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Rebuild your APIs Better, Stronger, Faster

With Minimal APIs

Jonathan “J.” Tower

Overview

A Brief History of RPC Tech in .NET

Quick intro to Minimal APIs

Comparing Controllers and Minimal APIs

Migrating Controllers to Minimal A

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Jonathan "J." Tower

Principal Consultant & Partner

Microsoft MVP in .NET

jtower@trailheadtechnology.com

trailheadtechnology.com/blog

jtowermi

jtower

Free

Consultation

bit.ly/th-offer

github.com/trailheadtechnology/minimal-apis

How We Got Here

A brief *history* of RPC Technology for .NET Developers

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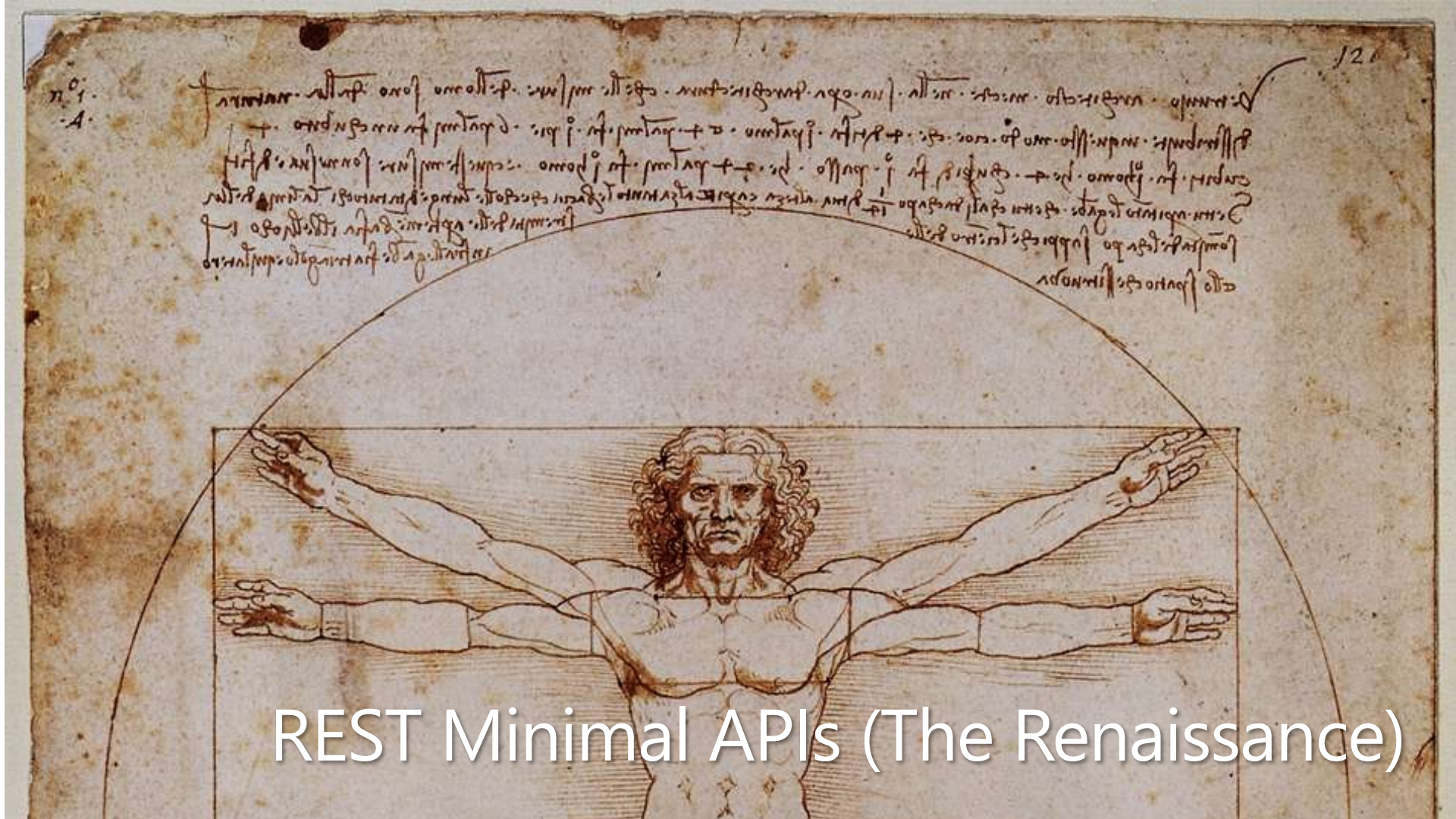
DCOM (Prehistoric Times)

SOAP & WCF (The Dark Ages)

REST Controllers (The Classical Period)



REST Minimal APIs (The Renaissance)

What's Available Today

Controller-Based APIs

Minimal APIs

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An Evolutionary Improvement

- Transport and Payload Format Doesn’t Change
- Two Options For Doing The Same Thing
- New Programming Model
- Less Automatic Features
- Simpler, Faster, More Controller

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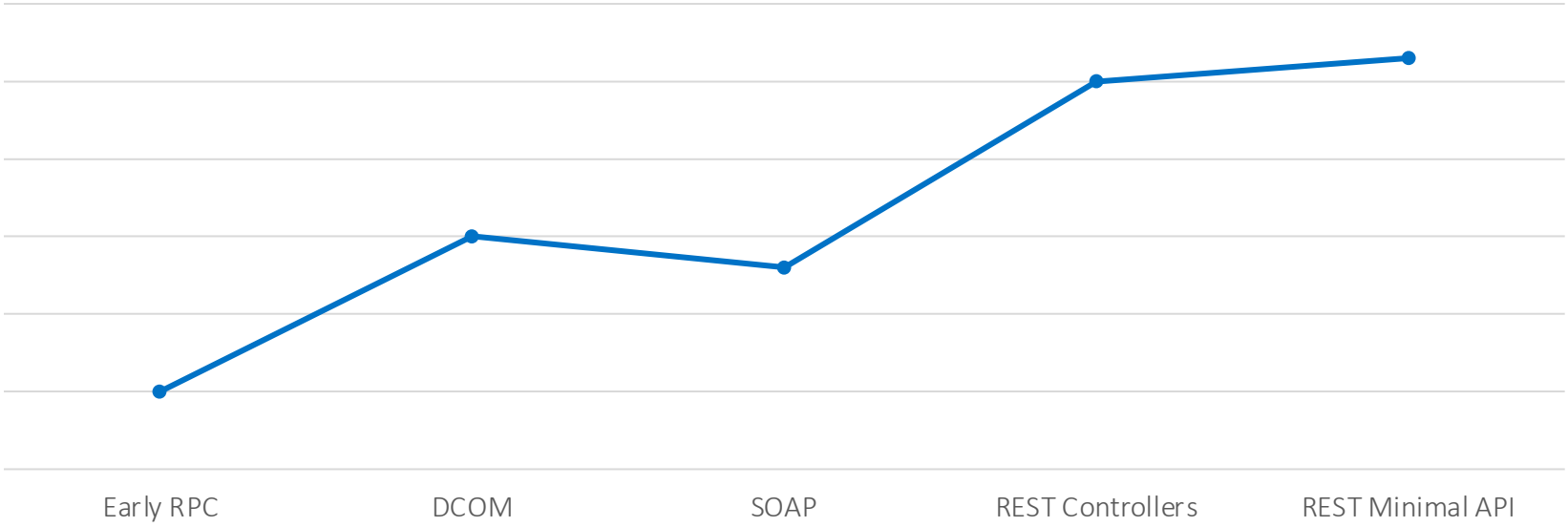
An Improvement; Not A Revolution



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A Quick Intro

Minimal APIs

Basic Controller API

Starup.cs

```
public class Startup
{
    public void ConfigureServices(IServiceCollection services)
    {
        services.AddControllers();
    }

    public void Configure(IApplicationBuilder app, IHostEnvironment env)
    {
        if (env.IsDevelopment())
        {
            app.UseDeveloperExceptionPage();
        }

        app.UseRouting();

        app.UseEndpoints(endpoints =>
        {
            endpoints.MapControllers();
        });
    }
}
```

HelloController.cs

```
[ApiController]
[Route("[controller]")]
public class HelloController : ControllerBase
{
    [HttpGet]
    public IActionResult Get()
    {
        return Ok("Hello, API!");
    }
}
```

Basic Minimal API

Progam.cs

```
var builder = WebApplication.CreateBuilder(args);
var app = builder.Build();

app.MapGet("/", () => "Hello World!");

app.Run();
```

Controllers Vs Minimal APIs

When to Use Each

Controllers and Minimal APIs: Compared

	Minimal APIs	Controllers
Organization	Must organize yourself ⊖	Organized in Controller file, Action Methods ⊕
Control	Granular Control ⊕	Magic ⊖
Bindings	Manual binding ⊖	Convention and manual bindings ⊕
Requirements	Just ASP.NET Core ⊕	MVC / Web API components ⊖
Speed	Fastest ⊕	Fast ⊖
Startup	Repeated startup (Microservices, Serverless) ⊕	Slow, infrequent startup ⊖
Memory	Small memory footprint ⊕	Bigger memory footprint ⊕
Learning	Easier to learn ⊕	Longer learning curve ⊖
Validation	Must validate yourself ⊖	Validation built-in ⊕

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Organization

“It Depends” #1

Default Organization

Progam.cs

```
var builder = WebApplication.CreateBuilder(args);
var app = builder.Build();

app.MapGet("/endpoint1", () => ...);
app.MapGet("/endpoint2", () => ...);
app.MapGet("/endpoint3", () => ...);
app.MapGet("/endpoint4", () => ...);
app.MapGet("/endpoint5", () => ...);
app.MapGet("/endpoint6", () => ...);
app.MapGet("/endpoint7", () => ...);
app.MapGet("/endpoint8", () => ...);
app.MapGet("/endpoint9", () => ...);
app.MapGet("/endpoint10", () => ...);
...

app.Run();
```

Better Organization Options

Extension Methods

Your Own Modules

Carter or SmartModules

Extension Methods

MinimalApiExtensions.cs

```
public static class MinimalApiExtensions
{
    public static void MapUserEndpoints(this IEndpointRouteBuilder endpoints)
    {
        endpoints.MapGet("/users", () => "Get all users");
        endpoints.MapGet("/users/{id}", (int id) => $"Get user with ID {id}");
        endpoints.MapPost("/users", () => "Create a new user");
        endpoints.MapPut("/users/{id}", (int id) => $"Update user with ID {id}");
        endpoints.MapDelete("/users/{id}", (int id) => $"Delete user with ID {id}");
    }
}
```

Extension Methods

MinimalApiExtensions.cs

New in .NET 7

```
public static class MinimalApiExtensions
{
    public static void MapUserEndpoints(this IEndpointRouteBuilder endpoints)
    {
        endpoints.MapGroup("/users", builder =>
        {
            builder.MapGet("", () => "Get all users");
            builder.MapGet("/{id}", (int id) => $"Get user with ID {id}");
            builder.MapPost("", () => "Create a new user");
            builder.MapPut("/{id}", (int id) => $"Update user with ID {id}");
            builder.MapDelete("/{id}", (int id) => $"Delete user with ID {id}");
        });
    }
}
```

Extension Methods

Program.cs

```
var app = WebApplication.Create();

app.MapUserEndpoints();
app.MapOtherEndpoints();
app.MapStillMoreEndpoints();

app.Run();
```

Your Own Modules

IModule.cs

```
public interface IModule
{
    void MapEndpoints(IEndpointRouteBuilder endpoints);
}
```

Your Own Modules

UserEndpointsModule.cs

```
public class UserEndpointsModule : IModule
{
    public void MapEndpoints(IEndpointRouteBuilder endpoints)
    {
        endpoints.MapGroup("/users", builder =>
        {
            builder.MapGet("", () => "Get all users");
            builder.MapGet("/{id}", (int id) => $"Get user with ID {id}");
            builder.MapPost("", () => "Create a new user");
            builder.MapPut("/{id}", (int id) => $"Update user with ID {id}");
            builder.MapDelete("/{id}", (int id) => $"Delete user with ID {id}");
        });
    }
}
```

Your Own Modules

ModuleLoader.cs

```
public static class ModuleLoader
{
    public static void LoadAllModules(this IEndpointRouteBuilder endpoints)
    {
        var moduleTypes = Assembly.GetExecutingAssembly().GetTypes()
            .Where(t => typeof(IModule).IsAssignableFrom(t)
                        && !t.IsInterface && !t.IsAbstract);

        foreach (var moduleType in moduleTypes)
        {
            var module = (IModule)Activator.CreateInstance(moduleType);
            module.MapEndpoints(endpoints);
        }
    }
}
```

Your Own Modules

Program.cs

```
app.MapGroup("/api", endpoints =>
{
   endpoints.LoadAllModules();
});
```

Third-Party Modules

```
> dotnet add package carter
```

```
> dotnet add package Codewrinkles.MinimalApi.SmartModules
```

Third-Party Modules

UserModule.cs

```
public class UserModule : ICarterModule
{
    public void AddRoutes(IEndpointRouteBuilder app)
    {
       app.MapGroup("/users", builder =>
       {
          builder.MapGet("", () => "Get all users");
          builder.MapGet("/{id}", (int id) => $"Get user with ID {id}");
          builder.MapPost("", () => "Create a new user");
          builder.MapPut("/{id}", (int id) => $"Update user with ID {id}");
          builder.MapDelete("/{id}", (int id) => $"Delete user with ID {id}");
       });
    }
}
```

Third-Party Modules

Program.cs

```
var builder = WebApplication.CreateBuilder(args);
builder.Services.AddCarter();

var app = builder.Build();
app.MapCarter();

app.Run();
```

Bindings

“It Depends” #2

Bindings

Minimal API

```
app.MapPost("/api/users", (string name, int age) =>
{
    // 'name' & 'age' bound from body or qs params
    // Minimal APIs inferr from the route and request data
});
```

Simpler
Uses param names, primarily

Controller

```
[HttpPost("/api/users")]
public IActionResult CreateUser([FromBody] Model data)
{
    // 'data' bound from request body using [FromBody]
    // Explicitly defined bindings using attributes
}
```

More Control
Convention first
Attributes second

Validation

“It Depends” #3

Attribute Validation

Minimal API

```
public class Model
{
    [Required(ErrorMessage = "Name is required")]
    [MaxLength(50, ErrorMessage = "Name cannot exceed 50 characters")]
    public string Name { get; set; }

    [Range(18, 100, ErrorMessage = "Age must be between 18 and 100")]
    public int Age { get; set; }
}
```

Fluent Validation

Model

```
public class Model
{
    public string Name { get; set; }
    public int Age { get; set; }
}
```

Validator

```
public class Validator  : AbstractValidator<UserCreationModel>
{
    public Validator()
    {
        RuleFor(x => x.Name)
            .NotEmpty().MaximumLength(50);

        RuleFor(x => x.Age).InclusiveBetween(18, 100);
    }
}
```

Validation

Minimal API

```
app.MapPost("/test", async (Model data, Validator val) =>
{
    var results = await val.ValidateAsync(data);

    if (!result.IsValid)
        return Results.BadRequest(result.Errors);

    return Results.Ok("User created successfully");
});
```

Inject a Fluent validator
Validation and persistence separate

Controller

```
public class UserController : ControllerBase
{
    [HttpPost("/test")]
    public IActionResult CreateUser(Model model)
    {
        if (!ModelState.IsValid)
            return BadRequest(ModelState);

        return Ok("User created successfully");
    }
}
```

ModelState built in
Validation and persistence mixed

When To Use Each

The Official Answer

What are Minimal APIs Good For?

Microservices

Speed

Small Footprint

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What are Controllers Good For?

Traditional Monoliths

Enterprise

Convention over Configuration

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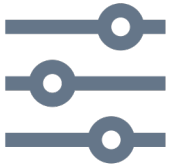
Maybe The Actual Answer?

Microservices

The More Nuanced Answer

Depends on your Needs

Pros/Cons



Your Preference

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Why J. Likes Minimal APIs

Full Control
(Less Magic)

Small

Fast

Clean
Architecture

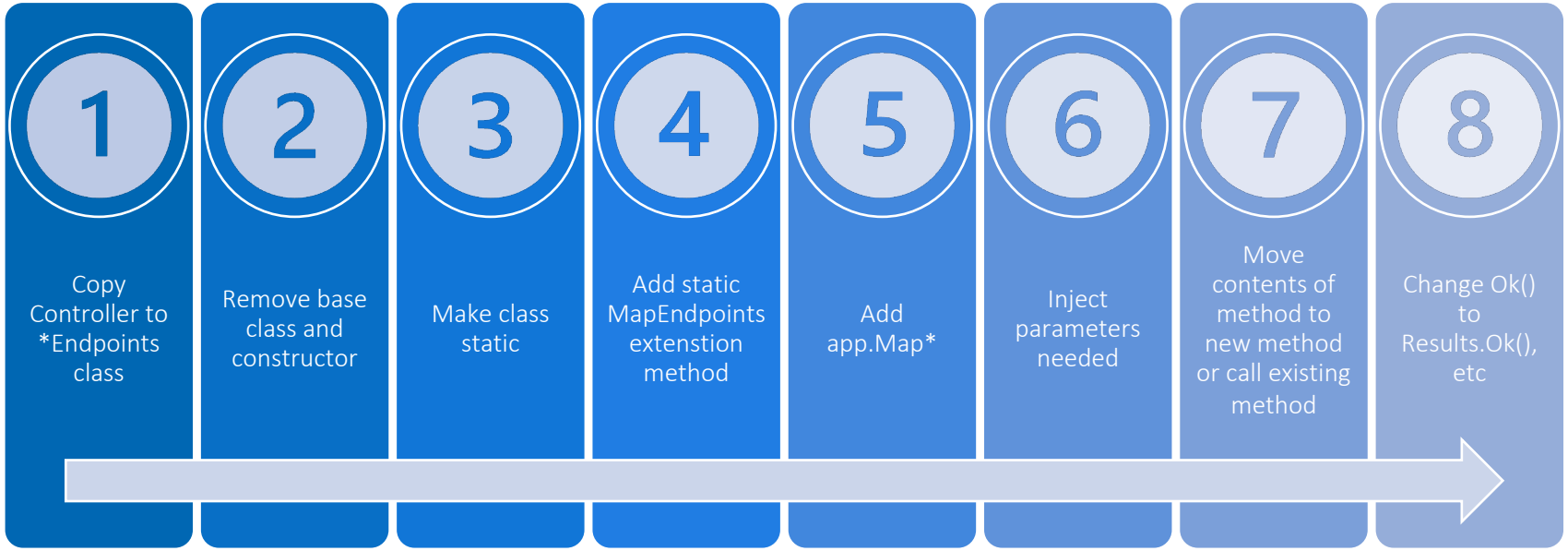
DEMO

Speed and Memory Footprint

Migrating Controllers To Minimal APIs

Step by Step

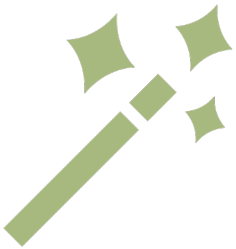
Migration Steps



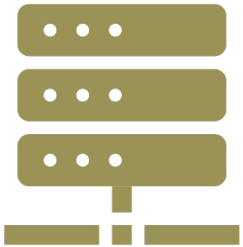
DEMO

Migrate a Controller

Other Helpful Tools

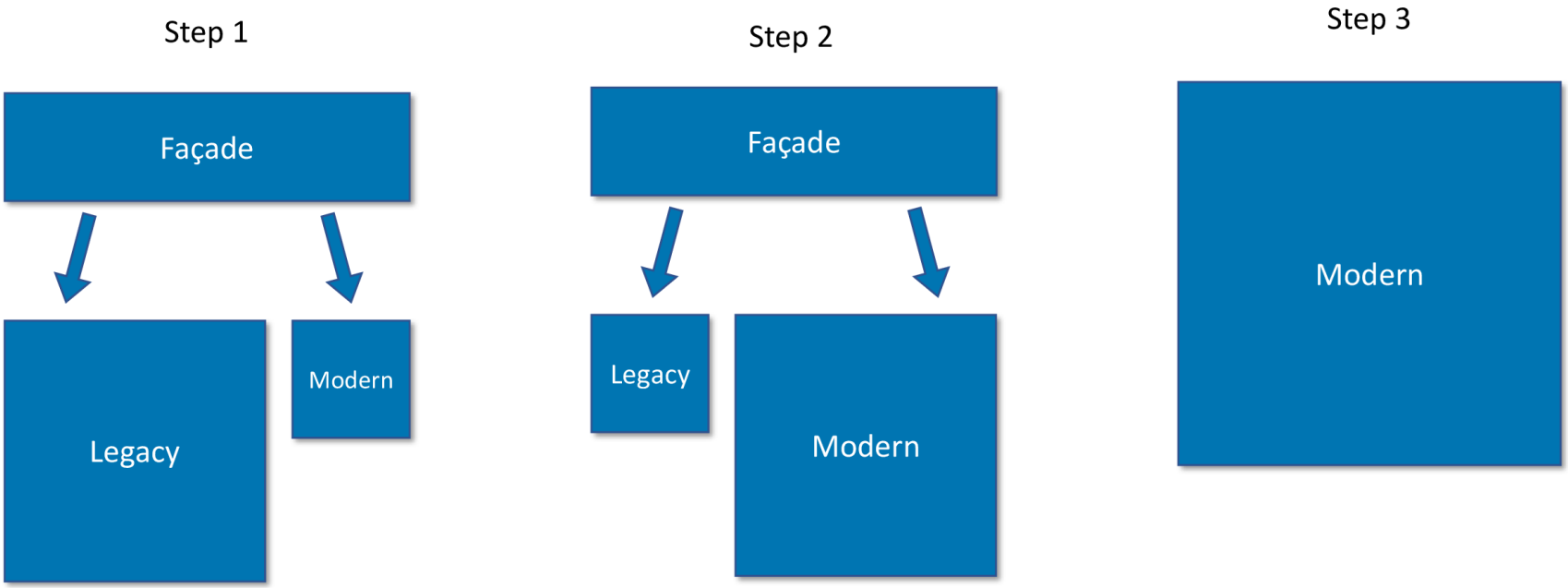


.NET Upgrade Assistant



YARP

Strangler Fig Pattern



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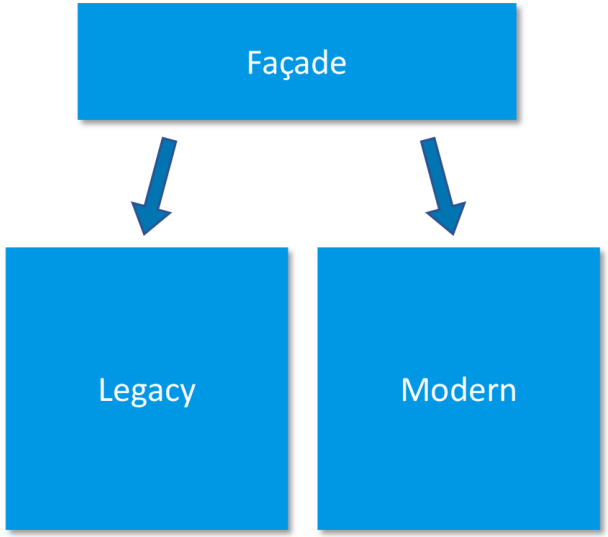
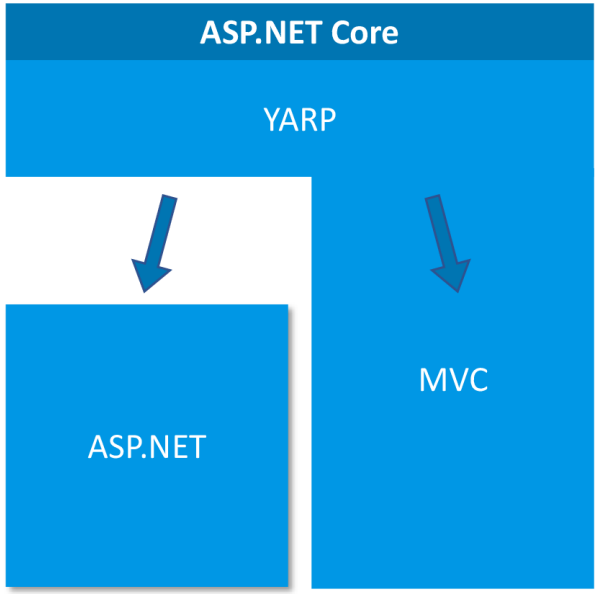
Strangler Fig With YARP





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DEMO

YARP and .NET Upgrade Assistant

Recap

New Programming Model

Faster and Simpler

Better for Microservices

Same Transport and Payloads

Easy To Migrate To

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Thanks! Questions?

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