Using EF Core to Query a Database

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Module Overview

Understand EF Core's query workflow

Basics of querying using EF Core and LINQ

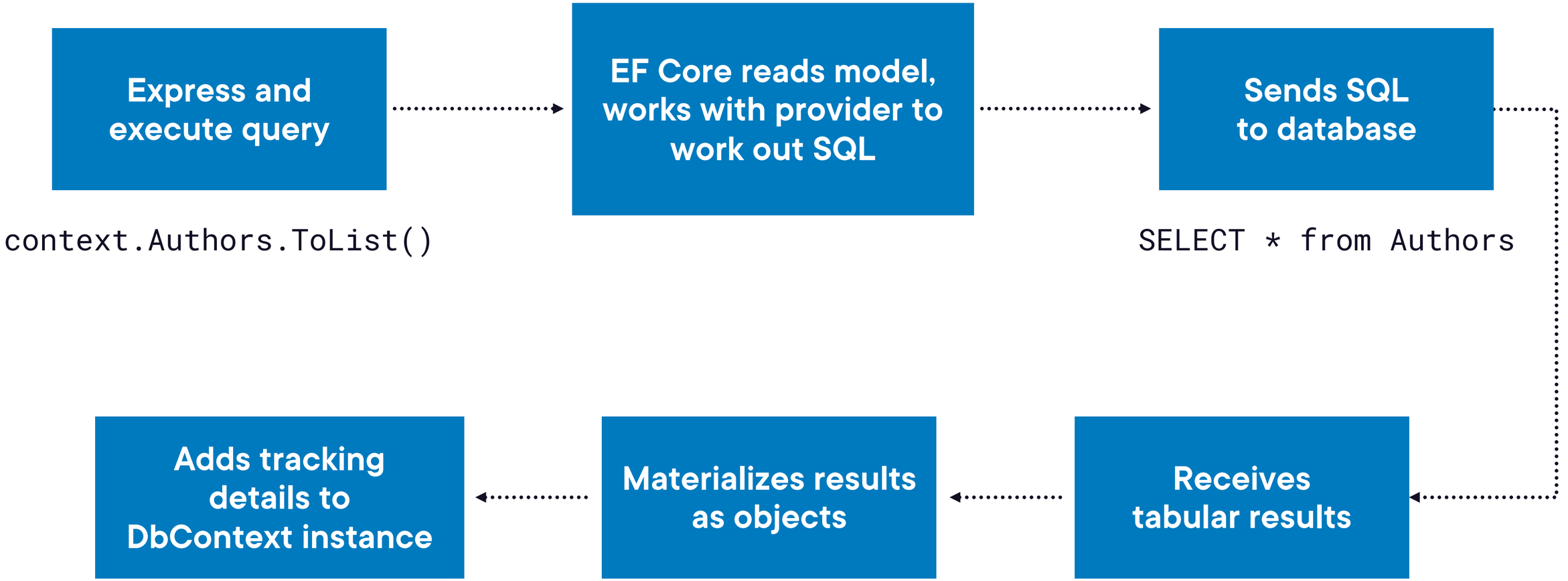
Filtering, sorting, and aggregating in queries

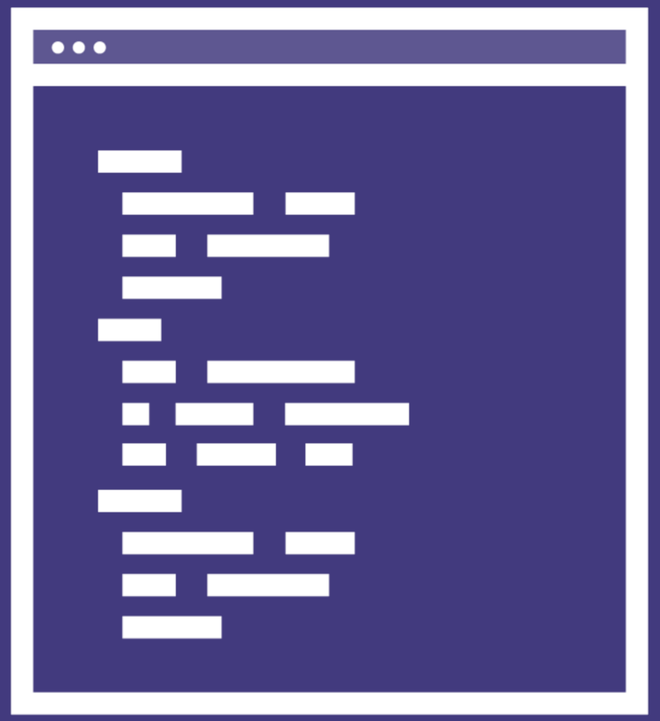
Explore the SQL queries that EF Core is building for you

Improve query performance by deactivating tracking when not needed

Querying Basics

Query Workflow





The Simplest Query

```
_context.Authors.ToList()
```

A LINQ execution method,
e.g., ToList(),
triggers the query to
execute on the database.

Two Ways to Express LINQ Queries

LINQ Methods

```
context.Authors.ToList();
```

```
context.Authors
.Where(a=>a.FirstName==“Julie”)
.ToList()
```

LINQ Operators

```
(from a in context.Authors
 select a)
.ToList()
```

```
(from a in context.Authors
 where a.FirstName==“Julie”
 select a)
.ToList()
```

More about LINQ Operators

Querying Data in EF Core

Torben Boeck Jensen

```
var authors = context.Authors.ToList();

var query = context.Authors;
var authors = query.ToList();
```

Queries are Composable

You don’t need to convey them in a single expression

Triggering Queries via Enumeration

```
var query=_context.Authors;

foreach (var a in query)
{
  Console.Writeline(a.LastName);
}
```

```
~~var query=_context.Authors;~~

foreach (var a in
          context.Authors)
{
  Console.Writeline(a.LastName);
}
```

Database connection remains open during query enumeration

Enumerate vs. Execute

```
foreach (var a in context.Authors){
   Console.WriteLine(a.FirstName);
}
```

```
foreach (var a in context.Authors){
   RunSomeValidator(a. FirstName);
   CallSomeService(a.Id);
   GetSomeMoreDataBasedOn(a.Id);
}
```

```
var authors=context.Authors.ToList()
foreach (var a in authors){
   RunSomeValidator(a.FirstName);
   CallSomeService(a.Id);
   GetSomeMoreDataBasedOn(a.Id);
}
```

- Good enumeration: Minimal effort on enumeration
- Bad enumeration: Lots of work for each result. Connection stays open until last result is fetched.
- Execution: Smarter to get results first

Filtering Queries Securely by Default

Parameterized queries protect your database from SQL Injection attacks

More about SQL Injection Attack Security

Ethical Hacking: SQL Injection

Troy Hunt

EF Core Parameter Creation

Search value is directly in query

```
.Where(a=>a.FirstName==“Josie”)
```

No parameter is created in SQL

```
SELECT * FROM Authors
WHERE Authors.FirstName=‘Josie’
```

Search value in a variable

```
var name=“Josie”
.Where(a=>a.FirstName==name)
```

Parameter is created in SQL

```
@P1=‘Josie’
SELECT * FROM Authors
WHERE Authors.FirstName=@P1
```

Benefiting From Additional Filtering Features

Filtering Partial Text in Queries

EF.Functions.Like

```
EF.Functions.Like(property, %abc%)
```

```
_context.Authors.Where(a=>
    EF.Functions.Like(a.Name,“%abc%”)
)
```

```
SQL LIKE(%abc%)
```

LINQ Contains

```
property.Contains(abc)
```

```
_context.Authors.Where(a=>
    a.Name.Contains(“abc”)
)
```

```
SQL LIKE(%abc%)
```

Finding an Entity Using its Key Value

- DbSet.Find(keyvalue)
- This is the only task that Find can be used for
- Not a LINQ method
- Executes immediately
- If key is found in change tracker, avoids unneeded database query

Skip and Take for Paging

1. Aardvark
2. Abyssinian
3. Adelie Penguin
4. Affenpinscher
5. Afghan Hound
6. African Bush Elephant
7. African Civet
8. African Clawed Frog
9. African Forest Elephant
10. African Palm Civet
11. African Penguin
12. African Tree Toad
13. African Wild Dog
14. Ainu Dog
15. Airedale Terrier
16. Akbash
17. Akita
18. Alaskan Malamute
19. Albatross
20. Aldabra Giant Tortoise

Get first 10 animals

Skip(0).Take(10)

Get next 10 animals

Skip(10).Take(10)

Sorting Data in Queries

Sorting with LINQ

OrderBy(o=>o.Property)

ThenBy(o=>o.Property)

OrderByDescending
(o=>o.Property)

ThenByDescending
(o=>o.Property)

LINQ Methods Can Be Combined

```
_context.Authors
.Where(a=>a.LastName=="Lerman")
.OrderByDescending(a=>a.FirstName).ToList();
```

Aggregating Results in Queries

LINQ to Entities Aggregate Execution Methods

`First()`	`FirstAsync()`
`FirstOrDefault()`	`FirstOrDefaultAsync()`
`Single()`	`SingleAsync()`
`SingleOrDefault()`	`SingleOrDefaultAsync()`
`Last()`	`LastAsync()`
`LastOrDefault()`	`LastOrDefaultAsync()`
`Count()`	`CountAsync()`
`LongCount()`	`LongCountAsync()`
`Min()`, `Max()`	`MinAsync()`, `MaxAsync()`
`Average()`, `Sum()`	`AverageAsync()`, `SumAsync()`

No Aggregation

`ToList()`	`ToListAsync()`
`AsEnumerable()`	`AsAsyncEnumerable()`

Aggregate Method Pointers

`First` **methods return the first of any matches**

`First/Single/Last` **will throw if no results are returned**

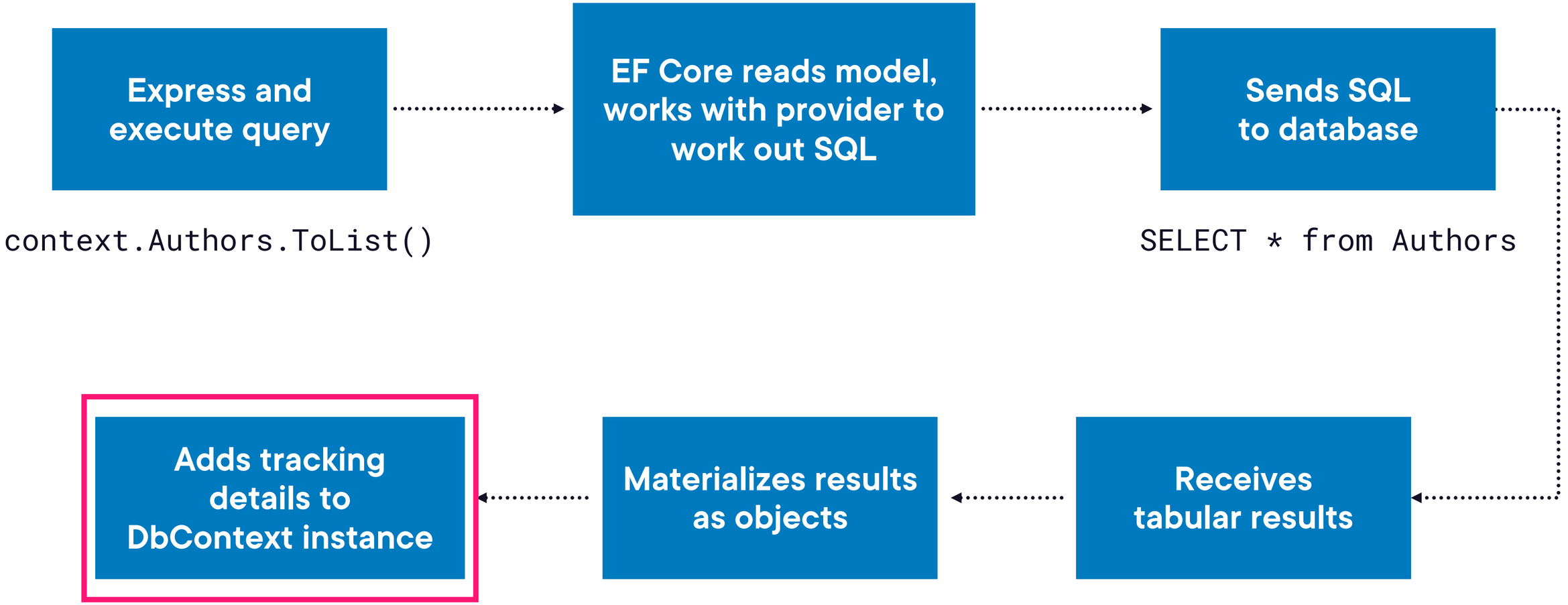
`Single` **methods expect only one match and will throw if there are none or more than one**

`FirstOrDefault/SingleOrDefault/LastOrDefault` **will return a null if no results are returned**

`Last` **methods require query to have an** `OrderBy()` **method otherwise will throw an exception**

Enhancing Query Performance When Tracking Isn’t Needed

Query Workflow



Change tracking is expensive.

Most Common Scenario for No Tracking: Web and Mobile Apps

No Track Queries and DbContexts

```
var author =
context.Authors.AsNoTracking()
.FirstOrDefault();
```

- AsNoTracking() returns a query, not a DbSet

```
protected override void OnConfiguring
(DbContextOptionsBuilder optionsBuilder)
{
  optionsBuilder
  .UseSqlServer(myconnectionString)
  .UseQueryTrackingBehavior
     QueryTrackingBehavior.NoTracking);
}
```

- All queries for this DbContext will default to no tracking

  Use DbSet.AsTracking() for special queries that need to be tracked

Review

EF Core, with provider's help, transforms LINQ queries into SQL

Query execution is triggered with specific methods

Workflow includes sending SQL to database

EF Core materializes database results into objects

LINQ filter, sorting and aggregating methods are also translated into SQL

You can improve performance by disabling the default tracking when not needed

Up Next:

Tracking and Saving Data with EF Core

Resources

Entity Framework Core on GitHub: github.com/dotnet/efcore

EF Core Documentation: learn.microsoft.com/ef/core

Ethical Hacking: SQL Injection (Pluralsight course by Troy Hunt):
app.pluralsight.com/library/courses/ethical-hacking-sql-injection

.NET Docs: Enumerable.FirstOrDefault Method
docs.microsoft.com/en-us/dotnet/api/system.linq.enumerable.firstordefault