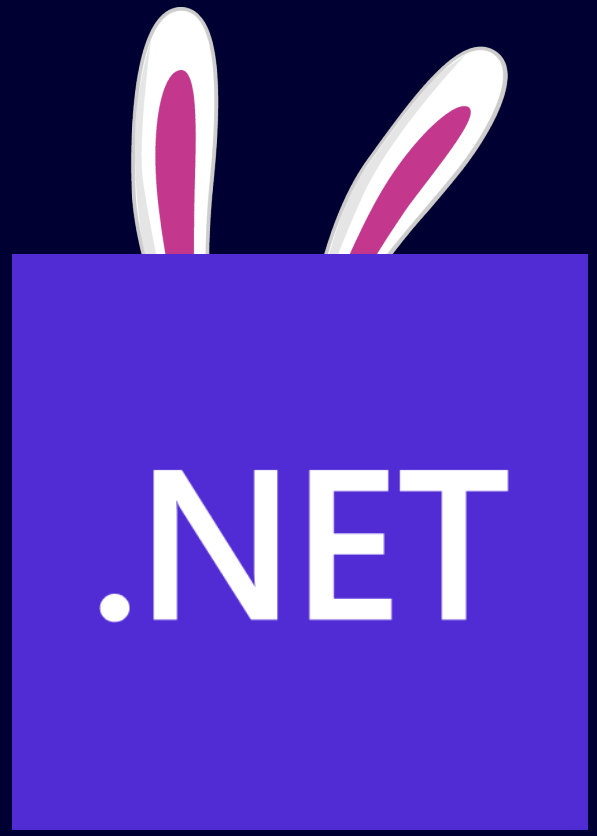
Trino C# .NET Client

Trino Conference Winter 2024



What is it?

- Trino .NET (C#) Client Library
  - .NET Standard 2.0
    - Compatible with .NET Framework 4.7.2 & .NET Core 2.0
- Open source from Microsoft
- ADO.NET implementation
- nuget packaging

.NET implementation	Version support
.NET and .NET Core	2.0, 2.1, 2.2, 3.0, 3.1, 5.0, 6.0, 7.0, 8.0, 9.0
.NET Framework [1]	4.6.1 [2], 4.6.2, 4.7, 4.7.1, **4.7.2**, 4.8, 4.8.1

Origins

- 6 years of iterating…
- Windows/ASP.NET

George Fisher
Oleg Savin
Ruslan Kartokhin
Ishan Patwa
Dimitry Berger

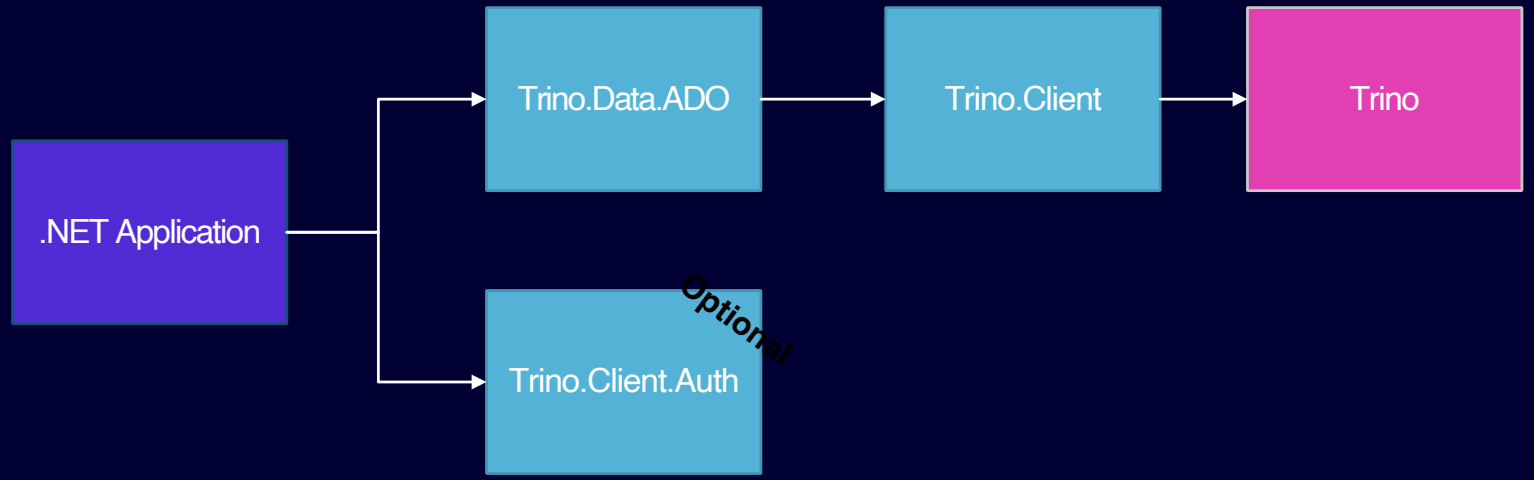
Special thanks to
David Lao
Xiaotong Zhang
Pruthvi Prodduturi

Design Objectives

- **Responsive/async** (fast return of rows for both short and long running queries).
- **.NET Type Support** (with complex types, date time precision, and System.Data types.)
- **Authentication** that is customizable and flexible (to support arbitrary custom token refresh, or unique cloud requirements).
- **Full ADO.NET** implementation.
- **Streaming** with read-ahead into customizable buffer size to allow for no-wait client paging.
- **Session support.**
- **Parameterized query support.**
- **Reduce DLL hell** no dependencies outside of .NET core except Newtonsoft.Json and Microsoft.Extensions.Logging. Authentication in separate library.
- **Alignment with Trino Java client**, similar class structure.

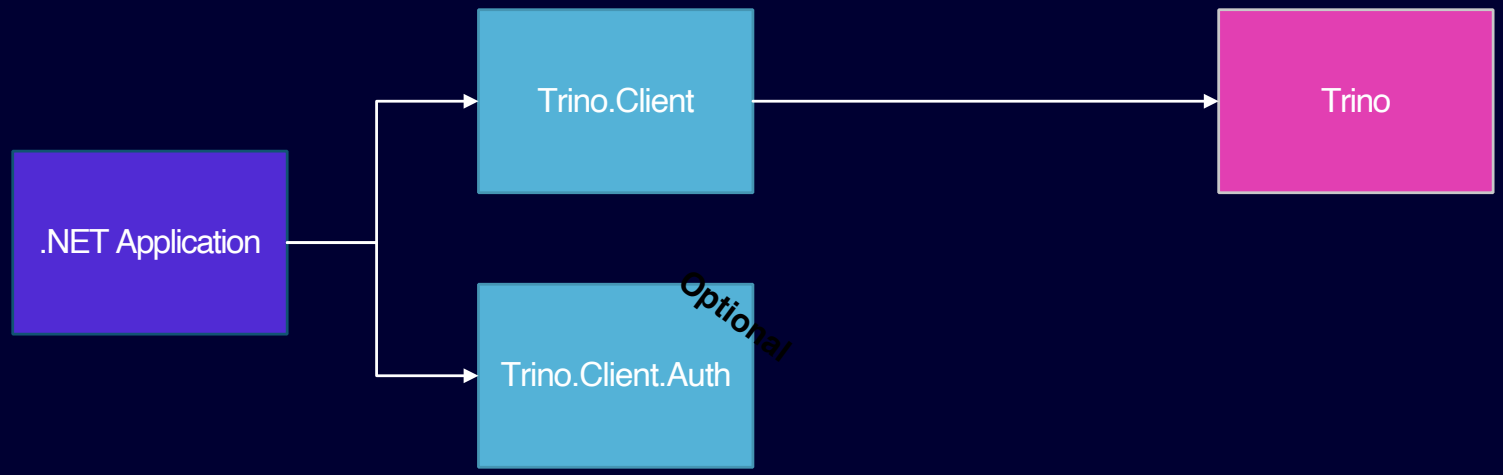
Usage/Project Structure

ADO.NET Approach



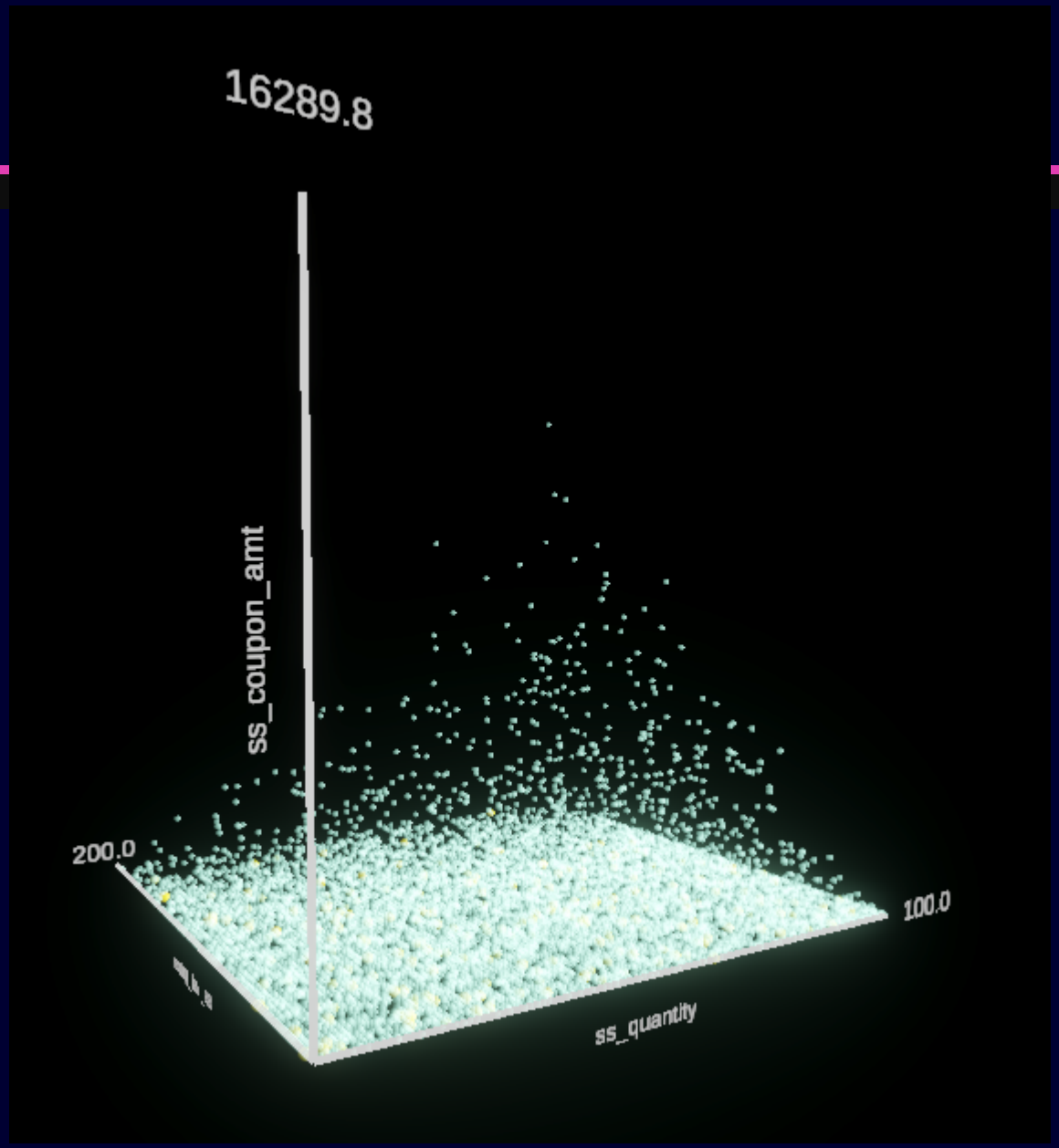
Direct Approach

Low level



Demo

- Trino .NET demo



.NET

ADO.NET Library: Trino.Data.ADO

- What is ADO.NET?
  - DbConnection, DbCommand, DbDataReader
- Why? Integration, familiarity, simplicity
- Connection string
  - Same properties as TrinoConnectionProperties
  - Authentication
- Test Connection
  - Off by default
  - Can be turned on for Open()
- Schema support
  - GetSchema()
  - DataTable GetSchema(string collectionName, string[] restrictionValues)
    - Catalogs, databases, schemas/schemata, tables, columns, views, functions, sessions
- Custom types: BigDecimal and YearToMonth

```
using (TrinoConnection tc = new TrinoConnection())
{
   tc.ConnectionString =
$"catalog=delta;schema=nyc;host={demoClusterHost};auth=TrinoJW
TAuth;AccessToken={token}";
}
```

```
using (var connection = new TrinoConnection(properties))
{
    connection.Open();
    using (var command = new TrinoCommand(connection,
query))
    using (var reader = command.ExecuteReader())
    {
        float x = (float)reader.GetDouble(0);
        float y = (float)reader.GetDecimal(1);
        float z = (float)reader.GetDecimal(2);
        …
    }
}
```

Trino.Client

- How to use

Low level

```
ClientSession session = new ClientSession(
    sessionProperties: new ClientSessionProperties()
    {
        Server = new Uri("http://localhost:8080/")
    });



DataTable dt = await(
    await RecordExecutor.Execute(
        session: session,
        statement: "select * from tpch.tiny.customer"
        )
    ).BuildDataTableAsync();
Console.WriteLine($"Read {dt.Rows.Count} rows");
```

Trino.Client

- How to use

Low level

```
ClientSession session = new ClientSession(
    sessionProperties: new ClientSessionProperties()
    {
        Server = new Uri("http://localhost:8080/")
    });


RecordExecutor records = await RecordExecutor.Execute(
        session: session,
        statement: "select * from tpch.tiny.customer"
        ).ConfigureAwait(false);

foreach (var row in records)
{
    Console.WriteLine(string.Join(",", row));
}
```

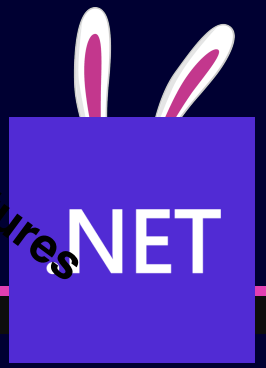
Trino.Client

- How to use

Low level

```
ClientSession session = new TrinoConnectionProperties()
{
    Catalog = "tpch",
    Server = new Uri("https://trino.myhost.net/"),
    Auth = auth,
    SessionProperties = new Dictionary<string, string>()
    {
        { "dictionary_aggregation", "false" }
    }
}.GetSession();

RecordExecutor records = await RecordExecutor.Execute(
    logger: null, // optional detailed logging
    queryStatusNotifications: [(stats, error) =>
    {
        Console.WriteLine($"Processed rows:
{stats.processedRows}");
    }], // Output statistics to console as query runs
    session: session,
    statement: "select * from tpch.tiny.customer where custkey
= ?",
    queryParameters: new List<QueryParameter>() { new(751)
},
    bufferSize: 1024 * 1024 * 5, // 5 MB
    isQuery: true,
    CancellationToken.None).ConfigureAwait(false);
```



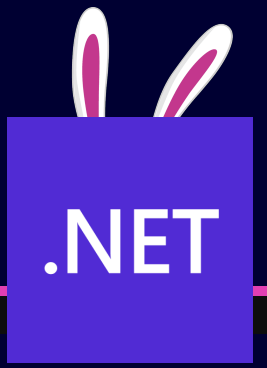
Other features

- Auth modes: interface ITrinoAuth
  - In Trino.Client:
    - TrinoJWTAuth
    - LDAPAuth
  - In Trino.Client.Auth:
    - TrinoOauthClientSecretAuth
    - TrinoAzureDefaultAuth
    - Need more…
- Trino.Client.Utils extension methods
  - public static DataTable BuildDataTable(this IList<TrinoColumn> columns)
  - public async static Task<DataTable> BuildDataTableAsync(this RecordExecutor recordExecutor)

What's Next?

- Auth modes
- Spooling protocol support
  - Performance!
- Build/test/nuget.org distribution pipeline on Github
- Less restrictive type handling for ADO.NET?

Live on Github!



- [trinodb/trino-csharp-client: C# client for Trino]

- Ready for PRs/reviewers!