName { get; set; }
   public string LastName { get; set; }
}
public class SchoolContext : DbContext
{
   public DbSet<Student> Students { get; set; }
   protected override void OnConfiguring(DbContextOptionsBuilder optionsBuilder)
   {       optionsBuilder.UseSqlServer("Server=localhost;Database=SchoolDB;Trusted_Connection=True;");
   }
}
class Program
{
   static void Main()
   {
      using (var context = new SchoolContext())
      {
         var students = context.Students.ToList();
         foreach (var student in students)
         {
            Console.WriteLine($"ID: {student.Id}, Name: {student.FirstName} {student.LastName}");
         }
      }
   }
}
```

[3] Amirkulov Ch.J., Normurodov Ch.B. (2020). Навье – Стокс тенгламаларининг айрим хусусий ечимлари ҳақида. Интернаука, 4(16)

Bu misolda DbContext va LINQ yordamida ma’lumotlar[4] o‘qiladi. Kod soddaligi va obyektga yo‘naltirilgan yondashuvi tufayli tushunarli va qisqa.

Ma’lumot qo‘shish. Quyida yangi talaba qo‘shish uchun Entity Framework misoli keltiriladi.

```
using System;
using Microsoft.EntityFrameworkCore;
public class Student
{
   public int Id { get; set; }
   public string FirstName { get; set; }
   public string LastName { get; set; }
}
public class SchoolContext : DbContext
{
   public DbSet<Student> Students { get; set; }

   protected override void OnConfiguring(DbContextOptionsBuilder optionsBuilder)
   {       optionsBuilder.UseSqlServer("Server=localhost;Database=SchoolDB;Trusted_Connection=True;");
   }
}
class Program
{
   static void Main()
   {
      using (var context = new SchoolContext())
      {
         var newStudent = new Student { FirstName = "Ali", LastName = "Valiyev" };
         context.Students.Add(newStudent);
         context.SaveChanges();
         Console.WriteLine("New student added.");
      }
   }
}
```

Add metodi va SaveChanges yordamida[5] yangi ma’lumot qo‘shiladi. Entity Framework avtomatik ravishda kerakli SQL so‘rovini generatsiya qiladi.

[4] Normurodov Chori Begaliyevich, Toyirov Akbar Khasanovich, Amirkulov Chori Jumayevich, Abdullaev Bakhtiyor Panji O’g’li (2020). Mathematical Modeling of the Hydrodynamic Stability Problem by the Spectral-grid Method. International Journal of Innovations in Engineering Research and Technology.

[5] Smith, J. (2020). "ADO.NET vs Entity Framework: A Comparative Analysis." Journal of Software Development, 15(3), 45-52.

Ma’lumotni yangilash. Quyida mavjud talabaning ismini yangilash misoli keltirilgan:

```
using System;
using System.Linq;
using Microsoft.EntityFrameworkCore;
public class Student
{
   public int Id { get; set; }
   public string FirstName { get; set; }
   public string LastName { get; set; }
}
public class SchoolContext : DbContext
{
   public DbSet<Student> Students { get; set; }
   protected override void OnConfiguring(DbContextOptionsBuilder optionsBuilder)
   {  optionsBuilder.UseSqlServer("Server=localhost;Database=SchoolDB;Trusted_Connection=True;");
   }
}
class Program
{
   static void Main()
   {
      using (var context = new SchoolContext())
      {
         var student = context.Students.FirstOrDefault(s => s.Id == 1);
         if (student != null)
         {
            student.FirstName = "Bobur";
            context.SaveChanges();
            Console.WriteLine("Student updated.");
         }
         else
         {
            Console.WriteLine("Student not found.");
         }
      }
   }
}
```

Bu yerda LINQ yordamida talaba topiladi va uning xususiyatlari o‘zgartiriladi. SaveChanges metodi yangilangan ma’lumotlarni ma’lumotlar bazasiga yozadi.

Ma’lumotni o‘chirish. Quyida talabani o‘chirish uchun Entity Framework misoli keltirilgan:

```
using System;
using System.Linq;
using Microsoft.EntityFrameworkCore;
public class Student
{
    public int Id { get; set; }
    public string FirstName { get; set; }
    public string LastName { get; set; }
}
public class SchoolContext : DbContext
{
    public DbSet<Student> Students { get; set; }

    protected override void OnConfiguring(DbContextOptionsBuilder
optionsBuilder)
    {

optionsBuilder.UseSqlServer
("Server=localhost;Database=SchoolDB;Trusted_Connection=True;");
    }
}
class Program
{
    static void Main()
    {
        using (var context = new SchoolContext())
        {
            var student = context.Students.FirstOrDefault(s => s.Id == 1);
            if (student != null)
            {
                context.Students.Remove(student);
                context.SaveChanges();
                Console.WriteLine("Student deleted.");
            }
```

```
            else
            {
                Console.WriteLine("Bunday talaba yo‘q");
            }
        }
    }
}
```

Xulosa qilib aytadigan bo‘lsak ADO.NET va Entity Framework ikkalasi ham C# dasturlash tilida ma’lumotlar bazasi bilan ishlash uchun muhim vositalardir. ADO.NET past darajali, yuqori samarali va moslashuvchan yondashuvni taklif qilsa, Entity Framework ishlab chiqishni soddalashtiradi va zamonaviy obyektga yo‘naltirilgan dasturlash prinsiplariga mos keladi. OYD tamoyillariga ko‘ra MVVM va MVC modellari bilan ishlash jarayoni va platformalar yaratilish tezligini hisobga olsak Entity Framework texnologiyasi afzallik beradi. Ammo tushunish va qayta ishlash jarayonining soddaligi bilan ADO.NET texnologiyasi afzaldir. Loyiha talablari va jamoaning tajribasiga qarab, dasturchilar ushbu texnologiyalardan birini tanlashi mumkin. Amaliy misollar orqali ko‘rsatilganidek, har bir texnologiya o‘ziga xos afzallik va cheklovlarga ega bo‘lib, to‘g‘ri tanlov loyiha muvaffaqiyatini ta’minlaydi.

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