Interacting with Your EF Core Data Model

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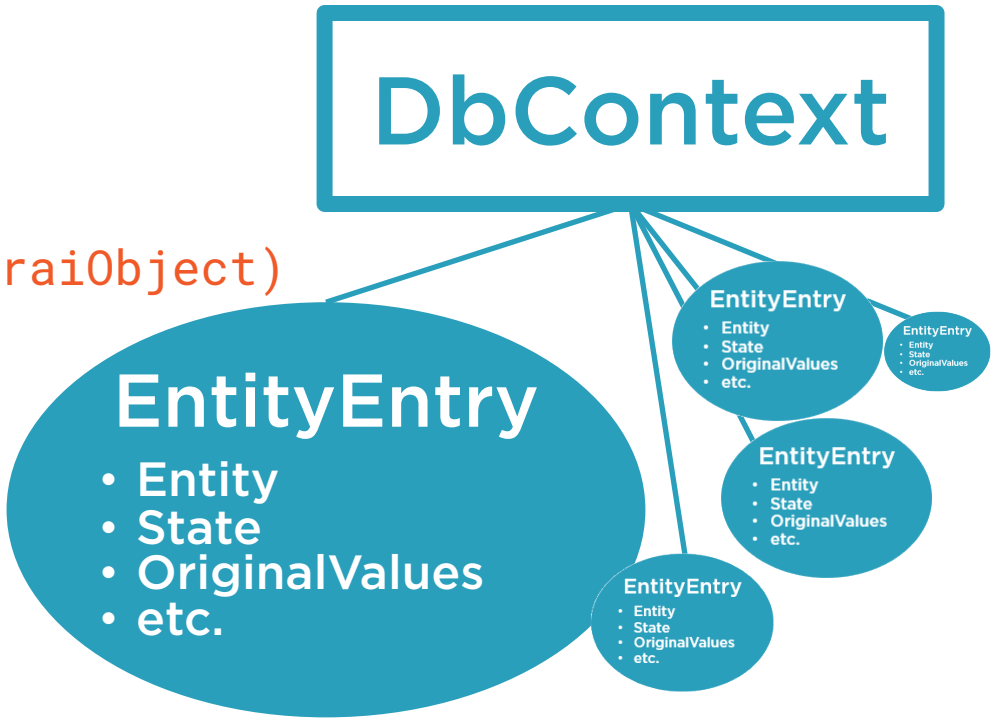
Module Overview

- Exploring SQL generated by EF Core
- Adding EF Core logging to the app
- Bulk operation support
- Query workflow
- Filters and aggregates in queries
- Updating and deleting objects
- Persisting data in disconnected apps
- De-activate tracking in disconnected apps

Looking at SQL Built by EF Core

Under the Covers: Tracking Entities

```
context.Samurais.Add(samuraiObject)
```



Under the Covers: Tracking Entities

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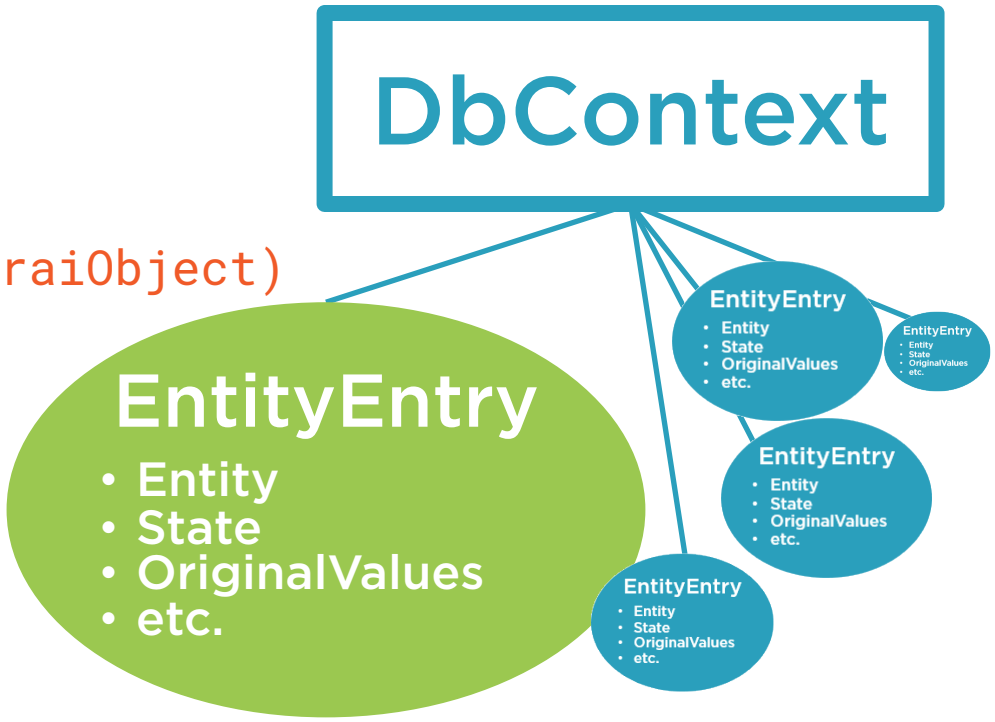

Under the Covers: Tracking Entities

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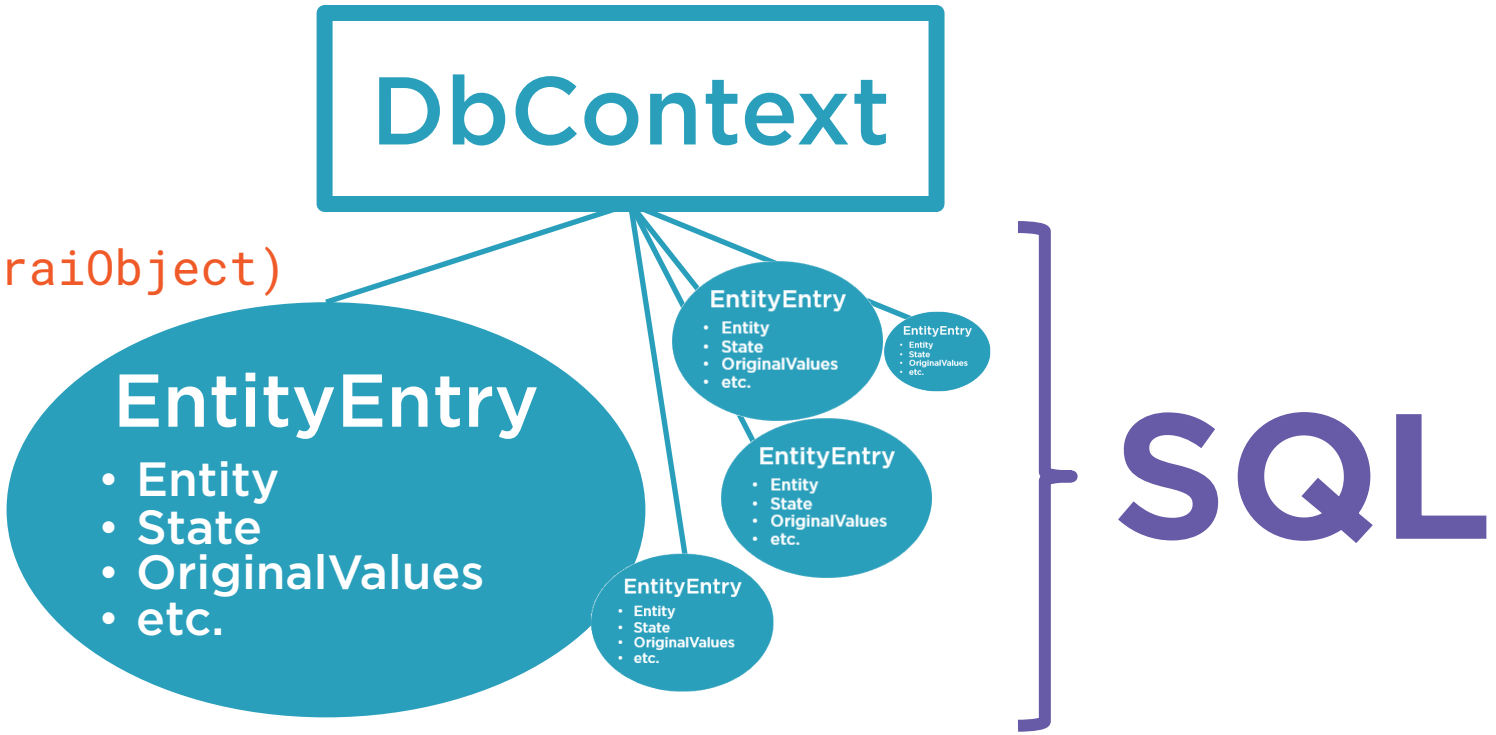


Adding Logging to EF Core's Workload

.NET Core Logging

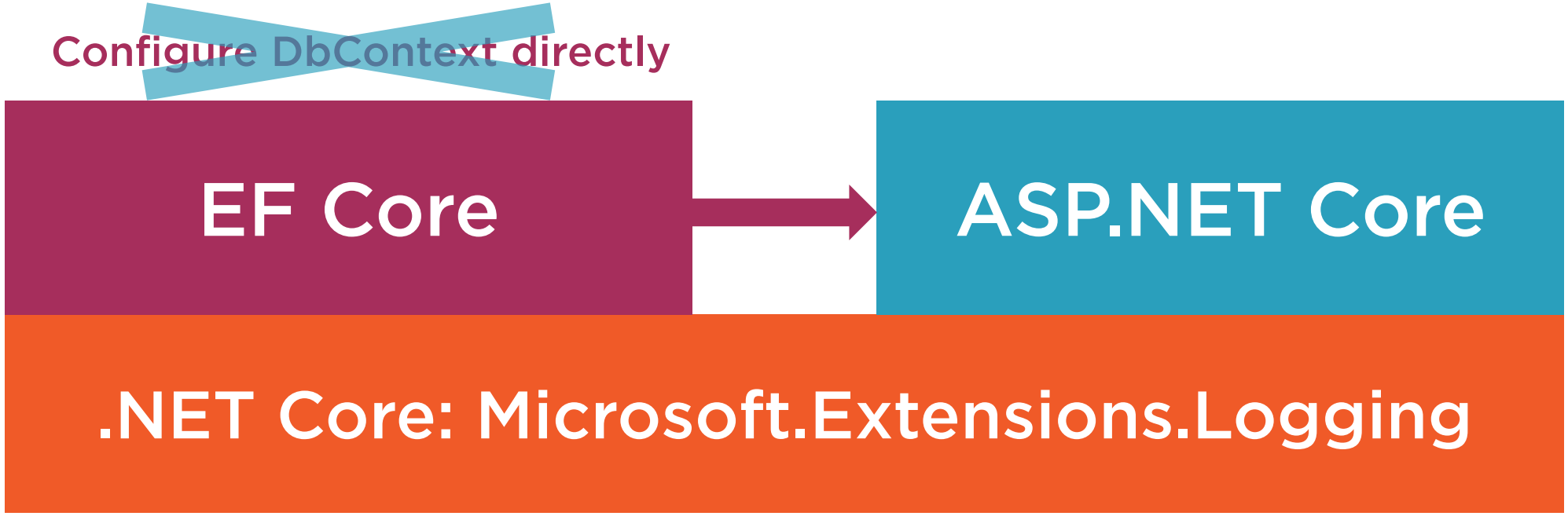
Configure DbContext directly

EF Core

.NET Core: Microsoft.Extensions.Logging

Logging is so much better in EF Core 5

.NET Core Logging



New DbContextOptionsBuilder.LogTo Method

```
protected override void OnConfiguring
(DbContextOptionsBuilder optionsBuilder)

{
    optionsBuilder
      .UseSqlServer(someconnectionstring)
      .LogTo(target);
}
```

LogTo Target Examples

```
optionsBuilder
 .LogTo(Console.WriteLine)
```

- Delegate to Console.WriteLine

```
private StreamWriter _writer
 = new StreamWriter
  (“EFCoreLog.txt", append: true);

optionsBuilder
 .LogTo(_writer.WriteLine)
```

- Delegate to StreamWriter.WriteLine

```
optionsBuilder
 .LogTo(log=>Debug.WriteLine(log));
```

- Lambda expression for Debug.WriteLine

Even More Logging Features

Formatting

Detailed query error information

Filter on event types

What information goes in a log message

Show sensitive information e.g., parameters

Enabling Sensitive Data to Show in Logs

Default: Parameters are hidden

```
[__name_0='?' (Size = 4000)]
```

Configure with OptionsBuilder

```
protected override void OnConfiguring(DbContextOptionsBuilder optionsBuilder)
{
  optionsBuilder
  .UseSqlServer(connectionString)
  .LogTo(Console.WriteLine)
  .EnableSensitiveDataLogging();
}
```

```
[__name_0='Sampson' (Size = 4000)]
```

Even More Logging Features

Formatting

Detailed query error information

Filter on event types

What information goes in a log message

Show sensitive information e.g., parameters

Benefiting from Bulk Operations Support

Tracking Methods on DbSet and DbContext

```
context.Samurais.Add(…)

context.Samurais.AddRange(…)
```

Track via DbSet

DbSet indicates type

```
context.Add(…)

context.AddRange(…)
```

Track via DbContext

Context will discover type(s)

Batching can combine types and operations

Batch Operation Batch Size

- Default size & more is set by database provider
- Additional commands will be sent in extra batches
- Override batch size in DbContext OnConfiguring

```
protected override void OnConfiguring(DbContextOptionsBuilder optionsBuilder)
{
    optionsBuilder
        .UseLoggerFactory(MyConsoleLoggerFactory)
        .EnableSensitiveDataLogging(true)
        .UseSqlServer(connectionString, options=>options.MaxBatchSize(150));
}
```

Understanding the Query Workflow

The Simplest Query

```
_context.Samurais.ToList()
```

Query Workflow

Express & execute query

```
context.Samurais.ToList()
```

EF Core reads model, works with provider to work out SQL

Sends SQL to database

```
SELECT * from Samurais
```

Receives tabular results

3	Ms.	Donnie	F.	Carreras
4	Ms.	Janet	M.	Gates
5	Mr.	Lucy	*NULL*	Harrington
6	Mr.	Joop	X.	Carroll
7	Mr.	Dominic	P.	Gash
10	Ms.	Kathleen	M.	Garza
11	Ms.	Kathleen	*NULL*	Harding
12	Mr.	Johnny	A.	Caprio
16	Mr.	Christopher	R.	Beck
18	Mr.	David	J.	Liu
19	Mr.	John	A.	Beaver

Materializes results as objects

Adds tracking details to DbContext instance

Two Ways to Express LINQ Queries

LINQ Methods

```
context.Samurais.ToList();
```

```
context.Samurais
.Where(s=>s.Name==“Julie”)
.ToList()
```

LINQ Query Syntax

```
(from s in context.Samurais
 select s).ToList()
```

```
(from s in context.Samurais
 where s.Name==“Julie”
 select s).ToList()
```

Deferred Query Execution

```
var query=_context.Samurais;

var samurais=query.ToList();
```

```
var query=_context.Samurais;

foreach (var s in query)
{
  Console.Writeline(s.name);
}
```

Deferred Query Execution

```
var query=_context.Samurais;

var samurais=query.ToList();
```

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

foreach (var s in
            context.Samurais)
{
  Console.Writeline(s.name);
}
```

Database Connection Remains Open During Enumeration

```
foreach (var s in context.Samurais){
   Console.WriteLine(s.Name);
}
```

- Minimal effort on enumeration, ok

```
foreach (var s in context.Samurais){
   RunSomeValidator(s.Name);
   CallSomeService(s.Id);
   GetSomeMoreDataBasedOn(s.Id);
}
```

- Lots of work for each result. Connection stays open until last result is fetched.

```
var samurais=context.Samurais.ToList()
foreach (var s in samurais){
   RunSomeValidator(s.Name);
   CallSomeService(s.Id);
   GetSomeMoreDataBasedOn(s.Id);
}
```

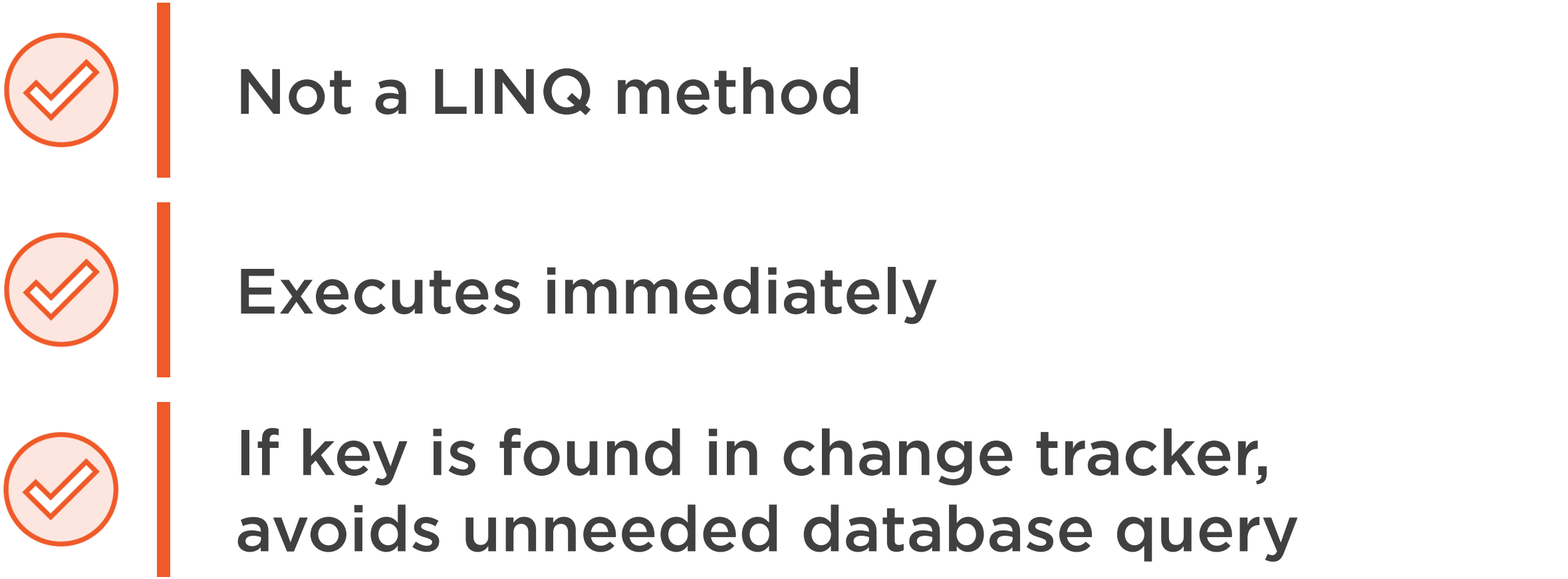
- Smarter to get results first

Filtering in Queries

Coming from EF Core 2?

Be aware of the
GREAT LINQ OVERHAUL
for EF Core 3, which
impacted query behavior

DbSet.Find(key)



Filtering Partial Text LINQ

Like

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

```
_context.Samurais.Where(s=>
  EF.Functions.Like(s.Name,"%abc%")
)
```

SQL LIKE(%abc%)

Contains

property.Contains(abc)

```
_context.Samurais.Where(s=>
  s.Name.Contains("abc")
)
```

SQL LIKE(%abc%)

Aggregating in Queries

EF Core Parameter Creation

Search value is directly in query

```
...Where(s=>s.Name==“Sampson”)
```

No parameter is created in SQL

```
SELECT * FROM T
WHERE T.Name=‘Sampson’
```

Search value is in a variable

```
var name=“Sampson”

...Where(s=>s.Name==name)
```

Parameter is created in SQL

```
@parameter=‘Sampson’

SELECT * FROM T
WHERE T.Name=@parameter
```

LINQ to Entities Execution Methods

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

Not a LINQ method, but a DbSet method that will execute:

Find(keyValue)	FindAsync(keyValue)

*Last methods require query to have an OrderBy() method otherwise will return full set then pick last in memory
*First/Single will

Execution Method Pointers

Last methods require query to have an OrderBy() method otherwise will return full set then pick last in memory

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

First methods return the first of any matches

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

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

Updating Simple Objects

Skip & 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

Get first 10 animals

Skip(0).Take(10)

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 next 10 animals

Skip(10).Take(10)

Deleting Simple Objects

Deleting May Seem a Little Weird

```
_context.Samurais.Add(samurai)
_context.Samurais.AddRange(samuraiList)

_context.Add(samurai)
_context.AddRange(samurai, battle)
```

```
_context.Samurais.Update(samurai)
_context.Samurais.UpdateRange(samuraiList)

_context.Update(samurai)
_context.UpdateRange(samurai, battle)
```

```
_context.Samurais.Remove(samurai)
_context.Samurais.RemoveRange(samuraiList)

_context.Remove(samurai)
_context.RemoveRange(samurai, battle)
```

- DbSet Add, AddRange
- DbContext Add, AddRange

- DbSet Update, UpdateRange
- DbContext Update, UpdateRange
- DbSet Remove, RemoveRange
- DbContext Remove, RemoveRange

Workarounds for Required Object to Delete

Fake object with key property filled: watch out for possible side effects

Stored procedure via EF Core raw SQL feature

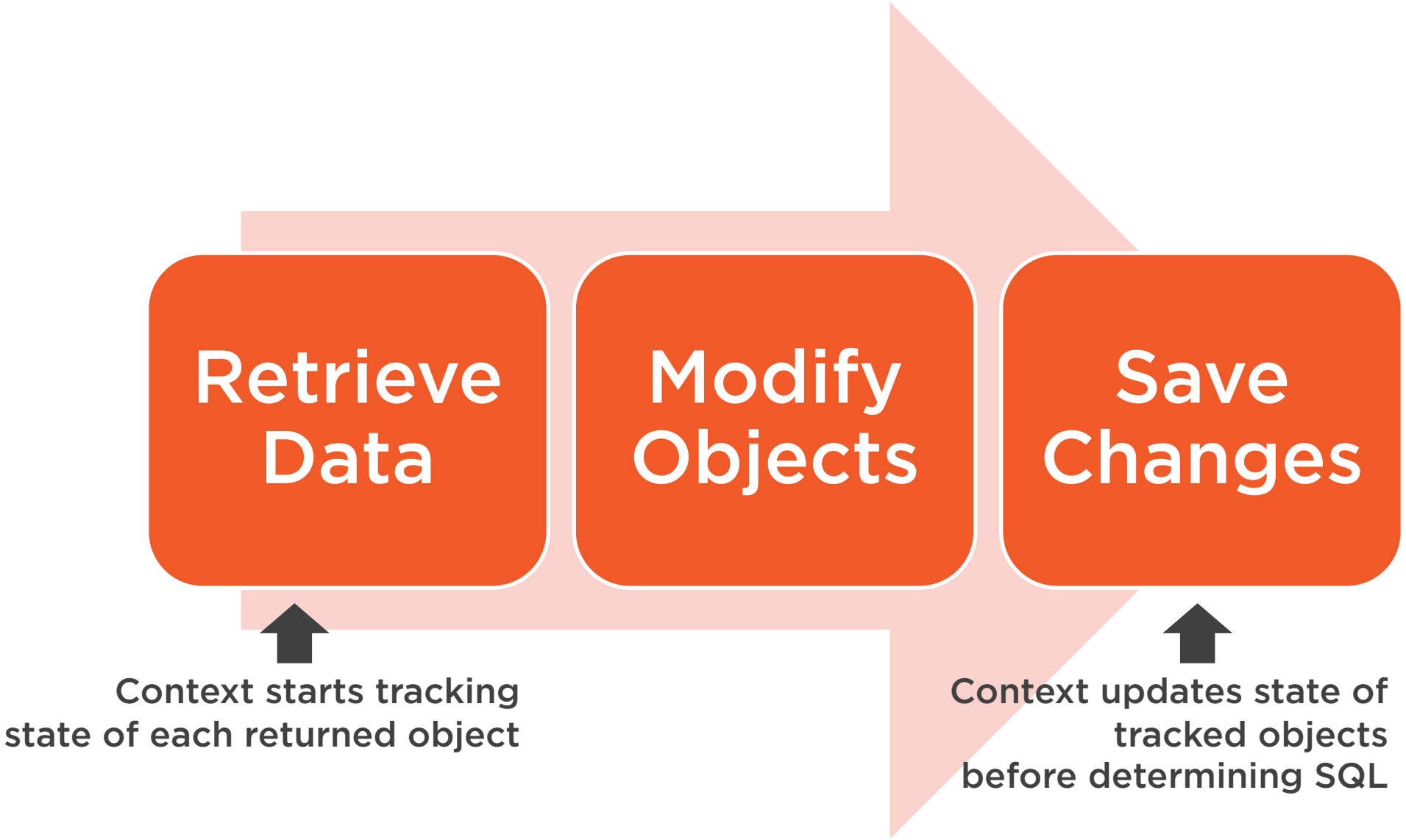
Further on in this course

Soft delete via Global Query Filters

Link in resources

Understanding Disconnected Scenarios

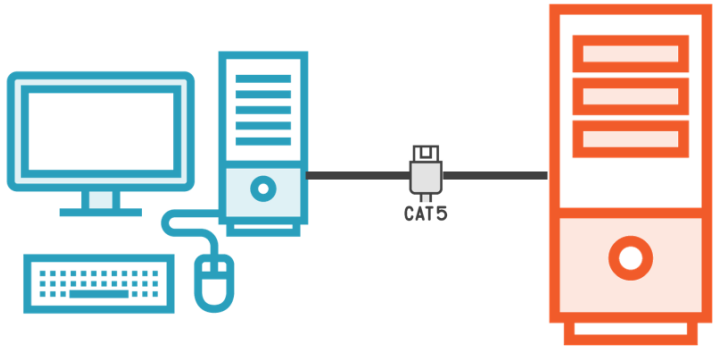
Working in a Single DbContext Instance



Connected Data Access

Client Storing Data Locally

Network Connected Clients



Disconnected Clients

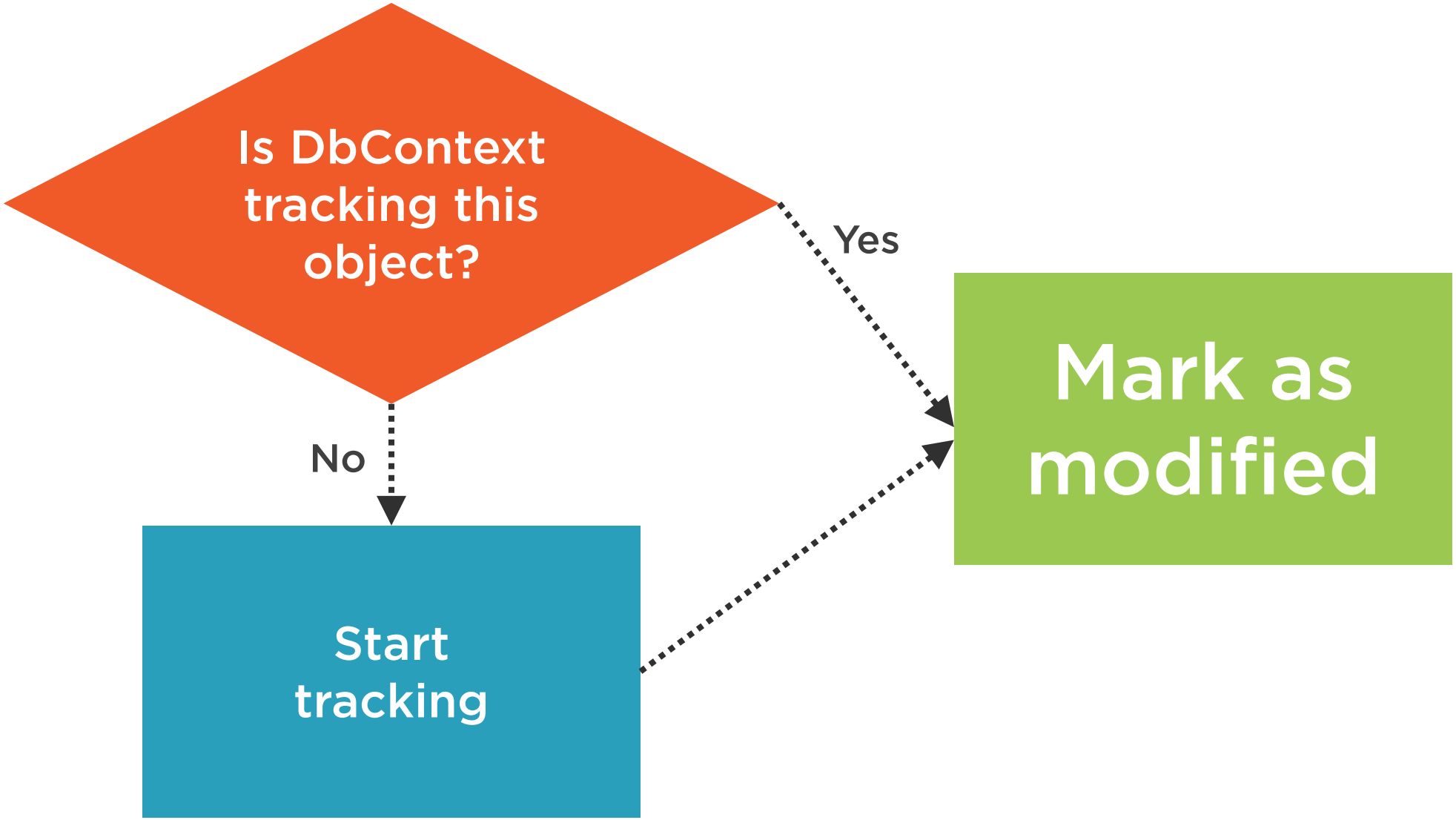
In disconnected scenarios, it's up to you to inform the context about object state.

Persisting Data in Disconnected Scenarios

Ignoring the *:* right now.

Next module works with relationships.

Update Methods



Update causes all properties to be updated whether they were edited or not

Enhancing Performance in Disconnected Apps with No-Tracking Settings

No Track Queries and DbContext

```
var samurai = _context.Samurais.AsNoTracking().FirstOrDefault();
```

AsNoTracking returns a query, not a DbSet

```
public class SamuraiContextNoTrack: DbContext
{
  public SamuraiContextNoTrack()
  {
    ChangeTracker.QueryTrackingBehavior=QueryTrackingBehavior.NoTracking;
  }
```

All queries on SamuraiContextNoTrack will default to no tracking
Use DbSet.AsTracking() for special queries to be tracked

Change Tracking Is Expensive

Review

- Log EF Core SQL commands
- Inserts, updates and deletes
- Bulk operations
- Comprehend EF Core querying
- Filtering and aggregating in queries
- Persisting in disconnected apps e.g., web site
- Improve performance when tracking is not needed

Resources

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

EF Core Documentation docs.microsoft.com/ef

Article about Merge Joins
brentozar.com/archive/2017/05/case-entity-framework-cores-odd-sql/

EF Core 5.0: Building on the Foundation codemag.com/Article/20100412
EF Core 3.0: A Foundation for the Future codemag.com/Article/1911062

Entity Framework in the Enterprise, Pluralsight course bit.ly/PS_EFEnt

Logging SQL and Change-Tracking Events in EF Core, MSDN Mag Oct 2019
msdn.microsoft.com/magazine/mt830355

SqlServerModificationCommandBatch.cs on GitHub bit.ly/3jgrRss

Soft Delete in EF Core Docs docs.microsoft.com/en-us/ef/core/querying/filters

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