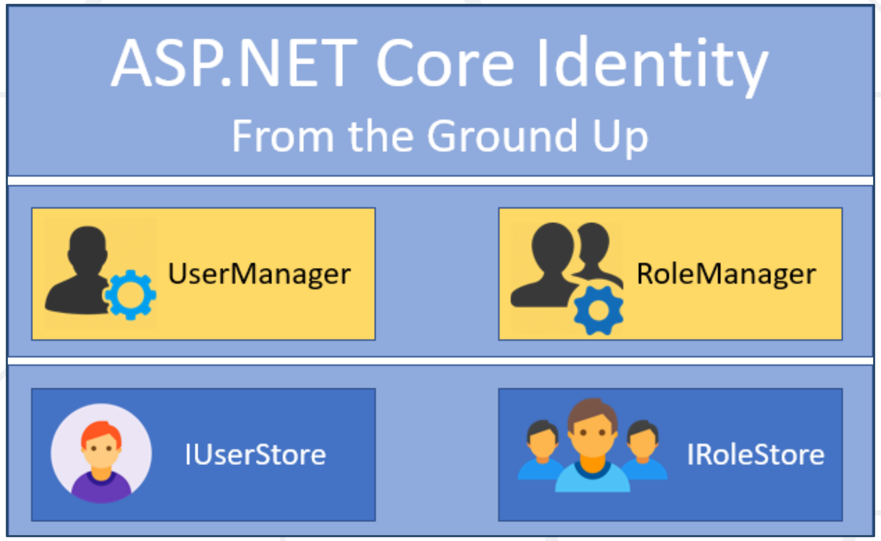
Identity

ASP.NET Core Identity, Authentication Types, Social Accounts, JWT



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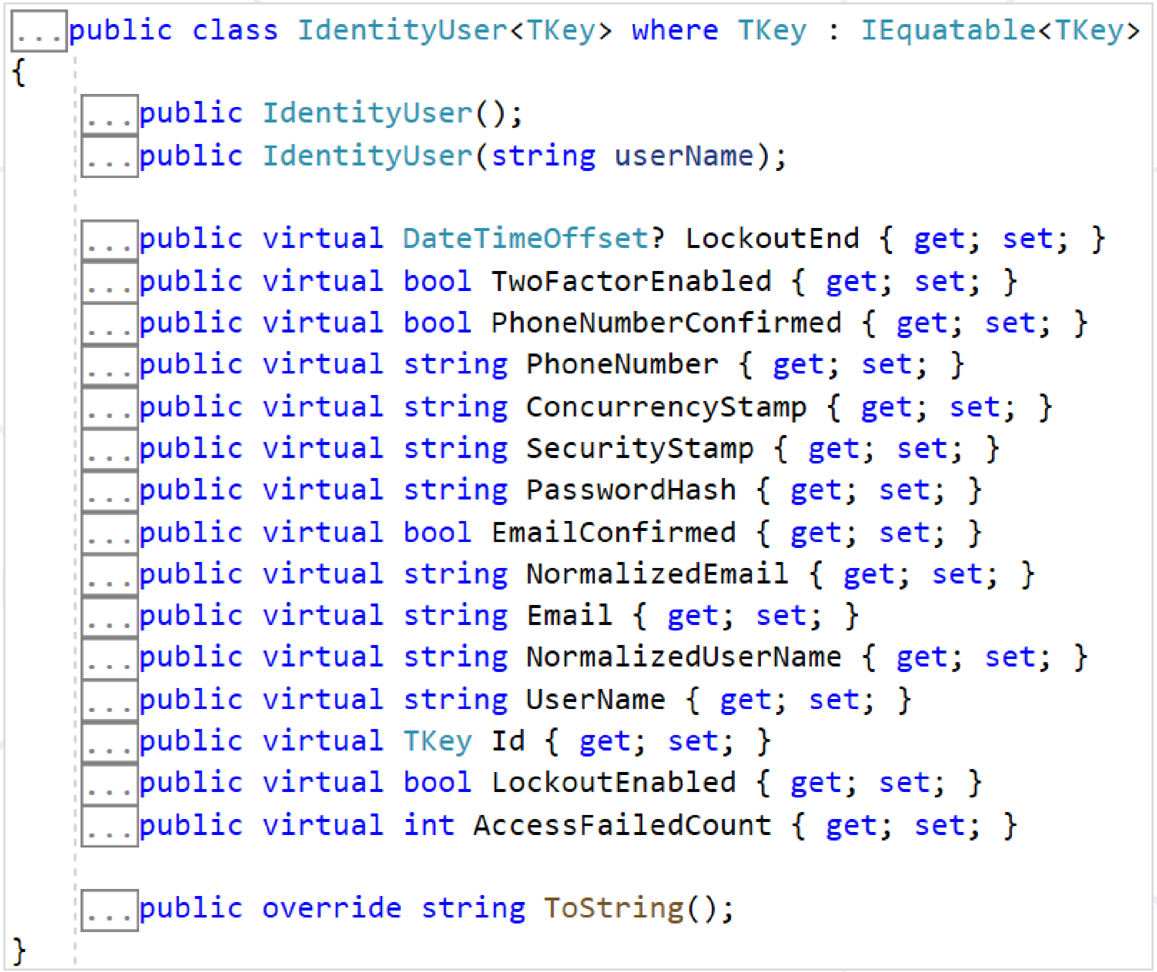
Gaining Full Control Over Identity

Extending ASP.NET Core Identity

- **ApplicationUser.cs** – can add user functionality
- Extends the **user** information from the ASP.NET Core **IdentityUser**
- May hold **additional fields**
  - E.g., first name, last name, birthday

```
public class ApplicationUser
                        : IdentityUser
{
    public string FirstName { get; set; }
    public string LastName { get; set; }
}
```



```
...public class IdentityUser<TKey> where TKey : IEquatable<TKey>
{
    ...public IdentityUser();
    ...public IdentityUser(string userName);

    ...public virtual DateTimeOffset? LockoutEnd { get; set; }
    ...public virtual bool TwoFactorEnabled { get; set; }
    ...public virtual bool PhoneNumberConfirmed { get; set; }
    ...public virtual string PhoneNumber { get; set; }
    ...public virtual string ConcurrencyStamp { get; set; }
    ...public virtual string SecurityStamp { get; set; }
    ...public virtual string PasswordHash { get; set; }
    ...public virtual bool EmailConfirmed { get; set; }
    ...public virtual string NormalizedEmail { get; set; }
    ...public virtual string Email { get; set; }
    ...public virtual string NormalizedUserName { get; set; }
    ...public virtual string UserName { get; set; }
    ...public virtual TKey Id { get; set; }
    ...public virtual bool LockoutEnabled { get; set; }
    ...public virtual int AccessFailedCount { get; set; }

    ...public override string ToString();
}
```

Gaining Full Identity Control (1)

- The default identity behavior is replaced with a custom one

```
builder.Services.AddIdentity<IdentityUser, IdentityRole>()
        // services.AddDefaultIdentity<IdentityUser>()
        .AddEntityFrameworkStores<ApplicationDbContext>()
        .AddDefaultTokenProviders();
}
```

- You implement a custom **User** and a Custom **User Role**

Gaining Full Identity Control (2)

- The following sets the LoginPath, LogoutPath, AccessDeniedPath

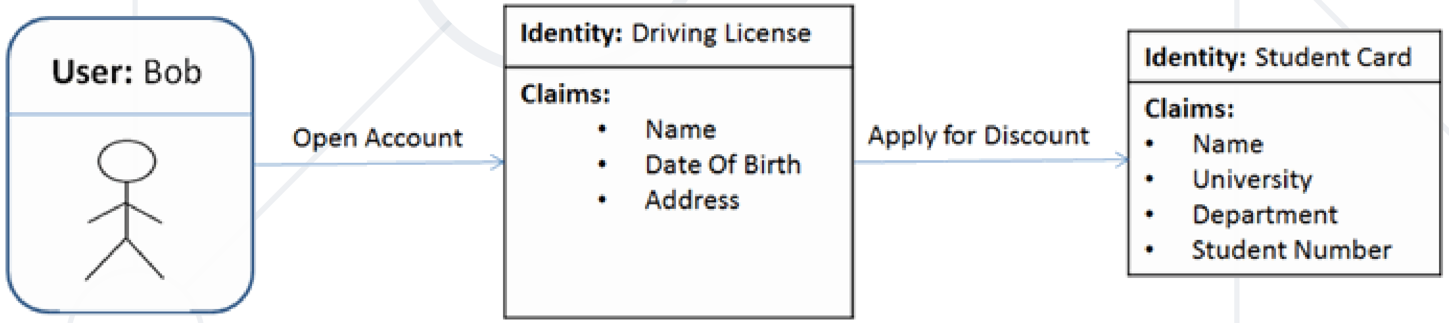
```
builder.Services.ConfigureApplicationCookie(options =>
{
        options.LoginPath = $"/Identity/Account/Login";
        options.LogoutPath = $"/Identity/Account/Logout";
        options.AccessDeniedPath = $"/Identity/Account/AccessDenied";
});
```

Claims

Claim-based Identity In ASP.NET Core

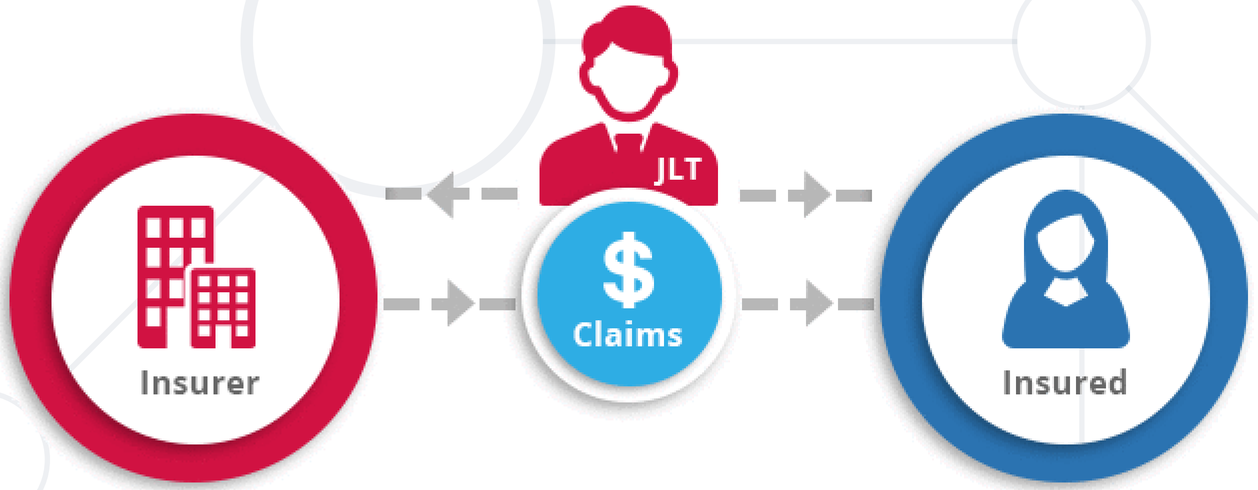
Claims

- **Claim**-based identity is a common technique used in applications
  - Applications acquire identity info about their users through **Claims**
- A **Claim** is a statement that one subject makes about itself
  - It can be about a name, group, ethnicity, privilege, association etc.
  - The subject making the claim is a **provider**
- **Claim**-based identity **simplifies** authentication logic
  - No **account creation** / **modification** required



Claims in ASP.NET Core

- In **ASP.NET Core**, **Claim**-based auth checks are **declarative**
  - The developer embeds them against a **Controller** or an **Action**
  - The developer specifies **required claims** to access the functionality
- **Claims requirements** are policy based
  - The developer must register a policy expressing claims requirements
- **Claims** are **name-value** pairs



Claims (2)

- The simplest type of **claim policy** checks only for the **presence** of a claim
  - The **value** of the **claim** is not checked

```
builder.Services.AddAuthorization(options =>
{
   options.AddPolicy("EmployeeOnly", policy =>
                                         policy.RequireClaim("EmployeeNumber"));
});
```

```
//This action is accessible only by Identities with the "EmployeeOnly" Claim...
[Authorize(Policy = "EmployeeOnly")]
public IActionResult VacationBalance() => View();
```

Roles

Roles

- Role-based **authorization** in ASP.NET Core
  - An identity may belong to **one** or **more roles**
- Roles are claims, but **not** all claims are roles
- Enable **`RoleManager`** with

```
builder.Services.AddDefaultIdentity<IdentityUser>(…)
       .AddRoles<IdentityRole>();
```

Add User to a Role

- Adding a **User** to an **existing Role**

```
public async Task<IActionResult> AddUserToRole()
{
   var roleName = "Administrator";
   var roleExists = await roleManager.RoleExistsAsync(roleName);

   if (roleExists)
   {
      var user = await userManager.GetUserAsync(User);
      var result = await userManager.AddToRoleAsync(user, roleName);

      if (result.Succeeded)
        // The user is now Administrator
   }
}
```

Require Logged-In User in Certain Role

- Give access only to Users in Role "**Administrator**"

```
[Authorize(Roles="Administrator")]
public class AdminController : Controller
{ … }
```

- Give access if User's Role is "**User**", "**Student**" or "**Trainer**"

```
[Authorize(Roles="User, Student, Trainer")]
public ActionResult Roles()
{
    …
}
```

Check the Currently Logged-In User's Role

```
// GET: /Home/Admin (for logged-in admins only)
[Authorize]
public ActionResult Admin()
{
    if (this.User.IsInRole("Administrator"))
    {
        ViewBag.Message = "Welcome to the admin area!";
        return View();
    }

    return this.View("Unauthorized");
}
```

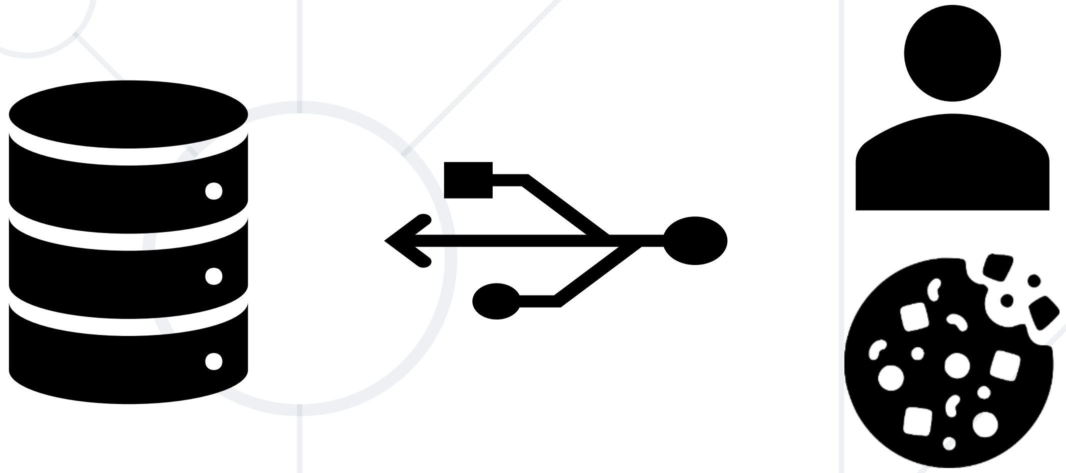
Authentication Types

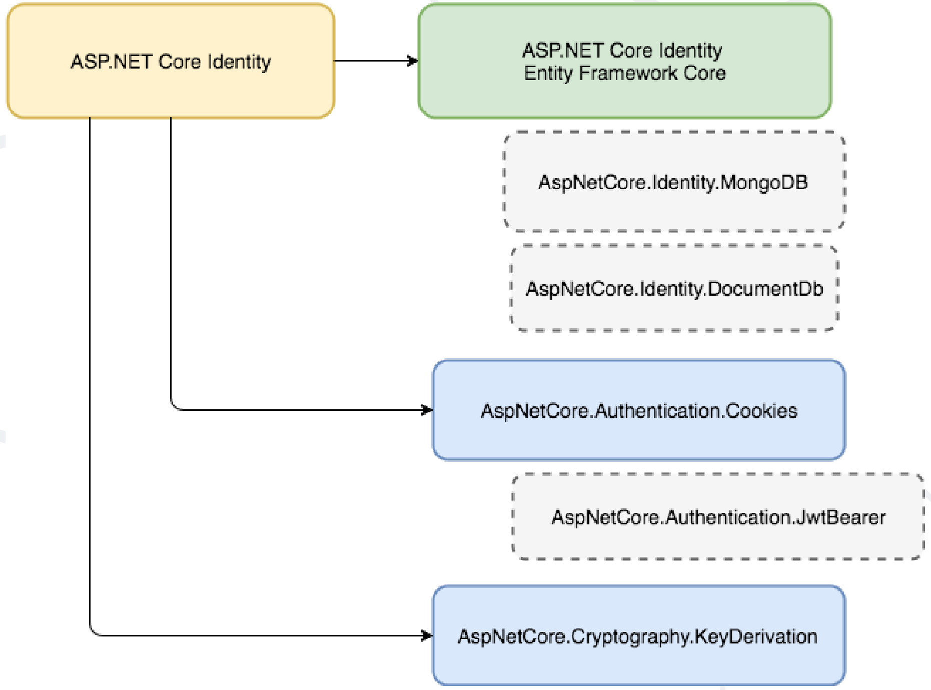
Authentication Types in ASP.NET Core

- **Cookie-based** Authentication & Authorization (Identity)
  - Authentication is entirely **Cookie-based**
  - The **Principal** is based on **claims**
- **Windows** Authentication & Authorization
  - Relies on the operating system to authenticate users
- **Cloud-based** Authentication & Authorization
  - An **external platform** handles the User functionality
- **JSON Web Tokens** (JWT) Authentication & Authorization

Cookie-Based Authentication & Authorization

- **Cookie-Based** auth is the **ASP.NET Core** app auth mechanism
  - Authentication is entirely **Cookie-based**
  - This is a major difference from **ASP.NET MVC**
  - The **Principal** is based on **claims**




ASP.NET Core Identity
ASP.NET Core Identity Entity Framework Core
AspNetCore.Identity.MongoDB
AspNetCore.Identity.DocumentDb
AspNetCore.Authentication.Cookies
AspNetCore.Authentication.JwtBearer
AspNetCore.Cryptography.KeyDerivation

Windows Authentication & Authorization

- **Windows** auth is a more complex auth mechanism
  - Relies on the operating system to authenticate users
  - Credentials are hashed before sent across the network
  - Best suited for intranet environments
    - Clients, Users, Servers belong to the same Windows domain (AD)

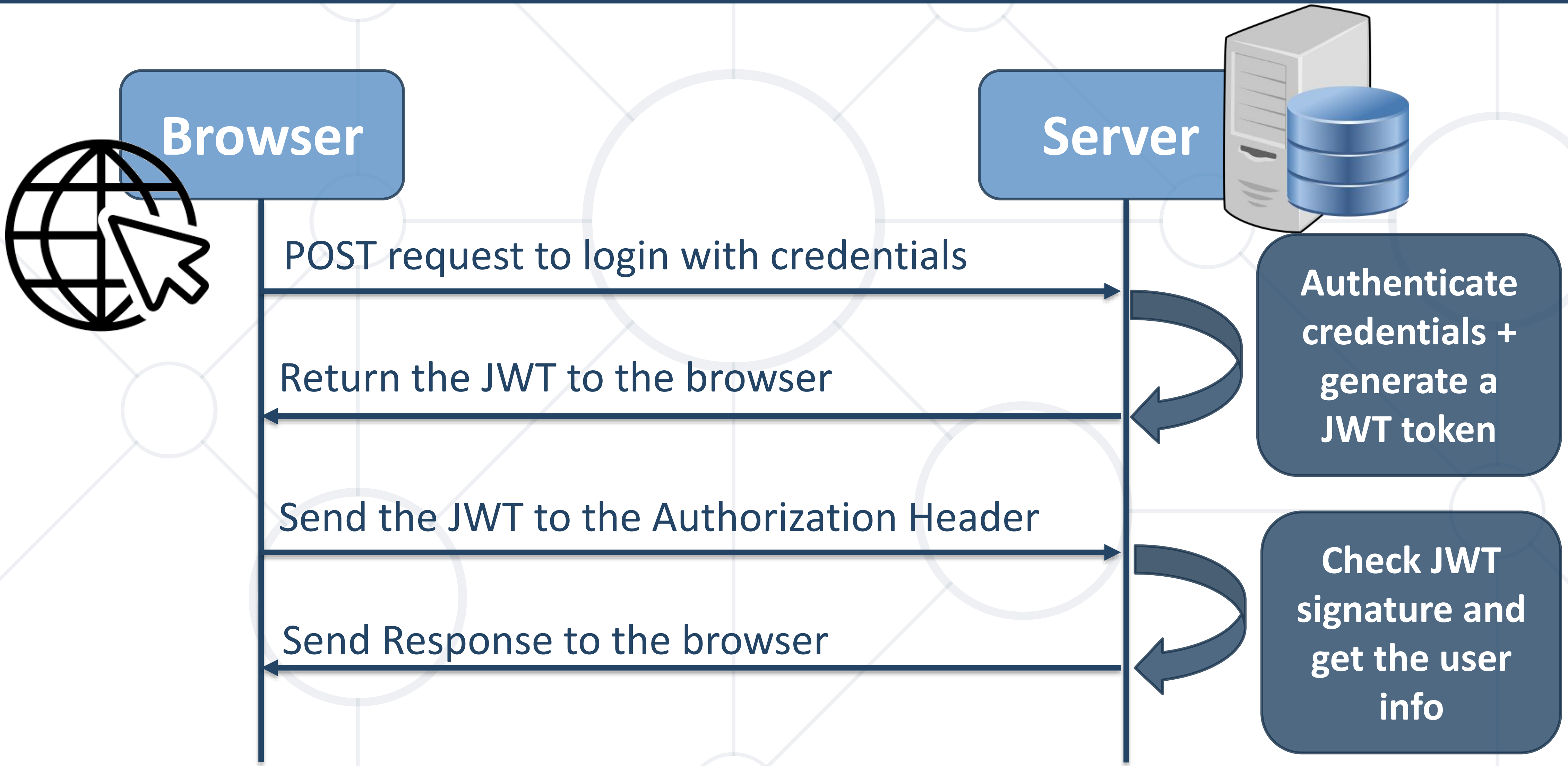
Cloud-based Authentication & Authorization

- **Cloud-based** auth is a more modern authentication approach
  - Authentication & Authorization work is outsourced
  - An **external platform** handles the User functionality
  - Ensures flexibility and speed
  - Greatly decouples the auth functionality from the others

JWT Authentication & Authorization (1)

- **JSON Web Tokens** is a modern JavaScript-based auth mechanism
  - Compact and self-contained
  - Focused on **signed tokens**
    - Work with claims
    - Data is encrypted
  - Used for auth & information exchange
  - Commonly used, when developing **REST**
  - Extremely simple to comprehend

JWT Authentication & Authorization (2)


Browser
Server
POST request to login with credentials
Authenticate credentials + generate a JWT token
Return the JWT to the browser
Send the JWT to the Authorization Header
Check JWT signature and get the user info
Send Response to the browser

Social Accounts

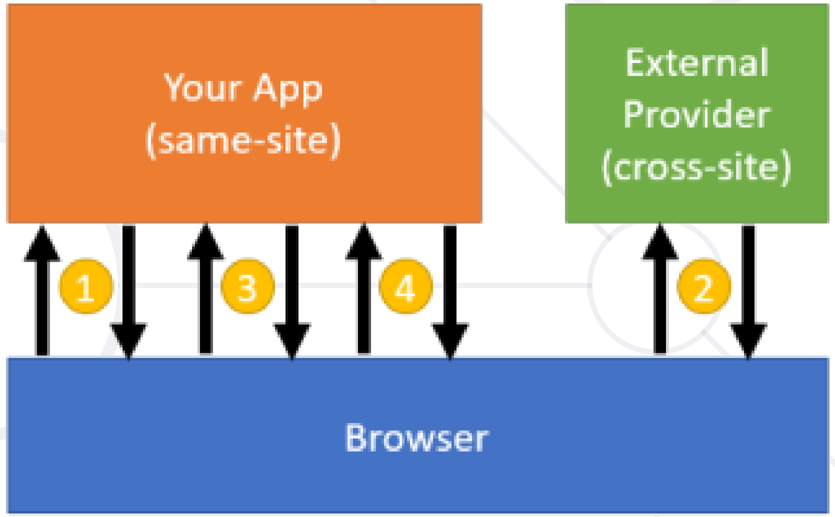
Social Accounts (1)

- Enabling users to sign in with their existing credentials is convenient
  - Shifts the complexities of managing the sign-in process to third party
  - Enhances user experience by minimizing their auth activities
- **ASP.NET Core** supports built-in external login providers for
  - Google
  - Facebook
  - Twitter
  - Microsoft

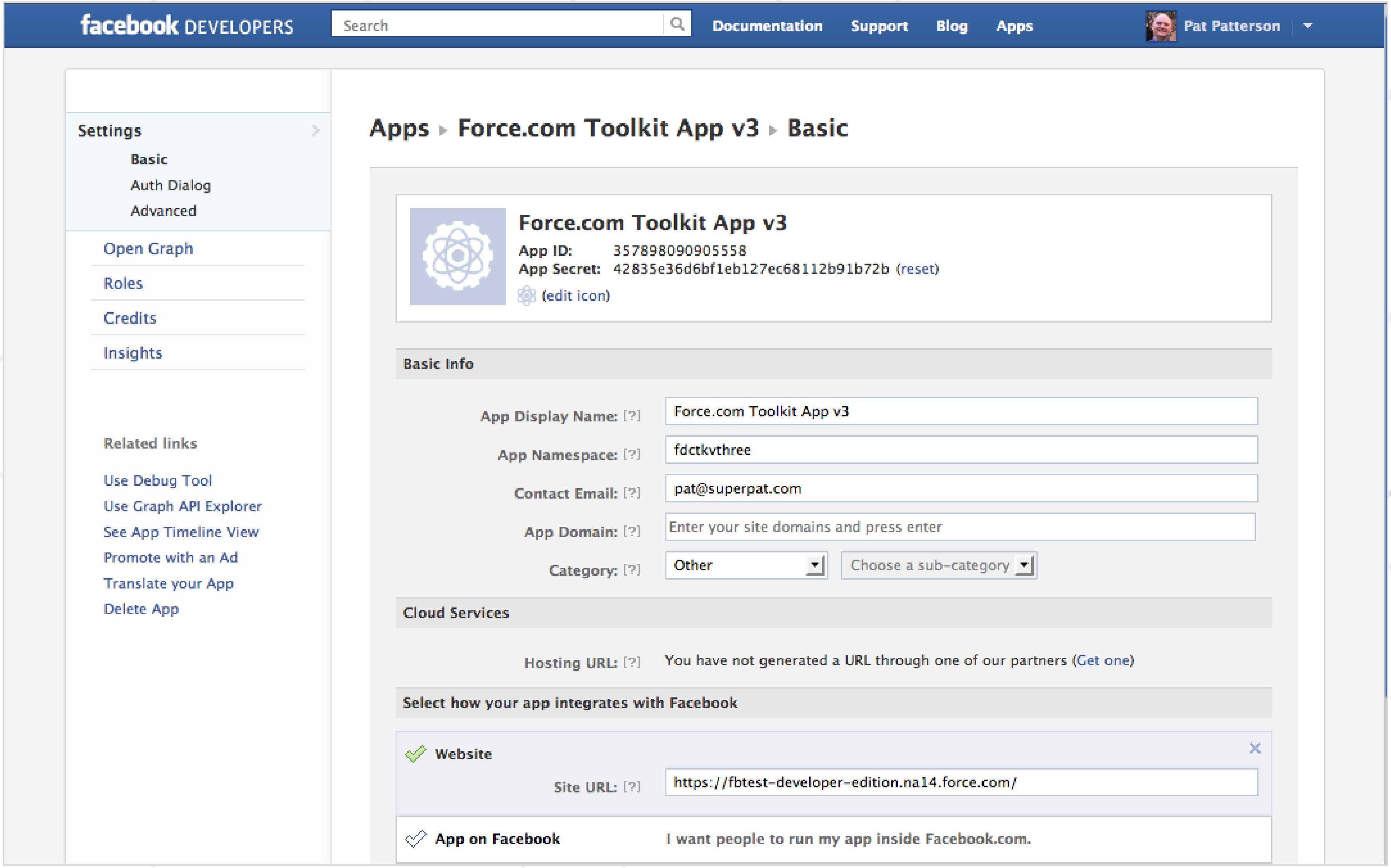
```
builder.Services.AddAuthentication()
        .AddGoogle(googleOptions => { ... })
        .AddFacebook(facebookOptions => { ... })
        .AddTwitter(twitterOptions => { ... })
        .AddMicrosoftAccount(microsoftOptions => { ... });
```

External Login Provider

- Each **External Login provider** has some Developer API
  - You have to configure an application there before using it
  - That application will provide you with credentials
    - Application **ID** + Application **Secret**
  - These credentials will be used by the external provider API
    - You authenticate yourself with them, when sending a request
    - They should **not** be stored in the **open world**



External Login Provider Developer API



Apps ▸ Force.com Toolkit App v3 ▸ Basic

Force.com Toolkit App v3

App ID: 357898090905558
App Secret: 42835e36d6bf1eb127ec68112b91b72b (reset)
(edit icon)

Basic Info

App Display Name: [?]	Force.com Toolkit App v3
App Namespace: [?]	fdctkvthree
Contact Email: [?]	pat@superpat.com
App Domain: [?]	Enter your site domains and press enter
Category: [?]	Other / Choose a sub-category

Cloud Services

Hosting URL: [?] You have not generated a URL through one of our partners (Get one)

Select how your app integrates with Facebook

✓ Website

Site URL: [?] https://fbtest-developer-edition.na14.force.com/

✓ App on Facebook — I want people to run my app inside Facebook.com.

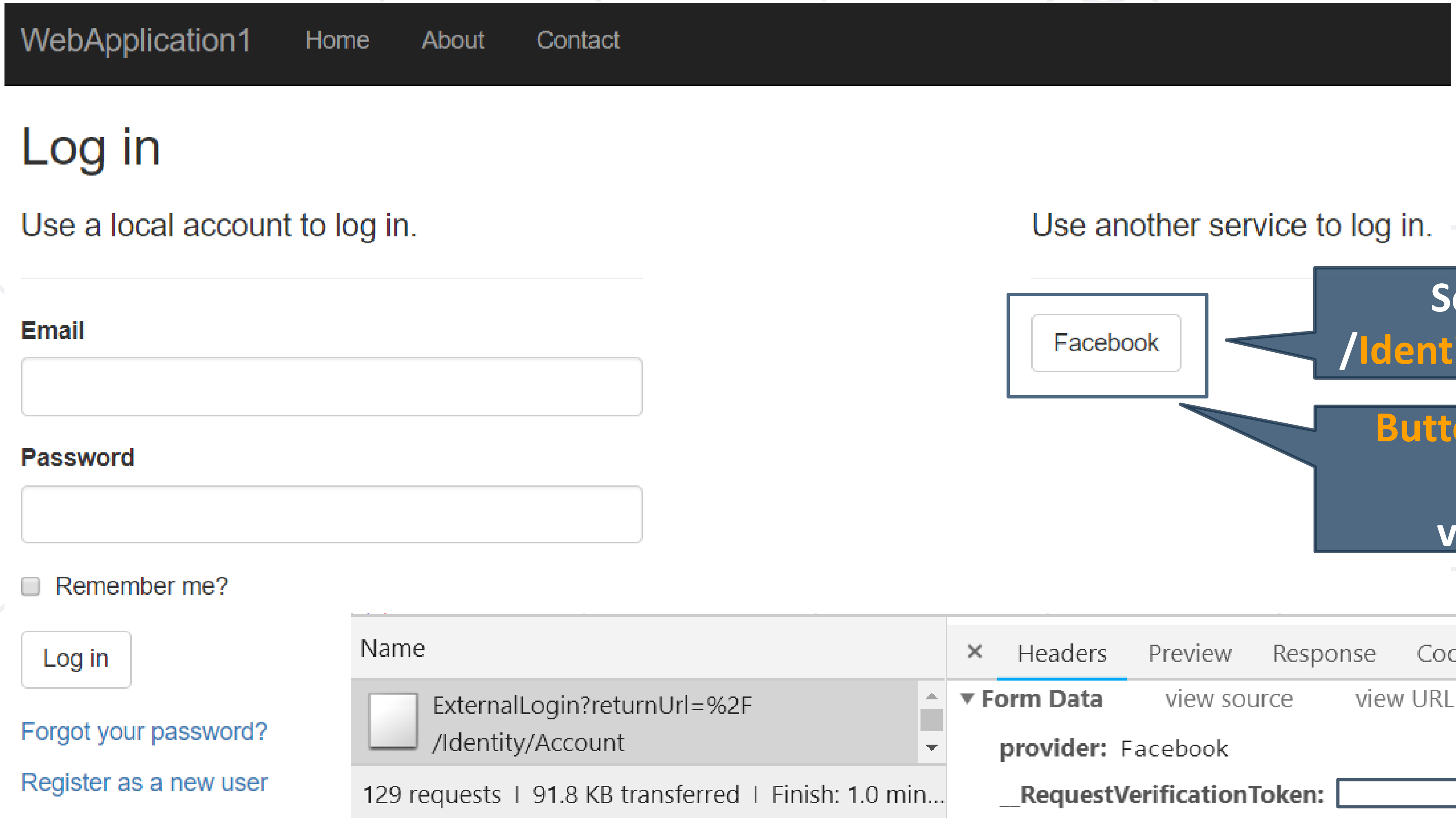
Configuring Social Accounts (1)

- On the back-end, it is quite simple, and quite clean
- Example: **Facebook**

```
builder.Services.AddAuthentication()
        .AddFacebook(facebookOptions => {
            facebookOptions.AppId =
                    configuration["Authentication:Facebook:AppId"];
            facebookOptions.AppSecret =
                    configuration["Authentication:Facebook:AppSecret"];
});
```

- If you use the **default ASP.NET Core Login** page, this will add a **form**

Configuring Social Accounts (2)



WebApplication1 Home About Contact

Log in

Use a local account to log in.

Email

Password

Remember me?

Log in

Forgot your password?

Register as a new user

Use another service to log in.

Facebook

Sends POST request to /Identity/Account/ExternalLogin

Button submits a parameter:
name: provider
value: {externalLogin}

Name

ExternalLogin?returnUrl=%2F
/Identity/Account

129 requests | 91.8 KB transferred | Finish: 1.0 min...

× Headers Preview Response Cookies Timing

▼ Form Data view source view URL encoded

provider: Facebook

__RequestVerificationToken: [redacted]

JSON Web Tokens

JWT

JSON Web Tokens (1)

- **JWT** is a method for representing claims between two parties
  - An open, industry standard – RFC 7519
  - Easy to use, and at the same time – absolutely secured
- When the user successfully **authenticates** (login) using their credentials:
  - A **JSON Web Token** is generated and returned
    - It must be stored (in **local** / **session** storage, **cookies** are also an option)
- Whenever a protected route is accessed, the user agent sends the **JWT**
  - Typically in an **Authorization** header, using the **Bearer** schema

JSON Web Tokens (2)

- **JWT** is absolutely **stateless**, nothing is stored on the server
- Here is an example of an encoded and decoded **JSON Web Token**

The parts of the **token** are separated by **dots**

As any normal auth **JWT** also has an **expiration**

Encoded

```
eyJhbGciOiJIUzI1NiIsInR5cCI6IkpXVCJ9
.eyJzdWIiOiIxMjM0NTY3ODkwIiwibmFtZSI
6IkpvaG4gRG9lIiwiaWF0IjoxNTE2MjM5MDI
yfQ.SflKxwRJSMeKKF2QT4fwpMeJf36POk6y
JV_adQssw5c
```

The parts of the **token** are in a strict **order**

The token data does not change the **token format**

Decoded

Header: (algorithm, token type)

```
{
  "alg": "HS256",
  "typ": "JWT"
}
```

Payload: (data)

```
{ "sub": "1234567890",
  "name": "John Doe",
  "iat": 1516239022
}
```

Verify Signature

```
HMACSHA256(base64UrlEncode(H...) +
"." + base64UrlEncode(P...), key)
```

JWT Configuration in ASP.NET Core (1)

- **JWT** in **ASP.NET Core** is configured in `Program.cs`
  - Install `Microsoft.AspNetCore.Authentication.JwtBearer`

appsettings.json

```
{
  "JWT": {
    "ValidAudience": "http://localhost:4200",
    "ValidIssuer": "http://localhost:61955",
    "Secret": "super-secret-JWT-key"
  },
  ...
}
```

```
var auth = builder.Services.AddAuthentication(options =>
    {
      options.DefaultAuthenticateScheme =
                JwtBearerDefaults.AuthenticationScheme;
      options.DefaultChallengeScheme =
                JwtBearerDefaults.AuthenticationScheme;
      options.DefaultScheme =
                JwtBearerDefaults.AuthenticationScheme;
    });

    auth.AddJwtBearer(…);

    // Configure DI for application services
builder.Services.AddScoped<IUserService, UserService>();
```

On the next slide

JWT Configuration in ASP.NET Core (2)

```
auth.AddJwtBearer(options =>
{
   options.SaveToken = true;
   options.RequireHttpsMetadata = false;
   options.TokenValidationParameters = new TokenValidationParameters()
   {
      ValidateIssuer = true,
      ValidateAudience = true,
      ValidAudience = builder.Configuration["JWT:ValidAudience"],
      ValidIssuer = builder.Configuration["JWT:ValidIssuer"],
      IssuerSigningKey =
        new
SymmetricSecurityKey(Encoding.UTF8.GetBytes(builder.Configuration["JWT:Secret"]))
   };
});

...

// Don't forget to add app.UseAuthentication(); and app.UseAuthorization();
```

JWT in ASP.NET Core Controllers (1)

- The controller action (**Endpoint**) is kept "**thin**" to a maximum

```
[ApiController]
[Route("/api/[controller]")]
public class UsersController : ControllerBase
{
   private IUserService userService;

   public UsersController(IUserService userService) => this.userService = userService;

   [HttpPost("login")]
   public IActionResult Login([FromBody] LoginUserBindingModel loginUser)
   {
      var user = this.userService.Authenticate(loginUser.Username, loginUser.Password);

      if (user == null)
         return BadRequest(new { message = "Username or password is incorrect." });

      var tokenString = this.userService.GenerateJSONWebToken(user);
      return Ok(new { token = tokenString});
   }
}
```

Using services

JWT in ASP.NET Core in Services (2)

- Configurations for **JWT** are injected into a **service class constructor**

```
public class UserService : IUserService
{
    private AppDbContext context;
    private UserManager<IdentityUser> userManager;
    private readonly IConfiguration configuration;

    public UserService(AppDbContext context, IConfiguration configuration)
    {
       this.context = context;
       this.configuration = configuration;
       ...
    }

    public IdentityUser Authenticate(string username, string password) { ...}

    public string GenerateJSONWebToken(IdentityUser user) { ... }
}
```

On the next slides

JWT in ASP.NET Core in Services (3)

```
public IdentityUser Authenticate(string username, string password)
{
   var user = this.userManager.FindByNameAsync(username).Result;
   if (user != null && this.userManager.CheckPasswordAsync(user, password).Result)
      return user;

   return null;
}

public string GenerateJSONWebToken(IdentityUser user)
{
   var authClaims = new List<Claim>
   {
      new Claim(ClaimTypes.Name, user.UserName),
      new Claim(JwtRegisteredClaimNames.Jti, Guid.NewGuid().ToString()),
   };

   // Continues on the next slide...
```

JWT in ASP.NET Core in Services (4)

```
    string jwtSecret = this.configuration["JWT:Secret"];
    byte[] jwtSecretBytes = Encoding.UTF8.GetBytes(jwtSecret);
    var authSigningKey = new SymmetricSecurityKey(jwtSecretBytes);

    var token = new JwtSecurityToken(
       issuer: this.configuration["JWT:ValidIssuer"],
       audience: this.configuration["JWT:ValidAudience"],
       expires: DateTime.Now.AddHours(3),
       claims: authClaims,
       signingCredentials:
          new SigningCredentials(authSigningKey, SecurityAlgorithms.HmacSha256));

    return new JwtSecurityTokenHandler().WriteToken(token);
 }
```

Summary

- You can gain **full control** over Identity
- **Claims** == a statement that a user makes about themselves
- **Roles** are required to gain access to a specific resource
- There are different **authentication** types
- **Social Accounts** enable users to sign in with their existing credentials
- **JWT** =method for representing claims between two parties

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