FIT5032

Internet Applications Development

Week 7: Security and Identity

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Unit Topics

Week	Activities	Assessment
0		No formal assessment or activities are undertaken in week 0
1A	Intro to Web development and ASP.NET	Note: Studio classes commence in week 1
1B	The front end, user experience, accessibility and ASP.NET Scaffolding	
2	Introduction to C# & Version Control	
3	Entity Framework	
4	Fundamentals of Client side Javascript	Studio assessment task 1 due
5A	Validation	
5B	Security and Identity	
6	Sending Email, File Upload and Signal R	Studio assessment task 2 due
7	Web Optimisations & Evolution of ASP.NET CORE	
8A	Modern JavaScript Web Development Approaches	
8B	Testing and Deployment in Cloud	Studio assessment task 3 due
9	Review & Revision	Final Portfolio and Learning Summary due
	SWOT VAC	No formal assessment is undertaken in SWOT VAC
	Examination period	LINK to Assessment Policy:http://policy.monash.edu.au/policy-bank/academic/education/assessment/assessment-in-coursework-

Today

- Recap: Validation in ASP.NET MVC
- Security and Identity
- Log In Features
- Security Issues (in example)
- Additional Security Topics: XSS, CSRF, HTTP Headers
- OpenID, OAuth

Recap: Validation

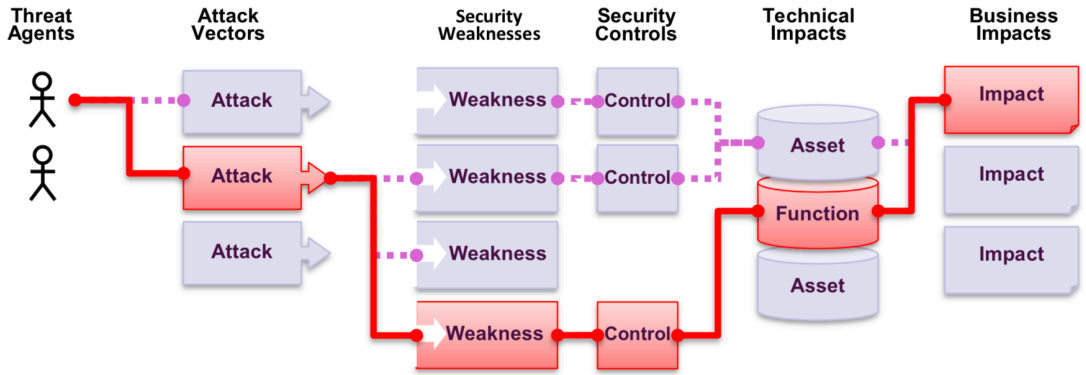
Validation in ASP.NET MVC

- Main aspects to implementing validation in ASP.Net MVC Applications
  - Validation in Models
  - Validation in Views
  - Validation Error Messages

Security and Identity

OWASP Top 10 Web Application Security Risks

1. Injection
2. Broken Authentication and Session Management
3. Sensitive Data Exposure
4. XML External Entity
5. Broken Access Control
6. Security Misconfiguration
7. Cross-Site Scripting
8. Insecure deserialization
9. Using Components With Known Vulnerabilities
10. Insufficient Logging and Monitoring



https://www.owasp.org/

Multi factor authentication

- The authentication factors that make up a multi-factor authentication request must come from two or more of the following:
  - something the claimant knows (e.g. a personal identification number (PIN), password or response to a challenge) **(Something you know)**
  - something the claimant has (e.g. a physical token, smart card or software certificate) **(Something you have)**
  - something the claimant is (e.g. a fingerprint or iris scan). **(Something you are)**

Hashing

- Hashing is an ideal way to store passwords, as hashes are inherently one-way in their nature.
- When storing a password, **hash it with a salt**, and then with any future login attempts, hash the password the user enters and compare it with the stored hash.
- If the two match up, then it's virtually certain that the user entering the password entered the right one.
- MS Identity uses the PBKDF2 to hash passwords.

ASP.NET Identity Goals

- One ASP.NET Identity system
- Ease of plugging in profile data about the user
- Persistence control
- Unit testability
- Role provider
- Claims based
- Social Login Providers
- Azure Active Directory
- OWIN Integration
- NuGet package

Log In Features

Log In Concepts

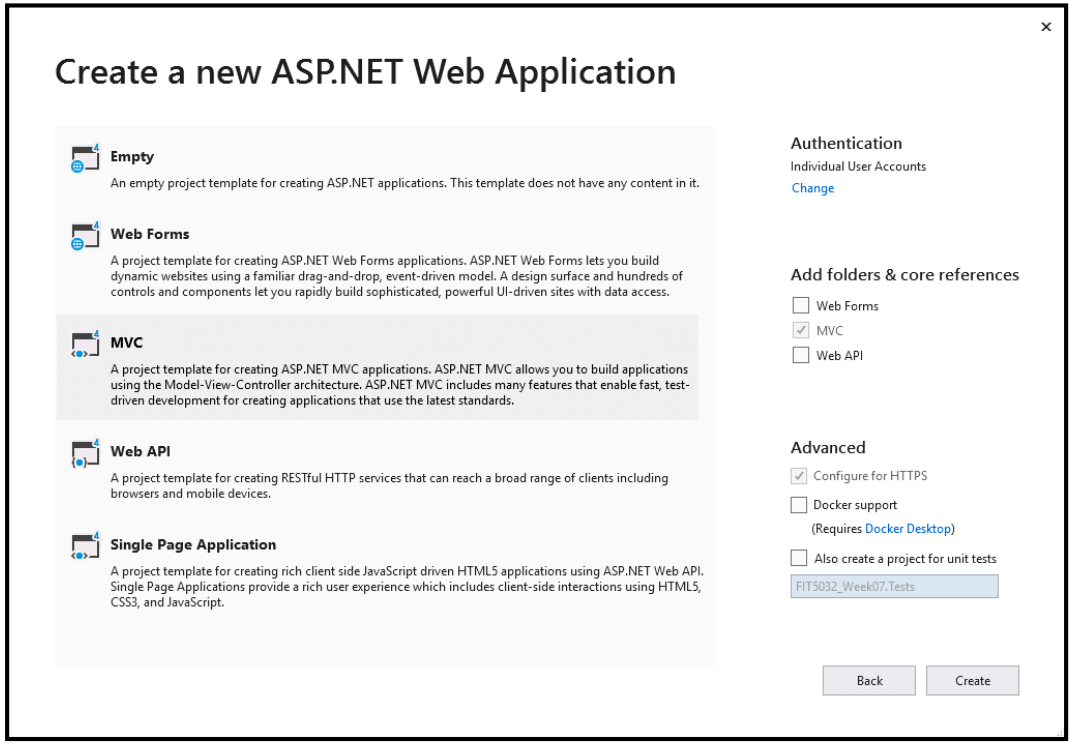
- Almost all real world web applications require users to log in to the website
    - to use more than the basic functionality.
- Require usernames and passwords
- Some applications use role based authentication
    - administrator roles, user roles etc
- Security and account information stored
    - on file system
    - or database

Log In Systems for ASP.Net MVC

- ASP.Net MVC application
    - Can auto-generate applications with log in functionality
- Basic ASP.Net MVC application
    - with users
        - register
        - interact with public areas before log in
        - interact with private areas after log in

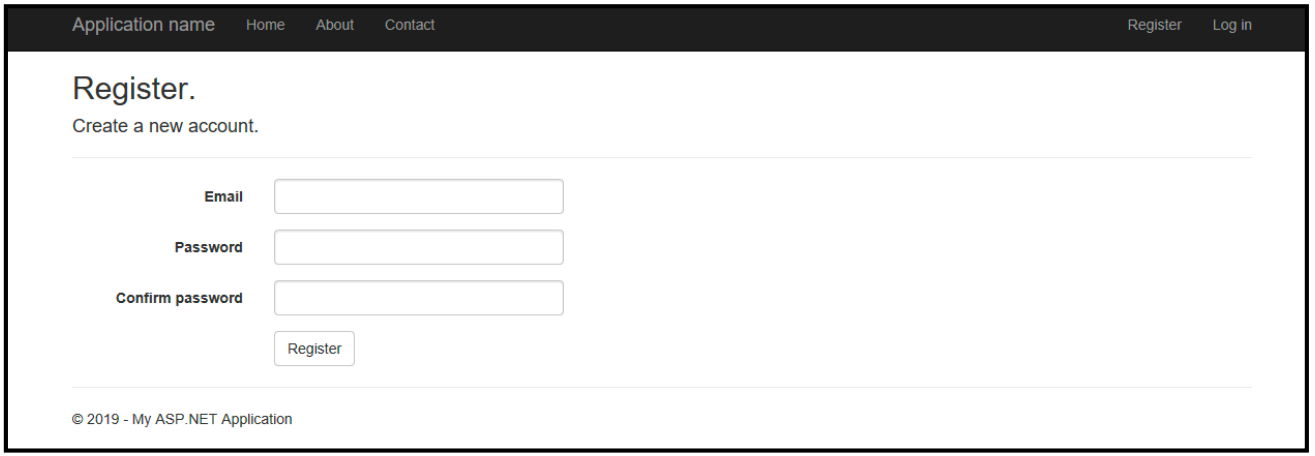
Creating an application with log in accounts

- Auto-generate applications with log in functionality



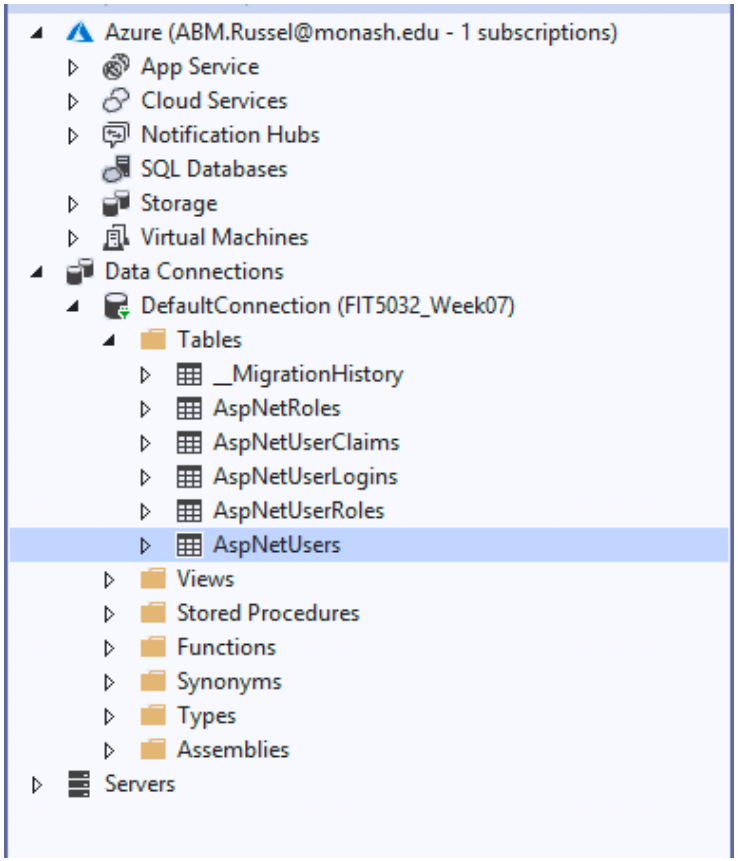
Registering a user

- You can register a user in this new application that you created



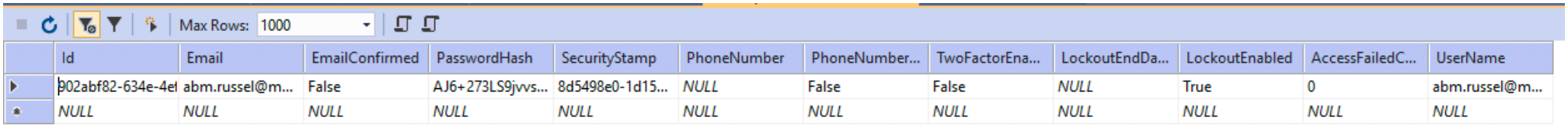
User Account Tables

- Several Tables are created when the application is autogenerate



User Table

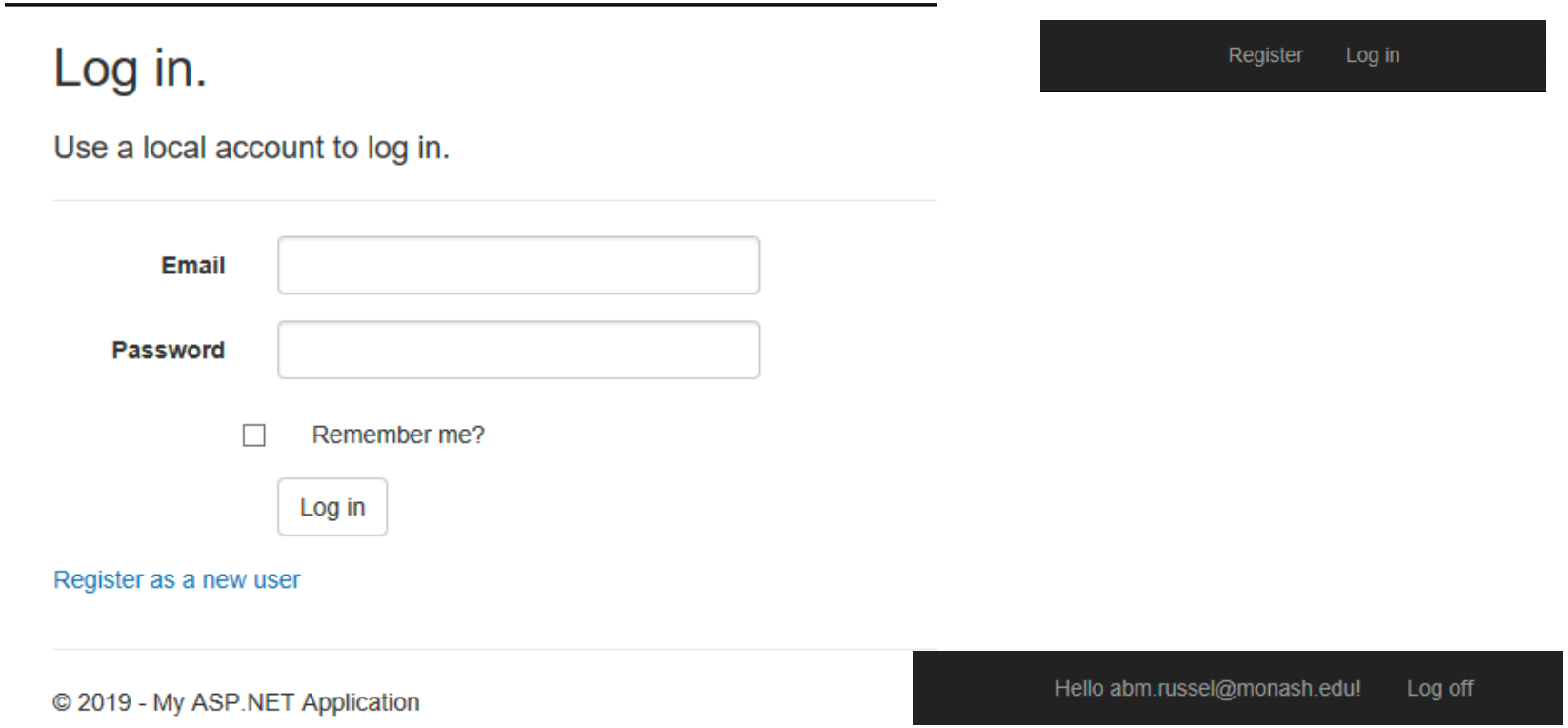
- The AspNetUser table has the details of the user that have registered



Id	Email	EmailConfirmed	PasswordHash	SecurityStamp	PhoneNumber	PhoneNumber...	TwoFactorEna...	LockoutEndDa...	LockoutEnabled	AccessFailedC...	UserName
902abf82-634e-4ef	abm.russel@m...	False	AJ6+273LS9jvvs...	8d5498e0-1d15...	NULL	False	False	NULL	True	0	abm.russel@m...
NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL

Log In the User

- The Registered Users can Log in



Securing an Action

- An Action (e.g. from the HomeController) can be restricted to logged in users
    - Use the [Authorize] annotation

```
[Authorize]
 public ActionResult Contact()
 {
     ViewBag.Message = "Your contact page.";

     return View();
 }
```

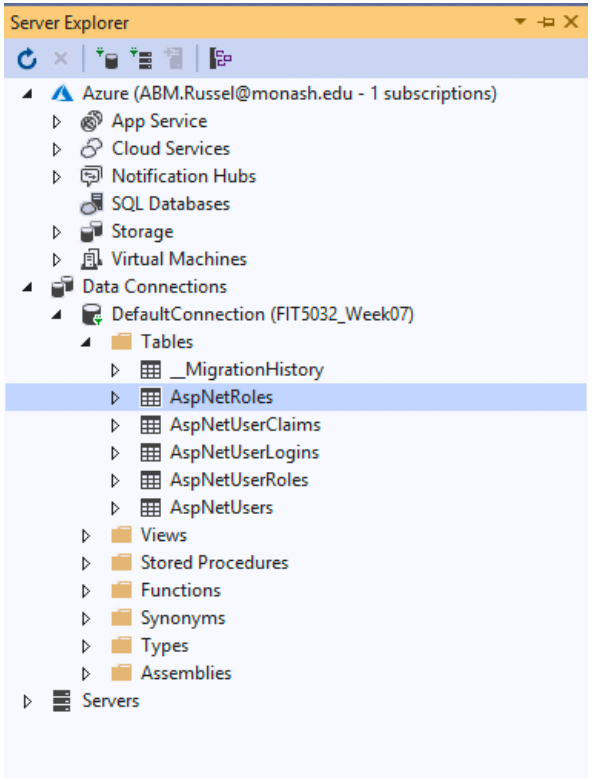
- Now the user must log in to access the Contact action.

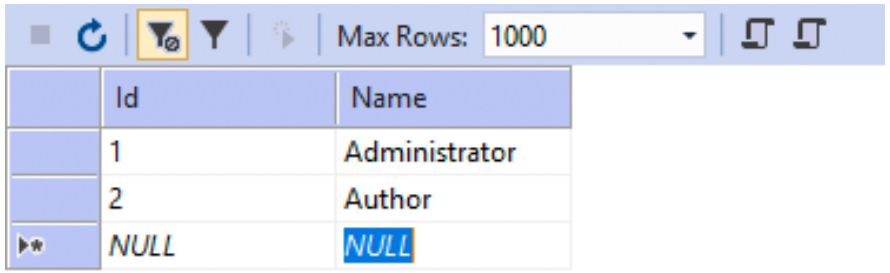
Roles

- Normally applications are secured based on roles
  - Administrators
  - Authors
  - general public
  - Etc…

ASP.Net MVC Roles

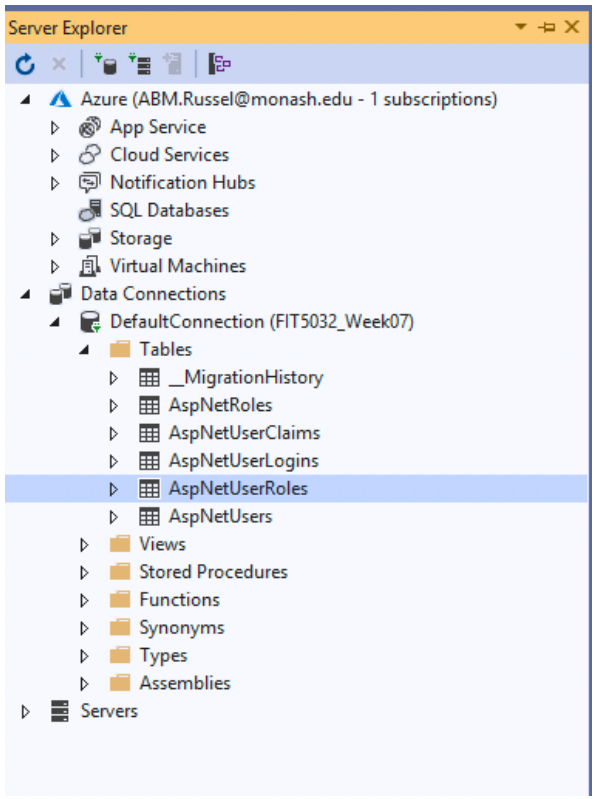
- We can specify roles in the application by adding entries in the AspNetRoles table

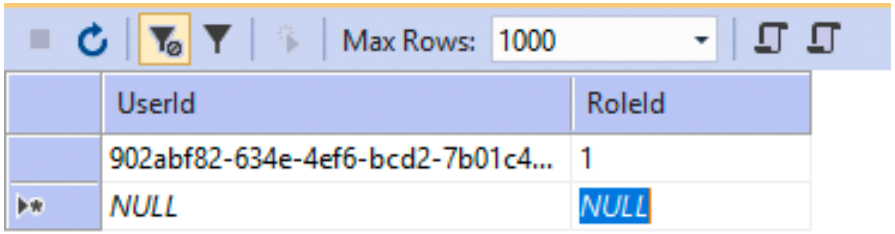




Mapping Users and Roles

- The Mapping of the Users to the roles is done in the AspNetUserRoles table





Intro to ASP.Net security

- Sections Secured by restricting controllers
  - Add the "[Authorize]" annotation in the HomeController.cs

```
namespace FIT5032_Week07.Controllers
{
    [Authorize]
    0 references
    public class HomeController : Controller
    {
        0 references
        public ActionResult Index()
        {
            return View();
        }

        0 references
        public ActionResult About()
        {
            ViewBag.Message = "Your application description page.";

            return View();
        }

        [Authorize]
        0 references
        public ActionResult Contact()
        {
            ViewBag.Message = "Your contact page.";

            return View();
        }
    }
}
```

Securing/Unsecuring Actions

- Smaller sections secured
    - adding the “[Authorize]” annotation to the action.
- Secured controller, can have unsecured action
    - “[AllowAnonymous]”annotation for that action.

Securing Controllers/Actions based on roles

- Application (controllers and actions)
    - secured using the roles
    - defined for the application (in the AspNetRoles table)
- Use “[Authorize(Roles = “Administrator”)]”
    - name of the roles are your choice.

Multiple Roles

- Multiple roles allowed access
    - [Authorize(Roles = “HRManager,Finance")]
- Multiple roles needed to access
    - [Authorize(Roles = “PowerUser")]
    - [Authorize(Roles = “ControlPanelUser")]
- Reference: https://docs.microsoft.com/en-us/aspnet/core/security/authorization/roles

Allowing Access to Own Data (Only)

- Selecting/Viewing items owned by log in user
    - ASP.Net MVC allows us to access the currently logged in user:

```
using Microsoft.AspNet.Identity;
......

string currentUserId = User.Identity.GetUserId();
.....
```

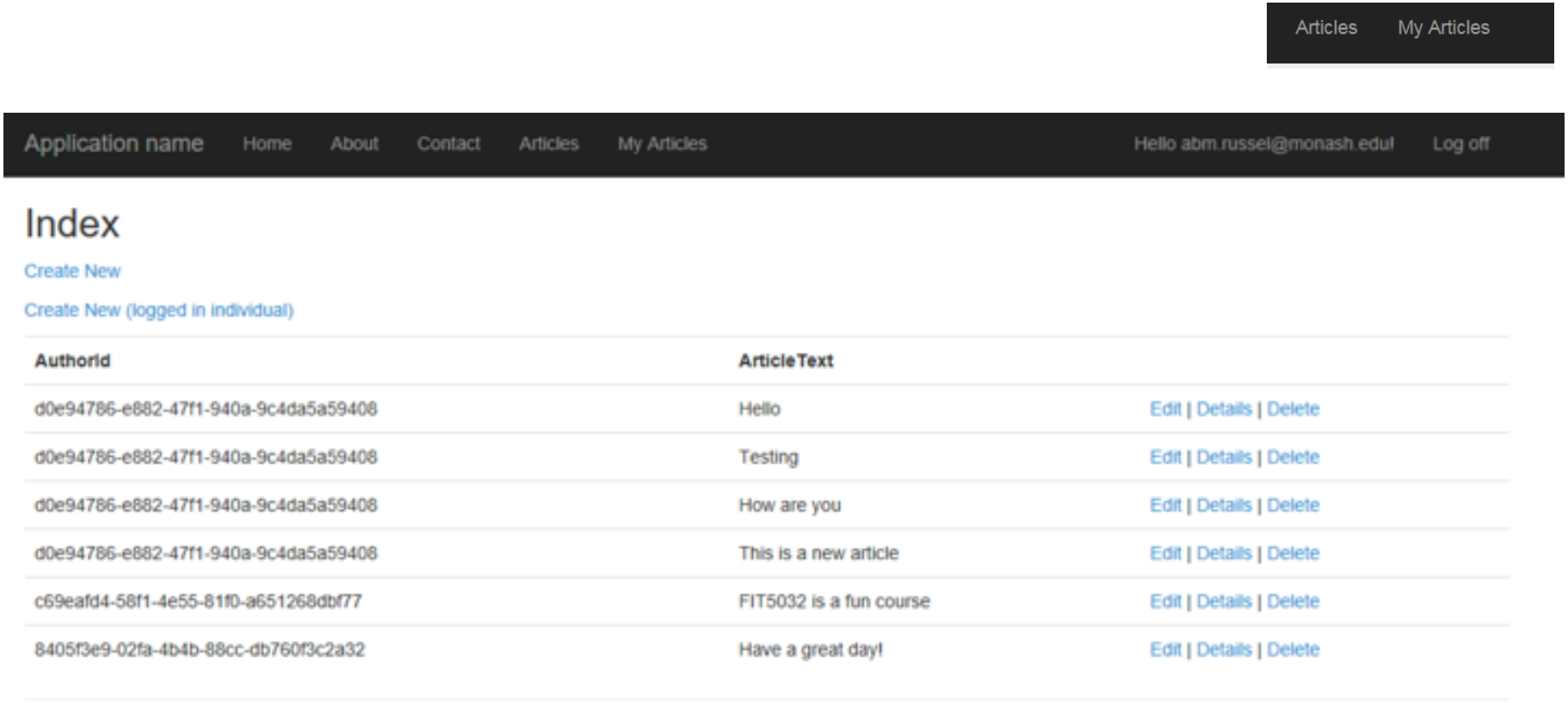
Selecting/Viewing items owned by log in user (Part 2)

- User id to select just the items that are created by the user (for viewing in the index view.)

```
// GET: Articles
        public ActionResult IndexUserNames()
        {
            //return View(db.Articles.ToList());
            string currentUserId = User.Identity.GetUserId();
            return View(db.Articles.Where(m=> m.AuthorId ==
currentUserId).ToList());
        }
```

Selecting/Viewing items owned by log in user (Part 3)

- Only the users own data is shown



Creating item (automatically adding userID)

- Action takes the current user id and adds it to the model before calling the View (with the model)

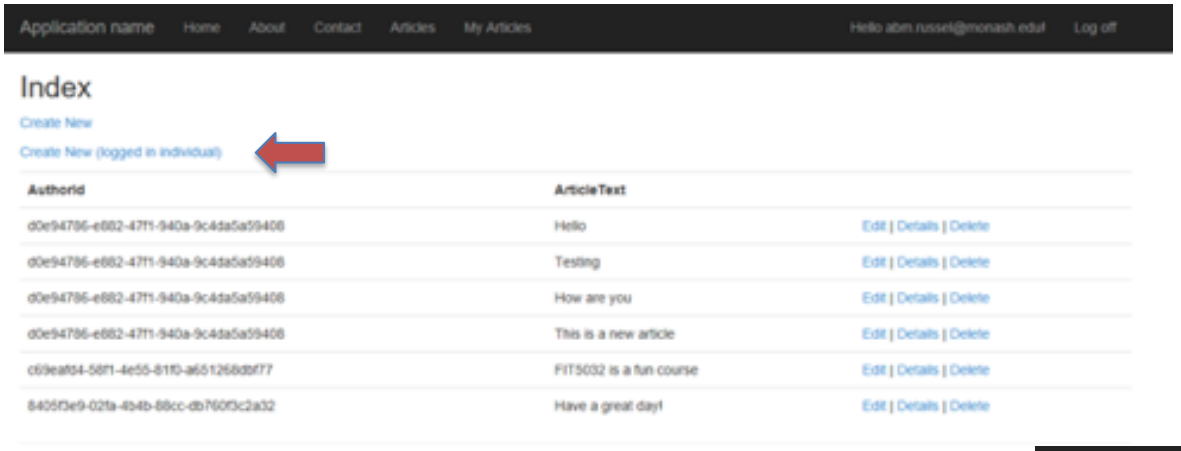
```
// GET: Articles/Create
        public ActionResult CreateIndividual()
        {
            Article article = new Article();
            string currentUserId = User.Identity.GetUserId();
            article.AuthorId = currentUserId;
            return View(article);
        }
```

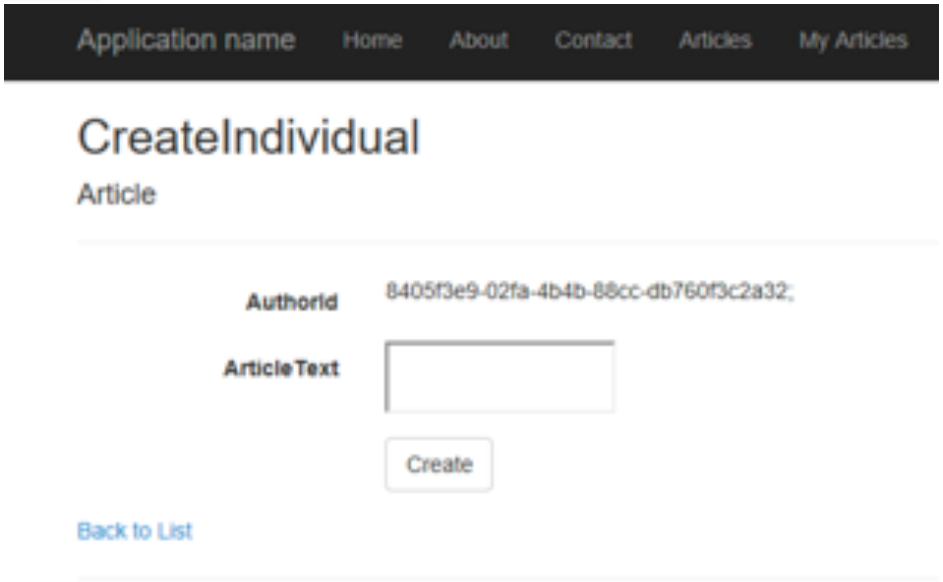
Creating item (automatically adding userID) Part 2

- Process the Posted Model Values when the user Completes the form

```
[HttpPost]
    [ValidateAntiForgeryToken]
    public ActionResult CreateIndividual([Bind(Include = "NewsId, AuthorId,
ArticleText")] Article article)
    …..
```

Creating item (automatically adding userID) Part 3





Creating item (automatically adding userID) Part 4

- A hidden field (model.AuthorId) is required to pass the AuthorID to the user.

```
@Html.HiddenFor(model => model.AuthorId,
htmlAttributes: new { @class = "form-control"})
```

- Normally the internal Id values (such as AuthorID) are not displayed in the user interface, this is just for debugging purposes.

Role and User based Security

- With these approaches:
  - Users can be restricted to their own data
  - Administrators given write access to all data
  - Public (no logged in users) given read access only

What is role based authentication?

What is role based authentication?

A. Using Usernames and Passwords to log in

B. Using roles such as administrator, user etc

C. Mapping of usernames to roles

D. All of the answers (except none)

E. None of the answers

What is the most secure way of storing passwords?

What is the most secure way of storing passwords?

A. No hashing

B. Hashing

C. Salting

D. Salting and Hashing

E. All of the answers

In ASP.Net MVC, how do you require users to log in to the system?

In ASP.Net MVC, how do you require users to log in to the system?

A. Annotate the action with [Authorize(Roles = “Administrator")]

B. Annotate the action with [Authorize]

C. Map the username to the role

D. All of the answers (except none)

E. None of the answers

In ASP.Net how do you restrict a section of the application to a specific role (e.g. Administrator)

In ASP.Net how do you restrict a section of the application to a specific role (e.g. Administrator)

A. Annotate the action with [Authorize(Roles = “Administrator")]

B. Annotate the action with [Authorize]

C. Annotate the action with [AllowAnonymous]

D. All of the answers (except none)

E. None of the answers

In ASP.Net MVC, how do you restrict the logged in user to just see their own data?

In ASP.Net MVC, how do you restrict the logged in user to just see their own data?

A. This is done automatically in ASP.Net MVC

B. Filter the model with ".Where(m=> m.Id == currentUserId)”

C. Filter the view to just show the relevant data

D. All of the answers (except none)

E. None of the answers

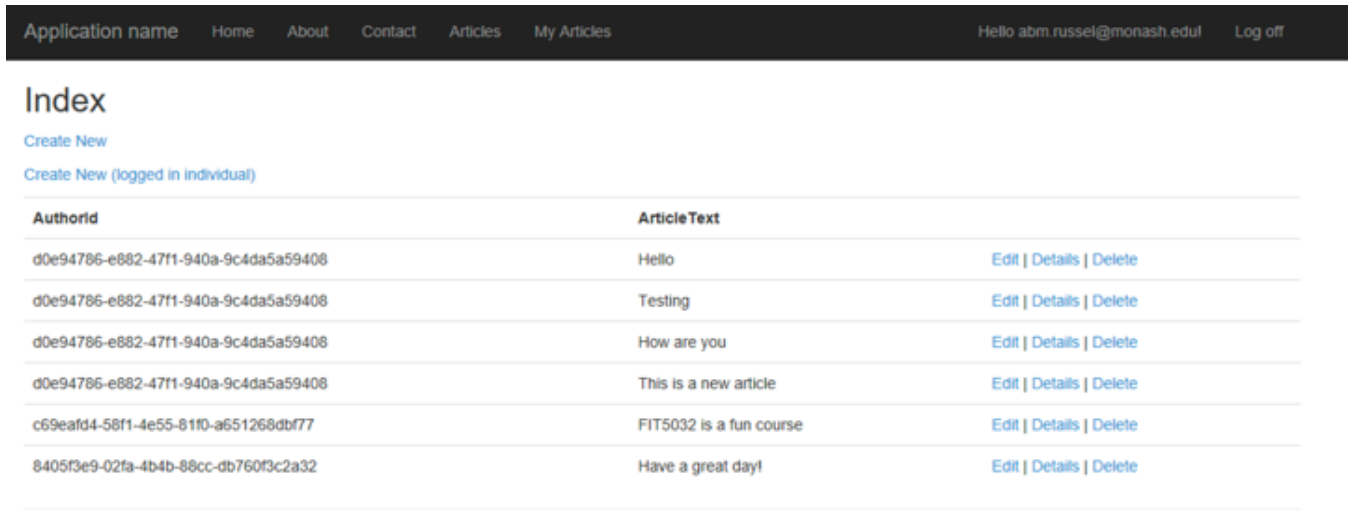
ASP.NET MVC Security Issues

Security Weakness #1

- The default CRUD actions have not been secured
    - When new functionality is added (new Actions) and secured, make sure the default CRUD actions are secured (for administrator access)
- Or remove the default actions

Security Weakness # 2

- The index action lists only items that are related to the user, including edit, delete links



- However any user can directly access the edit/delete action using the url !
    - They just need to know the item id

Security Weakness # 2

- Edit/Delete actions need to check user id:
    - Ensure the item that is being edited/deleted has a matching user ID to the current user!

Additional Security Tips

Cross Site Scripting (XSS)

- ASP.Net MVC has built in checks to ensure scripts are not submitted via user input
- However if you want users to input scripts (say a programming site)
- Disable validation for the relevant action

  [ValidateInput(false)]

Cross Site Request Forgery (CSRF) Attack

- It is possible for another site to submit (normally malicious) data to your application
  - ASP.Net MVC has a built in functionality to stop this
  - Add @Html.AntiForgeryToken() to the form
  - Add [ValidateAntiForgeryToken] to the action method

Custom HTTP Headers

- X-Frame-Options
    - Don’t allow iframe.
- X-Xss-Protection
    - Stop loading the page when a cross-site scripting attack is detected.
- X-Content-Type-Options
    - Harder for hackers to guess the right mime type of resources.

Custom HTTP Headers

- Referrer-Policy
    - Removes the referrer from http request, so difficult for admin from sites your users click to to see referrer details. Also minimises what you can analyse about traffic flow on your site.
- Strict-Transport-Security
    - Only HTTPS allowed once this is set correctly
- X-Powered-By
    - Hides the technology used for your site.

Custom HTTP Headers

- X-AspNetMvc-Version
    - Hides MVC version.
    - MvcHandler.DisableMvcResponseHeader = **true**;
- Server
    - Hides the IIS server details.
    - HttpContext.Current.Response.Headers.Remove("Server");
- Additional settings in:
    - Content-Security-Policy

You have created a default ASP.Net MVC CRUD application with user accounts. You've created a new action ListMine (annotated

You have created a default ASP.Net MVC CRUD application with user accounts. You've created a new action ListMine (annotated with the [Authorize] keyword) that shows all the items for the current user. Identify one potential security problem?

A. Anybody can use the ListMine

B. The ListMine action should be annotated with [Authorize(Roles = “Administrator")]

C. The index action still lists all values

D. All of the answers (except none)

E. None of the answers

You have created a default ASP.Net MVC CRUD application with user accounts. You've created a new action ListMine (annotated

You have created a default ASP.Net MVC CRUD application with user accounts. You've created a new action ListMine (annotated with the [Authorize] keyword) that shows all the items for the current user. Identify a second potential security problem?

A. The delete action should be annotated with [Authorize(Roles = “Administrator")]

B. The userID should be checked with the edit and delete actions

C. The edit action should be annotated with [Authorize(Roles = “Administrator")]

D. All of the answers (except none)

E. None of the answers

What is Cross Site Scripting Attack?

What is Cross Site Scripting Attack?

A. When scripts are submitted to your site (potentially executing)

B. When hackers log into your machine and change the scripts

C. When hackers get angry at your scripting methods

D. All of the above (except none)

E. None of the above

What is Cross Site Request Forgery

What is Cross Site Request Forgery

A. When another site looks like your site

B. When another site submits malicious input to your site

C. When another site has code similar to your site

D. All of the above (except none)

E. None of the above

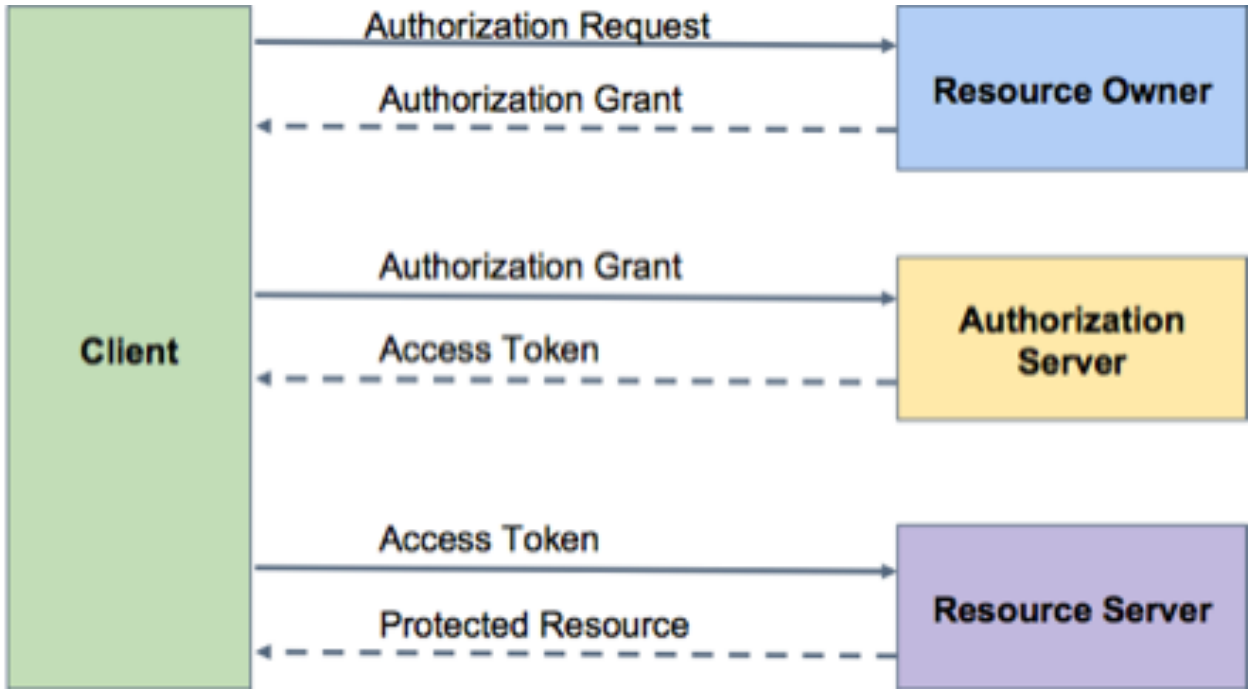
OpenID, OAuth

OpenId

- OpenID is an open standard and decentralized authentication protocol.
    - It allows Clients to verify the identity of the End-User based on the authentication performed by an Authorization Server, as well as to obtain basic profile information about the End-User in an interoperable and REST-like manner.
- Remember one username and one password.

OAuth

- OAuth 2.0 focuses on client developer simplicity while providing specific authorization flows for web applications, desktop applications, mobile phones, and living room devices.



List of OAuth Providers

- Amazon
- BattleNet
- BitBucket
- Dropbox
- Github
- Google
- Instagram
- LinkedIn
- Twitter
- Yahoo

Magic Quadrant for Access Management

Figure 1. Magic Quadrant for Access Management

Source: Gartner (August 2019)

References

- https://www.asp.net/mvc/overview/security
- http://www.csharpcorner.com/UploadFile/cda5ba/security-feature-in-mvc/
- https://blog.elmah.io/improving-security-in-asp-net-mvc-using-custom-headers/

An action (from HomeController) can be restricted to logged users using which annotation

An action (from HomeController) can be restricted to logged users using which annotation

A. [Authentication]

B. [Login]

C. [Authorize]

D. [Security]

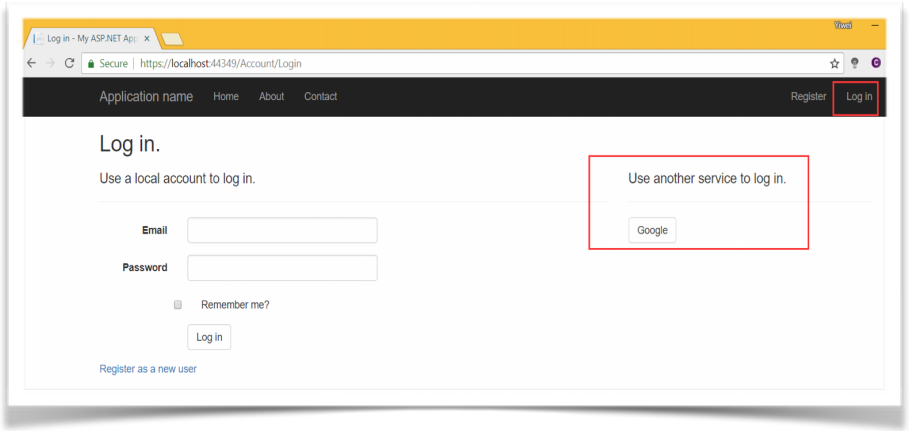
E. [None]

Lecture Summary

- Recap: Validation in ASP.NET MVC
- Security and Identity
- Log In Features
- Security Issues (in example)
- Additional Security Topics: XSS, CSRF, HTTP Headers
- OpenID, OAuth

Week 7 Studio Overview

- Security Presentation
- Using ASP.NET Identity
- MS Identity to sign in with Google Account



Next week: Email, File Upload, Signal R

- Sending Email
- File Upload
- Signal R