



# Week 10 - WebAPI

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```
HMACSHA256(  
base64(header) + "." + base64(payload),  
secretKey  
)
```

## CORS

**Cross-Origin Resource Sharing (CORS)** is an HTTP-header based mechanism that allows a server to indicate any origins (domain, scheme, or port) other than its own from which a browser should permit loading resources.

CORS also relies on a mechanism by which browsers make a "preflight" request to the server hosting the cross-origin resource, in order to check that the server will permit the actual request. In that preflight, the browser sends headers that indicate the HTTP method and headers that will be used in the actual request. (Used for PUT, PATCH, DELETE) (A request of type OPTION will be sent).

## Working of cors in browser

Browser will set origin to current domain, server will response with header `Access-Control-Allow-Origin: allowed_origin`, then browser will match origin and server's response if they don't match browser will not send response to app.

In case of PUT, DELETE, PATCH request browser may set other headers like `Access-Control-Request-Method`, `Access-Control-Request-Headers` and server response with

headers like `Access-Control-Allow-Origin` , `Access-Control-Allow-Methods` , `Access-Control-Allow-Headers` , `Access-Control-Max-Age`

<https://learn.microsoft.com/en-us/aspnet/web-api/overview/security/enabling-cross-origin-requests-in-web-api>

## To enable CORS

install nuget package `Microsoft.AspNet.WebApi.Cors`

In App\_start/WebApiConfig.cs write

```
config.EnableCors();
```

To enable cors controller level

```
using System.Net.Http;
using System.Web.Http;
using System.Web.Http.Cors;

namespace WebService.Controllers
{
    [EnableCors(origins: "http://mywebclient.azurewebsites.net", headers: "*",
methods: "*")]
    public class TestController : ApiController
    {
        // Controller methods not shown...
    }
}
```

To enable cors at action level

```

public class ItemsController : ApiController
{
    public HttpResponseMessage GetAll() { ... }

    [EnableCors(origins: "http://www.example.com", headers: "*", methods:
    "*")]
    public HttpResponseMessage GetItem(int id) { ... }

    public HttpResponseMessage Post() { ... }
    public HttpResponseMessage PutItem(int id) { ... }
}

```

To enable cors globally

```

public static class WebApiConfig
{
    public static void Register(HttpConfiguration config)
    {
        var cors = new EnableCorsAttribute("www.example.com", "*", "*");
        config.EnableCors(cors);
        // ...
    }
}

```

If you set the attribute at more than one scope, the order of precedence is:

1. Action
2. Controller
3. Global

# JWT

**JWT (JSON Web Token)** is a compact, URL-safe way to **securely transmit claims (data)** between a client and a server.

A JWT has **3 parts**, separated by dots ( `.` )

## 1. Header

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

## 2. Payload

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

## 3. Signature

```
HMACSHA256(  
  base64(header) + "." + base64(payload),  
  secretKey  
)
```

## How JWT Authentication Works

1. User logs in with credentials
2. Server verifies credentials
3. Server creates JWT and sends it to client

4. Client stores token (localStorage / cookie)
5. Client sends JWT in every request:

```
Authorization: Bearer <JWT>
```

6. Server:

- Verifies signature
- Checks expiration
- Reads claims
- Grants or denies access

Jwt is not encrypted so not send sensitive data in it

Jwt is stateless so server never store it so it cannot revoke it

## To configure it

1. Install necessary packages

```
Microsoft.Owin  
Microsoft.Owin.Host.SystemWeb  
Microsoft.Owin.Security.Jwt  
Microsoft.Owin.Security.OAuth
```

2. Create a startup class

```
public class Startup  
{  
    public void Configuration(IAppBuilder app)  
    {  
        // For more information on how to configure your application, visit http  
        s://go.microsoft.com/fwlink/?LinkID=316888
```

```

var issuer = ConfigurationManager.AppSettings["jwtIssuer"];
var audience = ConfigurationManager.AppSettings["jwtAudience"];
var secret = Encoding.UTF8.GetBytes(ConfigurationManager.AppSettings["jwtSecret"]);

app.UseJwtBearerAuthentication(new JwtBearerAuthenticationOptions
{
    AuthenticationMode = AuthenticationMode.Active,
    TokenValidationParameters = new TokenValidationParameters()
    {
        ValidateIssuer = true,
        ValidateAudience = true,
        ValidateIssuerSigningKey = true,
        ValidIssuer = issuer,
        ValidAudience = audience,
        IssuerSigningKey = new SymmetricSecurityKey(secret)
    },
});
}
}

```

### 3. To create jwt tokens in controller

```

private string CreateJwtToken(string username, string role)
{
    var secret = ConfigurationManager.AppSettings["jwtSecret"];
    var key = new SymmetricSecurityKey(Encoding.UTF8.GetBytes(secret));
    var credentials = new SigningCredentials(key, SecurityAlgorithms.HmacSha256);

    var claims = new[]
    {
        new Claim(ClaimTypes.Name, username),
    }
}

```

```

        new Claim(ClaimTypes.Role, role),
    };

    var token = new JwtSecurityToken(
        issuer: ConfigurationManager.AppSettings["jwtIssuer"],
        audience: ConfigurationManager.AppSettings["jwtAudience"],
        claims: claims,
        expires: DateTime.Now.AddHours(1),
        signingCredentials: credentials
    );

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

```

4. To check if jwt token is valid in action add attribute

```
[Authorize]
```

5. To check role based access

```
[Authorize(Roles = "Admin")]
```

To store configs in web.config

```

<appSettings>
  <add key="jwtSecret" value="secret_key" />
  <add key="jwtIssuer" value="issuer" />
  <add key="jwtAudience" value="audience" />
</appSettings>

```

## Exception Handling

### Basic way

It will not send stack trace if normal exception is thrown it will send stack trace in response

```
throw new HttpResponseException(  
    Request.CreateResponse(  
        HttpStatusCode.Forbidden,  
        new { message = "Access denied" }  
    )  
);
```

Quick response control but hard to manage for large apps

## Exception filters

A class that catches **unhandled exceptions** globally or per controller.

```
public class GlobalExceptionHandler : ExceptionFilterAttribute  
{  
    public override void OnException(HttpContext context)  
    {  
        if (context.Exception is InvalidOperationException)  
        {  
            context.Response = context.Request.CreateErrorResponse(  
                HttpStatusCode.BadRequest,  
                context.Exception.Message  
            );  
        }  
        else  
        {  
            context.Response = context.Request.CreateErrorResponse(  
                HttpStatusCode.InternalServerError,  
                "An unexpected error occurred"  
            );  
        }  
    }  
}
```



```
}  
}
```

To enable it for action add attribute

```
[GlobalExceptionHandler]
```

To enable it globally add given line to WebApiConfig.cs

```
config.Filters.Add(new GlobalExceptionHandler());
```

It cannot handle pipeline error like routing error

## Global Exception Handler

Catches **almost all exceptions**

```
public class GlobalExceptionHandler : ExceptionHandler  
{  
    public override void Handle(ExceptionHandlerContext context)  
    {  
        context.Result = new HttpResponseMessage(  
            context.Request.CreateErrorResponse(  
                HttpStatusCode.InternalServerError,  
                "Exception handled globally"  
            )  
        );  
    }  
}
```

In WebApiConfig.cs

```
config.Services.Replace(  
    typeof(IExceptionHandler),
```

```
new GlobalExceptionHandler()  
);
```

## Caching

Caching improves **performance, scalability, and response time** by storing frequently used data and avoiding repeated computation or database calls.

### Client side caching

Client side caching is done by setting headers

Headers used

1. max-age=3600 → Cache for 1 hour
2. no-cache → caching is not allowed
3. no-store → caching not allowed (strictly)
4. public → can be cached by browser & proxies
5. private → Only browser can cache

Ex:

```
Cache-Control: public, max-age=3600
```

6. E-tag → By setting e-tag (Browser send it with every request in header If-None-Match. If it receives 304 Not modified it will use cached version otherwise store response)
7. Last-Modified: Timestamp (Browser send If-Modified-Since)

### To set headers manually for request

```

public IHttpActionResult GetProducts()
{
    var response = Request.CreateResponse(HttpStatusCode.OK, products);

    response.Headers.CacheControl = new CacheControlHeaderValue
    {
        Public = true,
        MaxAge = TimeSpan.FromMinutes(10)
    };

    return ResponseMessage(response);
}

```

## To create attribute to set headers

```

public class CacheHeaderAttribute : ActionFilterAttribute
{
    public int Duration { get; set; }

    public override void OnActionExecuted(HttpActionExecutedContext context)
    {
        context.Response.Headers.CacheControl =
            new CacheControlHeaderValue
            {
                Public = true,
                MaxAge = TimeSpan.FromSeconds(Duration)
            };
    }
}

```

```
[CacheHeader(Duration = 300)]
```

## To use e-tag

```
public HttpResponseMessage getEtagData()
{
    var currentEtag = "\"prod-10-v2\"";

    if(Request.Headers.IfNoneMatch.Any(e => e.Tag == currentEtag))
    {
        return new HttpResponseMessage(HttpStatusCode.NotModified);
    }

    var response = Request.CreateResponse(HttpStatusCode.OK, "value");
    response.Headers.ETag = new System.Net.Http.Headers.EntityTagHeader(currentEtag);
    response.Headers.CacheControl = new System.Net.Http.Headers.CacheControlHeaderValue
    {
        Private = true,
        NoCache = true
    };

    return response;
}
```

## In memory cache

Install package : System.Runtime.Caching

```
public IEnumerable<string> Get()
{
    ObjectCache cache = MemoryCache.Default;
```

```

string cacheKey = "uniqueKey";

string[] response = cache[cacheKey] as string[];

if (response != null)
{
    return new string[] { response[0], "Cache hit" };
}

// add if not exists, update else
cache.Set(cacheKey, new string[] { "value1", "value2" }, DateTimeOffset.Now.AddMinutes(1));
return new string[] { "value1", "value2" };
}

```

Use `MemoryCache.Default` property to get reference of cache

### Other methods of MemoryCache

| Method                        | Description  |
|-------------------------------|--|
| Add                           | Adds an entry only if it does not already exist  |
| AddOrGetExisting              | Adds an entry if it does not exist; otherwise returns the existing value   |
| Contain                       | Checks if a key exists   |
| CreateCacheEntryChangeMonitor | Creates cache monitors; pass an array of keys—if they change (remove/add), the current cache entry is removed. Can be added via <code>policy.ChangeMonitors.Add</code> |
| Dispose                       | Frees resources  |
| Get                           | Fetches an entry   |
| GetCacheItem                  | Fetches the entire cache item  |
| GetCount                      | Returns the total number of cache entries  |
| GetEnumerator                 | Enumerates over key-value pairs  |

| Method    | Description   |
|-----------|---|
| GetValues | Fetches multiple entries at a time                          |
| Remove    | Removes an entry  |
| Trim      | Removes a given percentage of entries (Least Recently Used) |

## API Versioning

API versioning is the practice of **managing changes in your API over time** so that existing clients don't break when you introduce new features, fix bugs, or change behaviors.

### 1. Url based versioning

GET /api/v1/products

GET /api/v2/products

To implement it use attribute based routing

```
[RoutePrefix("api/v1/data")]
public class DataV1Controller : ApiController
{
    [HttpGet]
    [Route("")]
    public IHttpActionResult Get()
    {
        return Ok("HI");
    }
}
```

### 2. Query parameter based

GET /api/products?version=1

GET /api/products?version=2

To implement it

```
public IHttpActionResult Get()
{
    var query = Request.GetQueryNameValuePairs();
    var versionParam = query.FirstOrDefault(q => q.Key == "api-version").
Value;

    if(versionParam == "1")
    {
        return Ok("V1");
    }
    else if(versionParam == "2")
    {
        return Ok("V2");
    }
    else
    {
        return Ok("Invalid version");
    }
}
```

### 3. Header based versioning

GET /api/products

Header: API-Version: 1

Header: API-Version: 2

To implement it

```
public IHttpActionResult Get()
{
    IEnumerable<string> versionHeaders;

    if (!Request.Headers.TryGetValues("X-API-Version", out versionHeader
```

```

s))
    {
        return BadRequest("API version header missing");
    }

    var version = versionHeaders.FirstOrDefault();

    if (version == "1")
    {
        return Ok("V1");
    }
    else if (version == "2")
    {
        return Ok("V2");
    }
    else
    {
        return Ok("Invalid API version");
    }
}

```

## Swagger

Swagger is used for API documentation and testing

Install package : Swashbuckle

To send bearer token configure SwaggerConfig.cs as given below

```

GlobalConfiguration.Configuration
    .EnableSwagger(c =>
    {
        c.ApiKey("Token")
    }
)

```



```

        .Description("Filling in the value: Bearer {your JWT token}")
        .Name("Authorization")
        .In("header");
    })
    .EnableSwaggerUi(c =>
    {
        c.EnableApiKeySupport("Authorization", "header");
    });

```

To get xml comments

Go to project property → Build → output → tick XML documentation file

```

c.IncludeXmlComments(GetXmlCommentsPath());
private static string GetXmlCommentsPath()
{
    return string.Format(@"{0}\bin\AuthenticationAuthorizationWebAPI.xml", System.AppDomain.CurrentDomain.BaseDirectory);
}

```

## Postman

Postman is used for api testing

In postman we can create collection, folders to organize apis

We can create environments to store common variables

We can manually set headers, query params, cookies

Write script which run before and after api call