



TRAILHEAD
TECHNOLOGY PARTNERS

.NET and C# Training

Session 15

Overall Agenda

~~Session 1 – 6: Basic and Advanced C# and VS~~

~~Session 7: Classes available in .NET BCL~~

~~Session 8: Data Access Basics (ADO.NET)~~

~~Session 9 - 10: C# Advanced concepts~~

~~Session 11 – 12: Data Access with Entity Framework 6~~

~~Session 13 – 14: Version Control with TFVC and Git~~

Session 15 – 16: ASP.NET (RESTful) Web APIS

Today's Agenda

1. Review assignments (15 min)
2. ASP.NET Web API
3. New assignment (15 min)

Review Last Assignment

Assignment 14

- Read W3 Schools' Git Tutorial and complete the included exercises at <https://www.w3schools.com/git/>
- CHALLENGE
 - Create your own Git repository on GitHub or Azure DevOps
 - Add an assignment from this class to the repository
 - Connect to the remote and push your code to it
 - Practice making changes, adding, committing and pushing them
 - Try making a branch with a new feature and merging it back to the master/main branch

<https://github.com/jonathantower/learning-dotnet>

ASP.NET Web API

ASP.NET

ASP.NET replaced ASP (Active Server Pages)

Runs only on Windows

Runs only on IIS (Internet Information Server)

ASP.NET \neq ASP.NET Core

ASP.NET: Many Programming Models

.NET Framework

- ASP.NET Web Forms
- ASP.NET Web Pages
- ASP.NET MVC
- ASP.NET Web API

.NET Core

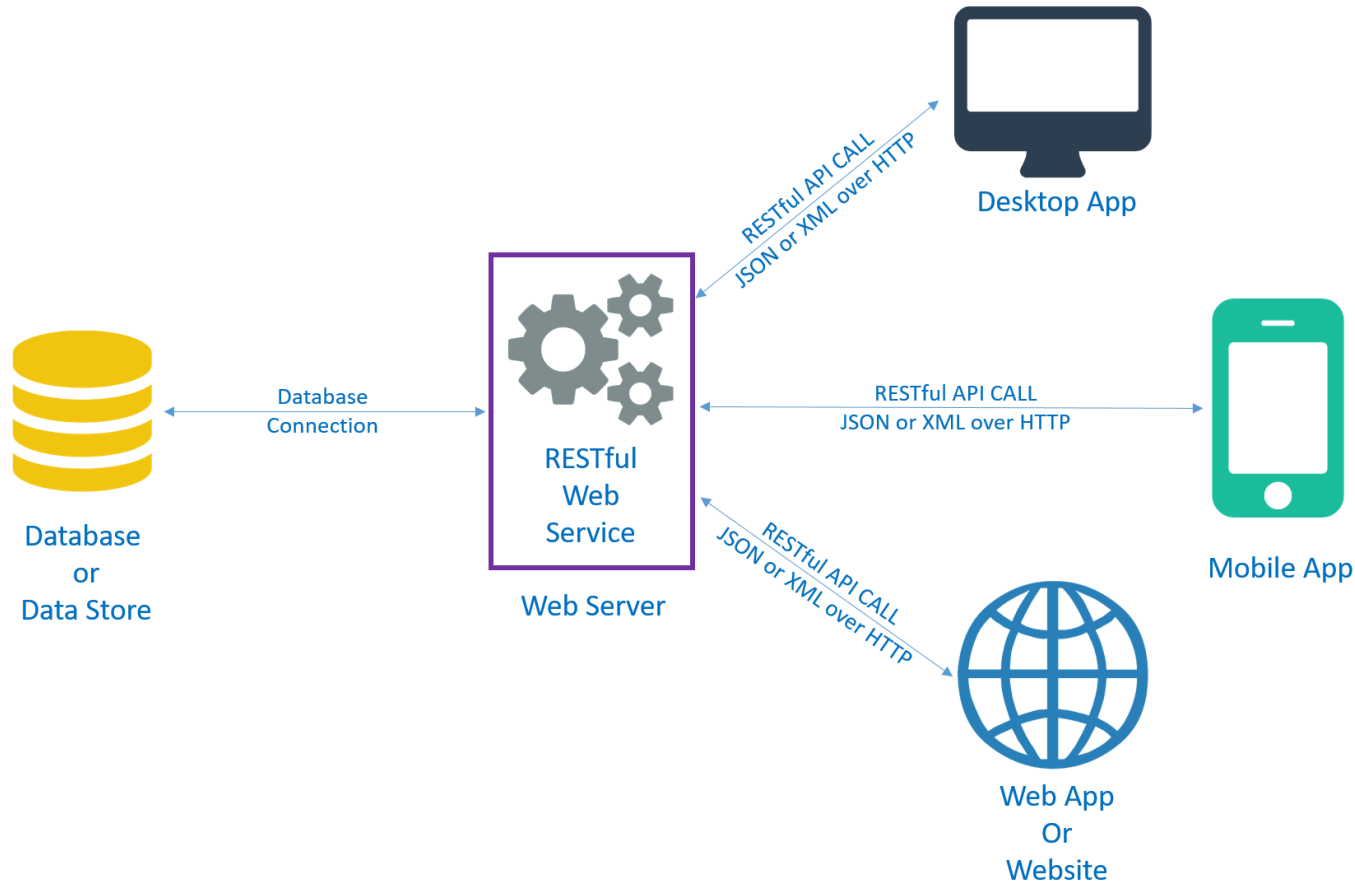
- ASP.NET MVC/Web API
- ASP.NET Razor Pages
- ASP.NET Minimal APIs

REST in ASP.NET = Web API

REST Overview

- REST = REpresentational State Transfer
- Stateless
- Everything has an ID
- URIs always the same
- Uses HTTP methods
 - GET, POST, PUT, DELETE
- Uses HTTP responses
 - 1xx: Informational, 2xx: Success, 3xx: Redirection, 4xx: Client Error, 5xx: Server Error

REST API Uses



- Integrations
- Web apps
- Mobile apps
- Desktop apps

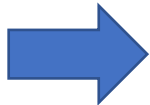
Convention-Based Routing

Priority	HTTP Verb	Path	Controller	Action Method	Parameters
1	GET	/api/widgets	WidgetsController	GetAll()	none
2	GET	/api/widgets/1	WidgetsController	Get(int id)	id: 1
3	POST	/api/users	UsersController	PostUser(User user)	user: {body}
4	GET	/api/users	UsersController	GetAll()	None
5	GET	/api/users/127	UsersController	Get(int id)	id: 127
6	DELETE	/api/users/99	UsersConroller	Delete(int id)	id: 99

Convention-Based Routing

Request URI

GET /api/order



Controller Action

OrderController.GetOrders()

Demo

Convention-Based Routing

Parameter Binding Conventions

Type of Value

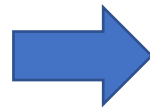
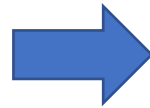
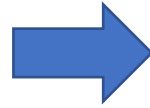
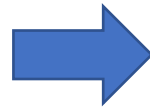
String

int

bool

etc...

Objects



Mapped from

URI

URI

URI

Body

Parameter Binding Conventions

Tour Search

Prices From:

To:

GET /api/tour?**minPrice=0.00**&**maxPrice=250.00**

Parameter Binding Conventions

Tour Search

Prices From:

To:

POST /api/tour

Body:

```
{  
  "minPrice": 0.00,  
  "maxPrice": 250.00  
}
```

Demo

Parameter Binding Conventions

Demo

Parameter Binding Attributes

HTTP Verb Attributes

- [HttpDelete]
- [HttpGet]
- [HttpHead]
- [HttpOptions]
- [HttpPatch]
- [HttpPost]
- [HttpPut]
- [HttpVerb]

Demo

HTTP Verb Attributes

Returning Void

```
[HttpGet()]  
public void MyGetAction() {  
    ...  
}
```

Returning Objects of Lists of Objects

```
[HttpGet()]
public Product GetProducts(int id) {
    var product = GetProduct(id);

    // 404
    if (product == null)
        throw new HttpResponseException(HttpStatusCode.NotFound);

    //200
    return Ok(data);
}
```

Returning HttpResponseMessage

```
public HttpResponseMessage Get()
{
    HttpResponseMessage response =
        Request.CreateResponse(HttpStatusCode.OK, "value");
    response.Content = new StringContent("hello", Encoding.Unicode);
    response.Headers.CacheControl = new CacheControlHeaderValue()
    {
        MaxAge = TimeSpan.FromMinutes(20)
    };
    return response;
}
```


Returning IActionResultResult

```
[HttpGet()]
public IActionResult MyGetAction(MyRequest req) {
    var data = GetData();

    if (data == null)
        return Conflict(); //409

    if (!ModelState.IsValid)
        return BadRequest(ModelState); //400

    return Ok(data); //200
}
```

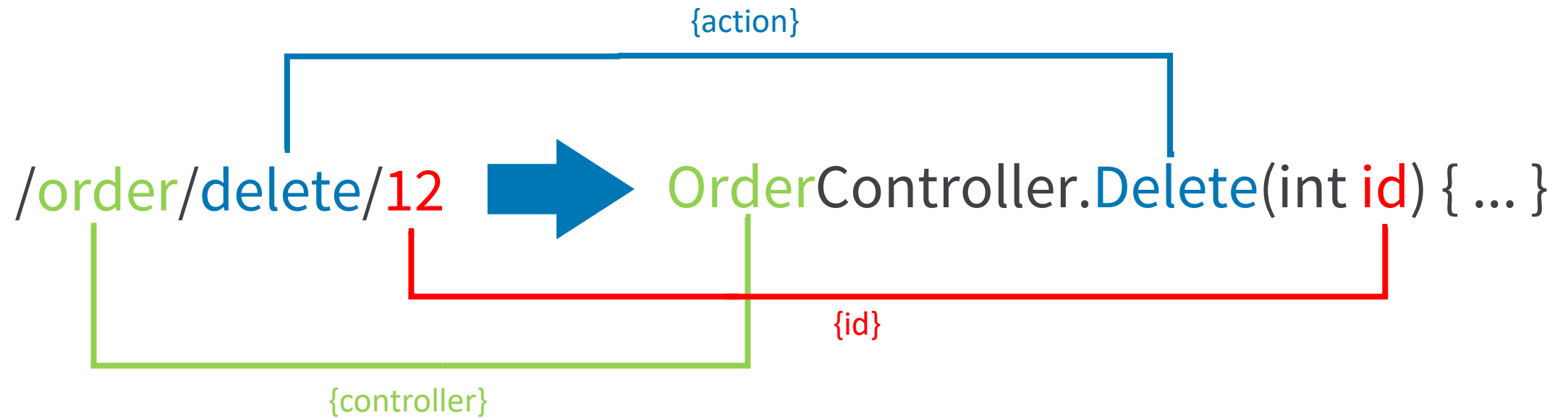
ActionResult Helper Methods

- BadRequest()
- Conflict()
- Content()
- Created()
- NotFound()
- Ok()
- Unauthorized()
- StatusCode()

Demo

Return Values

Routing Rules



Default Route URLs

http://mysite/

http://mysite/home

http://mysite/home/index

http://mysite/home/index/1

{CONTROLLER}

{ACTION}

{ID}

Other Route URLs

http://mysite/

http://mysite/widget

http://mysite/widget/index

http://mysite/widget/index/1

{CONTROLLER}

{ACTION}

{ID}

Demo

Routing Tables

Validating Models in ASP.NET

- Attributes in `System.ComponentModel.DataAnnotations`
- Use `ApiController.ModelState.IsValid`

Many Validation Attributes

- Compare
- CreditCard
- DataType
- EmailAddress
- MaxLength
- MinLength
- Phone
- Range
- RegularExpression
- Required
- Url
- ValidationAttribute

Demo

Validating Models

Built-In Web API XML Serializers

- `XmlSerializer`
- `DataContractSerializer`

XmlSerializer

- Older
- Opt-out serialization of properties/fields
- [XmlIgnore] attribute to opt out

DataContractSerializer

- Newer
- 10% faster
- Opt-in serialization of properties/fields
- [DataMember] attribute to opt in

Demo

JSON vs XML

Escaping RoutePrefix

```
[RoutePrefix("api/orders")]
public class OrdersController : ApiController
{
    [Route("~/api/customers/{customerId}/orders")]
    public IEnumerable<Order> GetByCustomer(int customerId) {
        ...
    }

    // etc.
}
```

Parameters in RoutePrefix

```
[RoutePrefix("api/orders/{accountId}")]  
public class OrdersController : ApiController {  
    ...  
}
```


Types

- alpha
- bool
- datetime
- decimal
- double
- float
- guid
- int
- length
- long
- max
- maxlength
- min
- minlength
- range
- regex

Demo

Attribute Routing & Customized Attribute Routing

Demo

Models vs DTOs

Demo

CRUD Operations with EF Scaffolding

Demo

JSON.NET (Newtonsoft.JSON)

Demo

Reference LoopHandling

Assignment 15

- Build a Web API that does something useful/interesting

CHALLENGES

- Create a desktop, web, or mobile front-end app that uses your API
- Try hosting your API in the cloud for free at <https://azure.microsoft.com/en-us/pricing/details/app-service/windows/#pricing>