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Entity Framework Performance

Databases

Telerik Software Academy
http://academy.telerik.com

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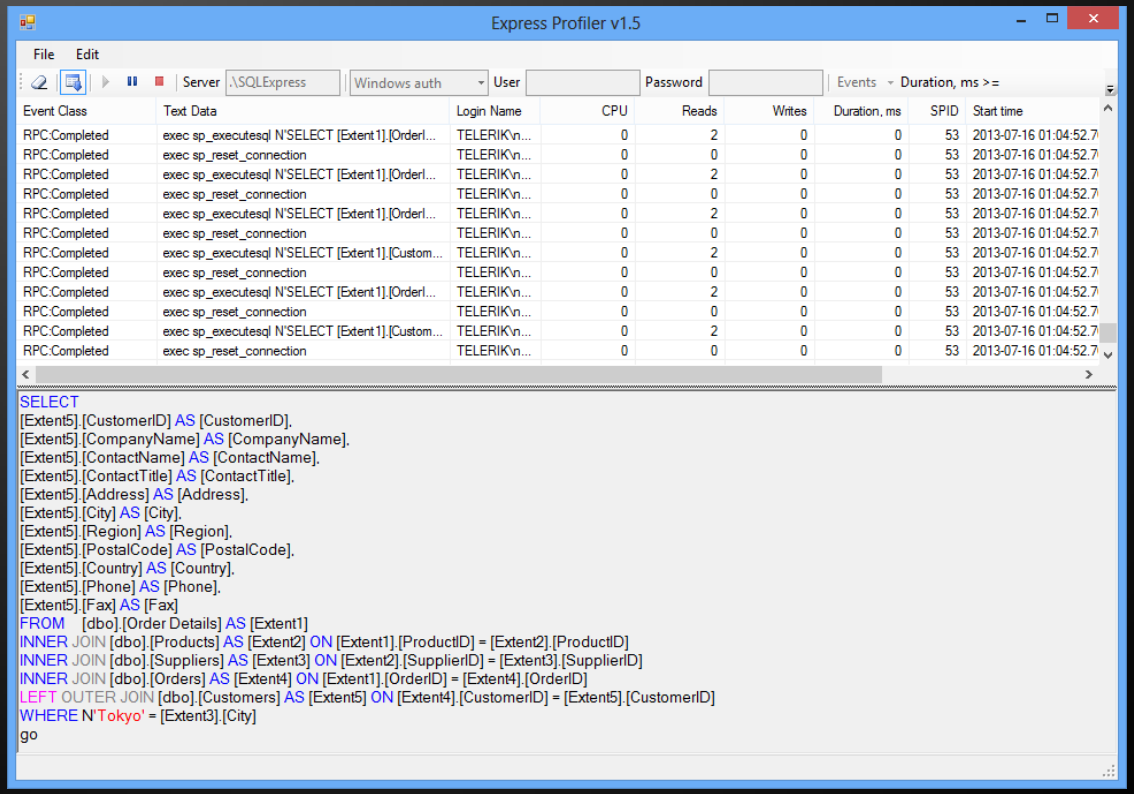
SQL Profilers

How to Trace All Executed SQL Commands?



What is SQL Profiler?

- SQL Profilers intercept the SQL queries executed at the server side
  - Powerful tools to diagnose the hidden Entity Framework queries
- SQL Server has "SQL Server Profiler" tool
  - Part of Enterprise / Developer edition (paid tool)
- A free SQL Profiler exists for SQL Server:
  - Express Profiler: http://expressprofiler.codeplex.com
  - Easy-to-use, open-source, lightweight, powerful, … and works!

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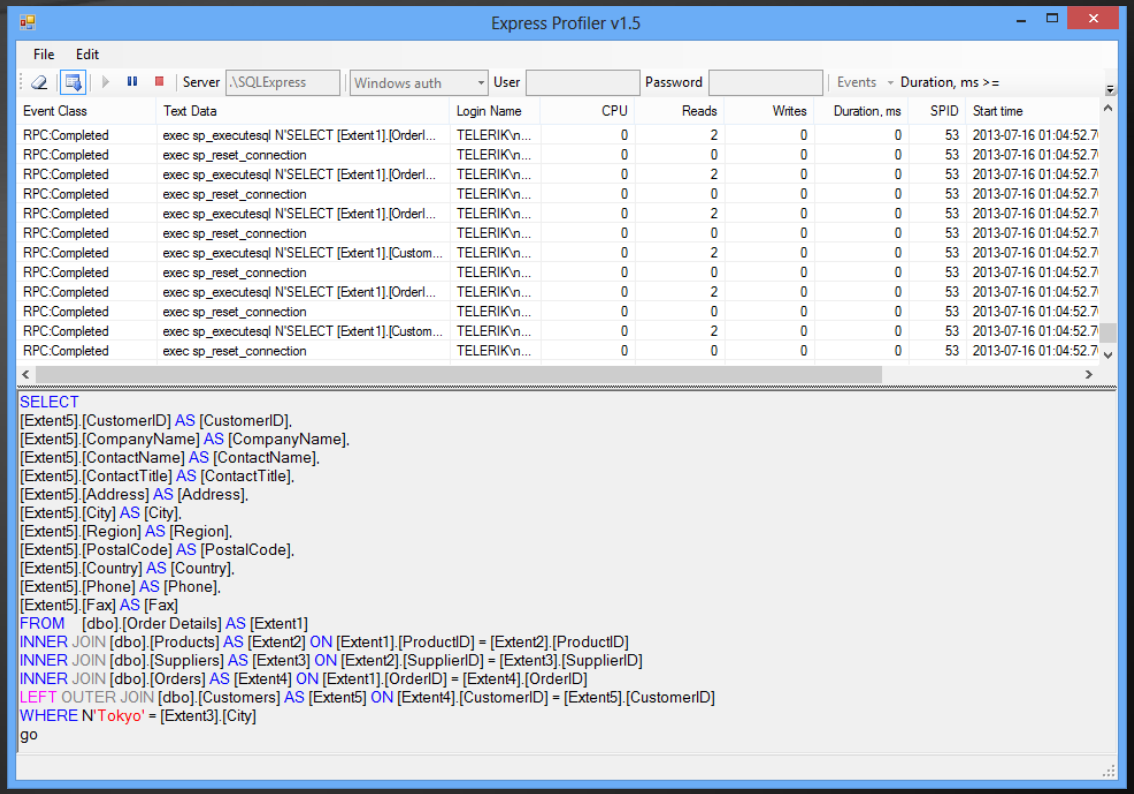

Express Profiler

Live Demo

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The N+1 Query Problem

What is the N+1 Query Problem and How to Avoid It?

The N+1 Query Problem

- What is the N+1 Query Problem?
  - Imagine a database that contains tables `Products`, `Suppliers` and `Categories`
    - Each product has a supplier and a category
  - We want to print each `Product` along with its `Supplier` and `Category`:

```
foreach (var product in context.Products)
{
  Console.WriteLine("Product: {0}; {1}; {2}",
    product.ProductName, product.Supplier.CompanyName,
    product.Category.CategoryName);
}
```

The N+1 Query Problem (2)

- This code will execute N+1 SQL queries:

```
foreach (var product in context.Products)
{
  Console.WriteLine("Product: {0}; {1}; {2}",
    product.ProductName, product.Supplier.CompanyName,
    product.Category.CategoryName);
}
```

One query to retrive the products

Additional N queries to retrieve the supplier for each product

Additional N queries to retrieve the category for each product

- Imagine we have 100 products in the database
  - That's ~ 201 SQL queries → very slow!
  - We could do the same with a single SQL query

Solution to the N+1 Query Problem

- Fortunately there is an easy way in EF to avoid the N+1 query problem:

Using `Include(…)` method only one SQL query with join is made to get the related entities

```
foreach (var product in context.Products.
  Include("Supplier").Include("Category"))
{
  Console.WriteLine("Product: {0}; {1}; {2}",
    product.ProductName, product.Supplier.CompanyName,
    product.Category.CategoryName);
}
```

No additional SQL queries are made here for the related entities

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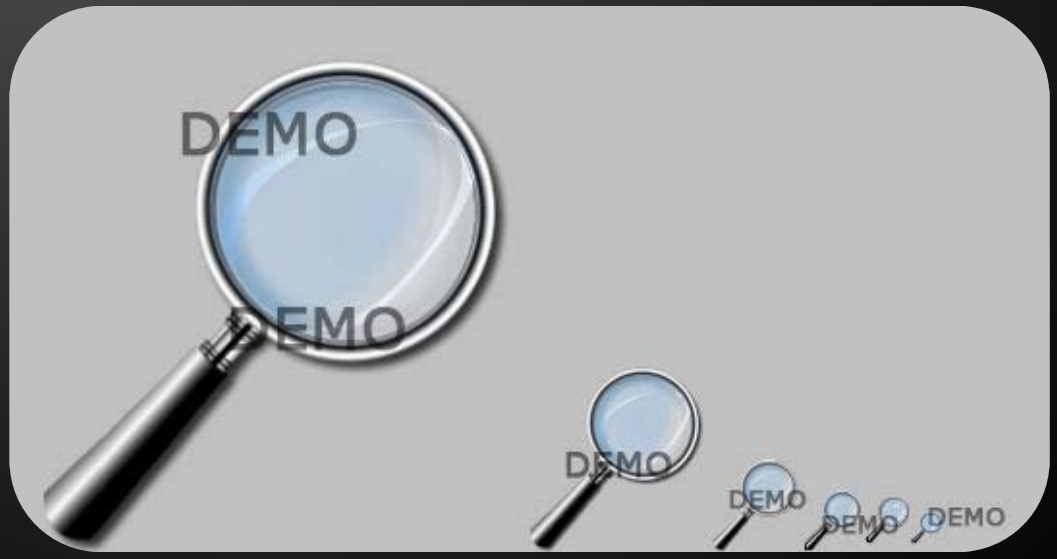
Solution to the N+1 Query Problem

Live Demo



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Incorrect Use of ToList()

How ToList() Can Significantly Affect the Performance

Incorrect Use of ToList()

- In EF invoking `ToList()` executes the underlying SQL query in the database
  - Transforms `IQueryable<T>` to `List<T>`
  - Invoke `ToList()` as late as possible, after all filtering, joins and groupings
- Avoid such code:

```
List<Order_Detail> orderItemsFromTokyo =
  northwindEntities.Order_Details.ToList().
  Where(od => od.Product.Supplier.City == "Tokyo").ToList();
```

  - This will cause all order details to come from the database and to be filtered later in the memory

Incorrect Use of ToList()

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Incorrect Use of SELECT *

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Deleting Entities Faster with Native SQL Query

Deleting Entities

- Deleting entities (slower):

```
NorthwindEntities northwindEntities = new NorthwindEntities();
var category = northwindEntities.Categories.Find(46);
northwindEntities.Categories.Remove(category);
northwindEntities.SaveChanges();
```

  - Executes SELECT + DELETE commands

- Deleting entities with native SQL (faster):

```
NorthwindEntities northwindEntities = new NorthwindEntities();
northwindEntities.Database.ExecuteSqlCommand(
  "DELETE FROM Categories WHERE CategoryID = {0}", 46);
```

  - Executes a single DELETE command

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Deleting Entities Faster with Native SQL Query

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Homework

1. Using Entity Framework write a SQL query to select all employees from the Telerik Academy database and later print their name, department and town. Try the both variants: with and without `.Include(…)`. Compare the number of executed SQL statements and the performance.
2. Using Entity Framework write a query that selects all employees from the Telerik Academy database, then invokes `ToList()`, then selects their addresses, then invokes `ToList()`, then selects their towns, then invokes `ToList()` and finally checks whether the town is "Sofia". Rewrite the same in more optimized way and compare the performance.

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