# CRUD WITH POSTMAN
# Create a web API with ASP.NET Core

## Steps:

- Create a web API project.
- Add a model class and a database context.
- Scaffold a controller with CRUD methods.
- Configure routing, URL paths, and return values.
- Call the web API with Postman.

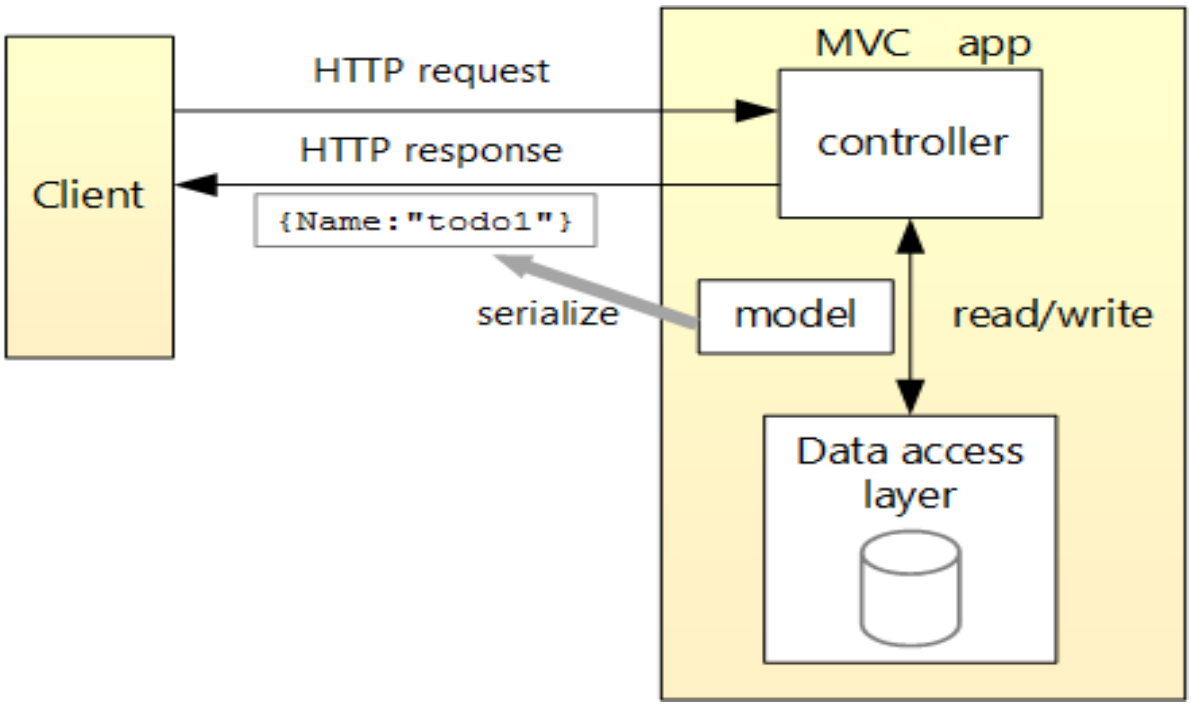
At the end, you have a web API that can manage "to-do" items stored in a database.

## Overview

---

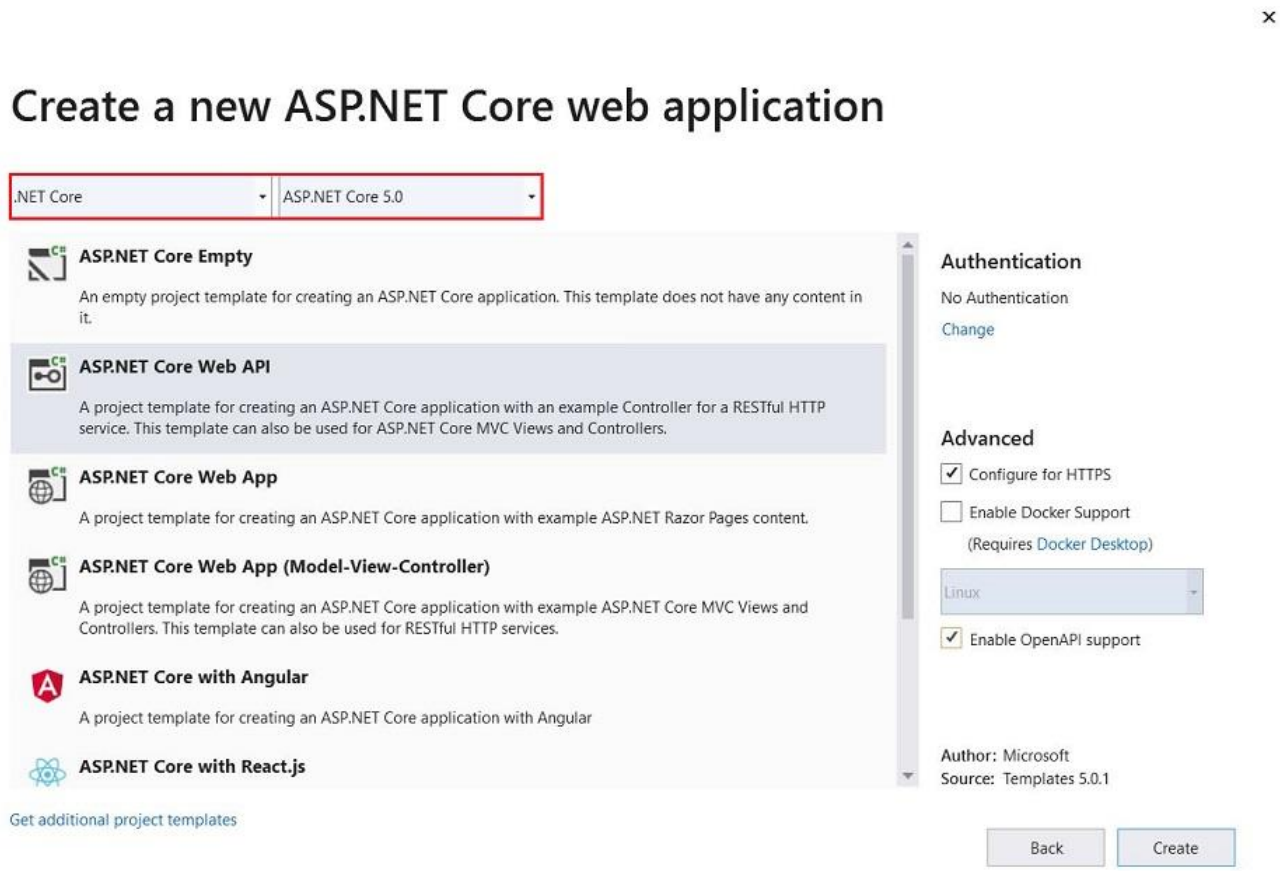
| API | Description | Request body | Response body |
|---|---|---|---|
| `GET /api/TodoItems` | Get all to-do items | None | Array of to-do items |
| `GET /api/TodoItems/{id}` | Get an item by ID | None | To-do item |
| `POST /api/TodoItems` | Add a new item | To-do item | To-do item |
| `PUT /api/TodoItems/{id}` | Update an existing item | To-do item | None |
| `DELETE /api/TodoItems/{id}` | Delete an item | None | None |

The following diagram shows the design of the app.




## Create a web project

- From the **File** menu, select **New** > **Project**.
- Select the **ASP.NET Core Web API** template and click **Next**.
- Name the project *TodoApi* and click **Create**.
- In the **Create a new ASP.NET Core Web Application** dialog, confirm that **.NET Core** and **ASP.NET Core 5.0** are selected. Select the **API** template and click **Create**.

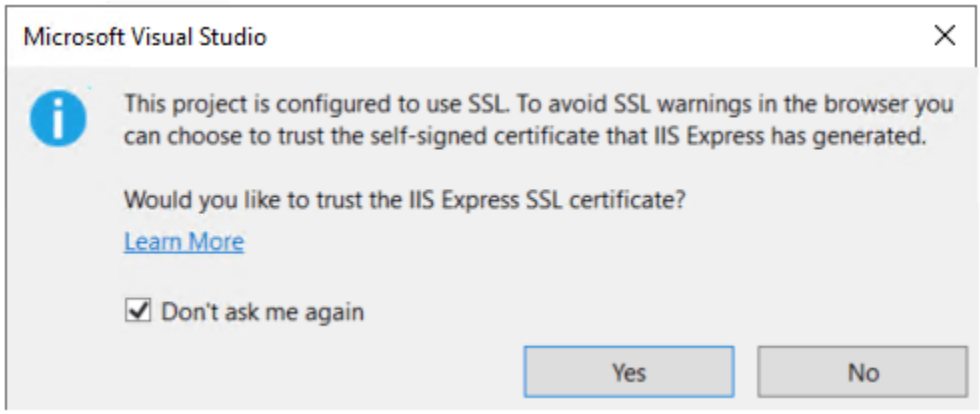



## Test the project

The project template creates a `WeatherForecast` API with support for Swagger.

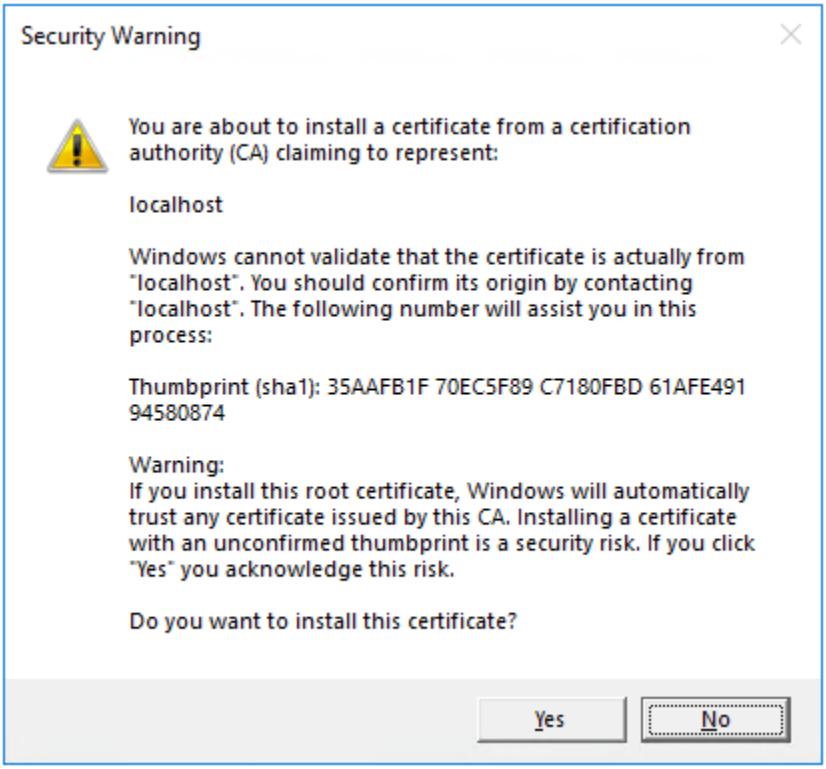
Press Ctrl+F5 to run without the debugger.

Visual Studio displays the following dialog:




Select **Yes** if you trust the IIS Express SSL certificate.

The following dialog is displayed:




Select **Yes** if you agree to trust the development certificate.

Visual Studio launches:

- The IIS Express web server.
- The default browser and navigates to `https://localhost:<port>/swagger/index.html`, where `<port>` is a randomly chosen port number.

The Swagger page `/swagger/index.html` is displayed. Select **GET** > **Try it out** > **Execute**. The page displays:

- The Curl command to test the WeatherForecast API.
- The URL to test the WeatherForecast API.
- The response code, body, and headers.
- A drop down list box with media types and the example value and schema.

Swagger is used to generate useful documentation and help pages for web APIs.

Copy and paste the **Request URL** in the browser: `https://localhost:<port>/WeatherForecast`

JSON similar to the following is returned:

JSONCopy

```
[
    {
        "date": "2019-07-16T19:04:05.7257911-06:00",
        "temperatureC": 52,
        "temperatureF": 125,
        "summary": "Mild"
    },
    {
        "date": "2019-07-17T19:04:05.7258461-06:00",
        "temperatureC": 36,
        "temperatureF": 96,
        "summary": "Warm"
    },
    {
        "date": "2019-07-18T19:04:05.7258467-06:00",
        "temperatureC": 39,
        "temperatureF": 102,
        "summary": "Cool"
    },
    {
        "date": "2019-07-19T19:04:05.7258471-06:00",
        "temperatureC": 10,
        "temperatureF": 49,
        "summary": "Bracing"
    },
    {
        "date": "2019-07-20T19:04:05.7258474-06:00",
        "temperatureC": -1,
        "temperatureF": 31,
        "summary": "Chilly"
    }
]
```

### Update the launchUrl

In *Properties\launchSettings.json*, update `launchUrl` from `"swagger"` to `"api/TodoItems"`:

```
"launchUrl": "api/TodoItems",
```

Because Swagger has been removed, the preceding markup changes the URL that is launched to the GET method of the controller added in the following sections.

## Add a model class

A *model* is a set of classes that represent the data that the app manages. The model for this app is a single `TodoItem` class.

- In **Solution Explorer**, right-click the project. Select **Add** > **New Folder**. Name the folder *Models*.
- Right-click the *Models* folder and select **Add** > **Class**. Name the class *TodoItem* and select **Add**.
- Replace the template code with the following:

```
namespace TodoApi.Models
{
    public class TodoItem
    {
        public long Id { get; set; }
        public string Name { get; set; }
        public bool IsComplete { get; set; }
    }
}
```

The `Id` property functions as the unique key in a relational database.

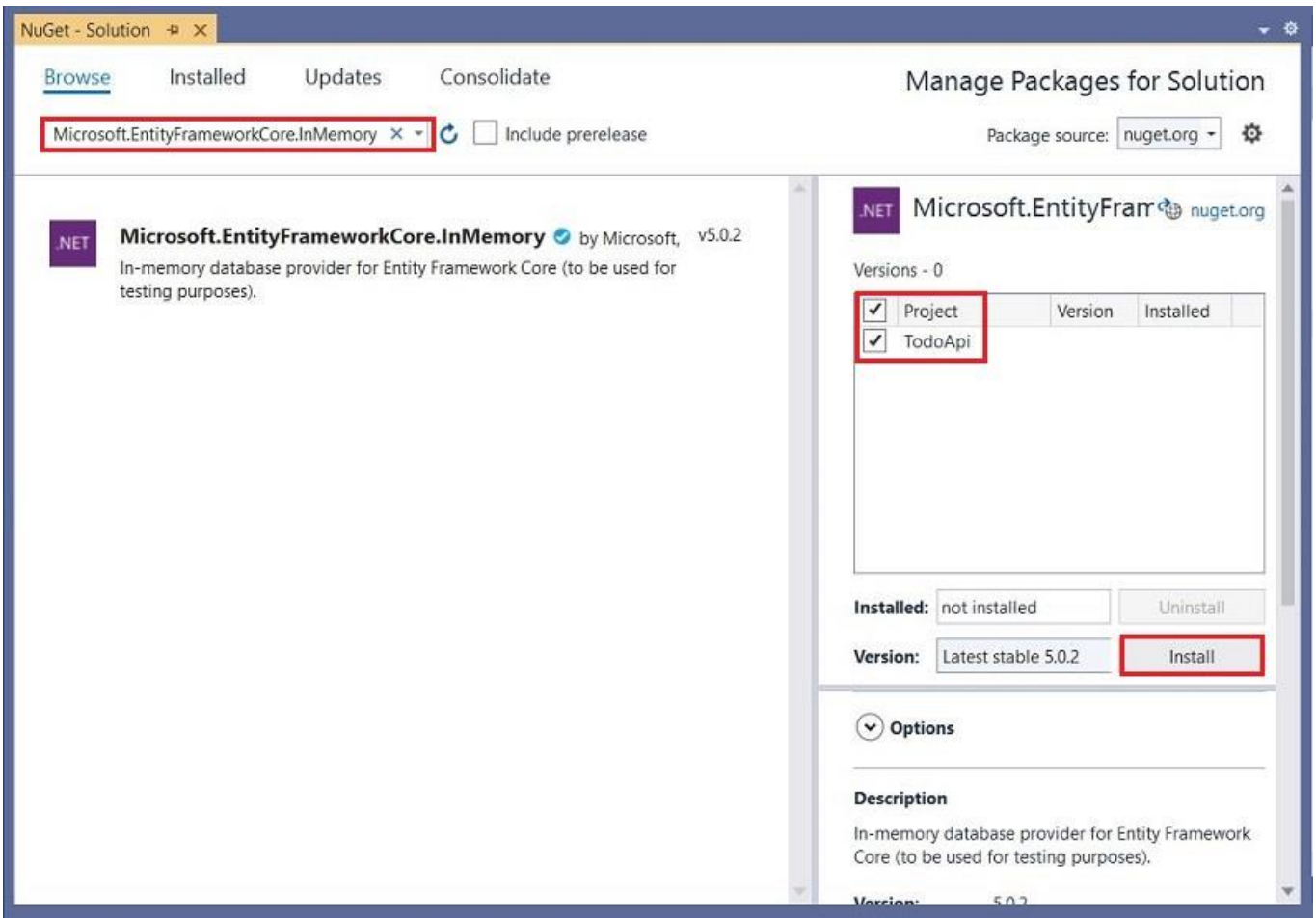
Model classes can go anywhere in the project, but the *Models* folder is used by convention.

## Add a database context

The *database context* is the main class that coordinates Entity Framework functionality for a data model. This class is created by deriving from the Microsoft.EntityFrameworkCore.DbContext class.

### Add NuGet packages

- From the **Tools** menu, select **NuGet Package Manager > Manage NuGet Packages for Solution**.
- Select the **Browse** tab, and then enter `Microsoft.EntityFrameworkCore.InMemory` in the search box.
- Select `Microsoft.EntityFrameworkCore.InMemory` in the left pane.
- Select the **Project** check box in the right pane and then select **Install**.




## Add the TodoContext database context

- Right-click the *Models* folder and select **Add** > **Class**. Name the class *TodoContext* and click **Add**.

- Enter the following code:

```
using Microsoft.EntityFrameworkCore;

namespace TodoApi.Models
{
    public class TodoContext : DbContext
    {
        public TodoContext(DbContextOptions<TodoContext> options)
            : base(options)
        {
        }

        public DbSet<TodoItem> TodoItems { get; set; }
    }
}
```

## Register the database context

In ASP.NET Core, services such as the DB context must be registered with the [dependency injection (DI)]() container. The container provides the service to controllers.

Update *Startup.cs* with the following code:

```
// Unused usings removed
using Microsoft.AspNetCore.Builder;
using Microsoft.AspNetCore.Hosting;
using Microsoft.Extensions.Configuration;
using Microsoft.Extensions.DependencyInjection;
using Microsoft.Extensions.Hosting;
using Microsoft.EntityFrameworkCore;
using TodoApi.Models;

namespace TodoApi
{
    public class Startup
    {
        public Startup(IConfiguration configuration)
        {
            Configuration = configuration;
        }

        public IConfiguration Configuration { get; }

        public void ConfigureServices(IServiceCollection services)
        {
            services.AddDbContext<TodoContext>(opt =>
                                                opt.UseInMemoryDatabase("TodoList"));
            services.AddControllers();
```

```
        }

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

            app.UseHttpsRedirection();
            app.UseRouting();

            app.UseAuthorization();

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

The preceding code:

- Removes the Swagger calls.
- Removes unused `using` declarations.
- Adds the database context to the DI container.
- Specifies that the database context will use an in-memory database.

# Scaffold a controller

- Right-click the *Controllers* folder.
- Select **Add** > **New Scaffolded Item**.
- Select **API Controller with actions, using Entity Framework**, and then select **Add**.
- In the **Add API Controller with actions, using Entity Framework** dialog:
  - Select **TodoItem (TodoApi.Models)** in the **Model class**.
  - Select **TodoContext (TodoApi.Models)** in the **Data context class**.
  - Select **Add**.

The generated code:

- Marks the class with the [ApiController] attribute. This attribute indicates that the controller responds to web API requests.
- Uses DI to inject the database context (`TodoContext`) into the controller. The database context is used in each of the CRUD methods in the controller.

The ASP.NET Core templates for:

- Controllers with views include `[action]` in the route template.
- API controllers don't include `[action]` in the route template.

When the `[action]` token isn't in the route template, the action name is excluded from the route. That is, the action's associated method name isn't used in the matching route.

## Update the PostTodoItem create method

Update the return statement in the `PostTodoItem` to use the nameof operator:

```
// POST: api/TodoItems
[HttpPost]
public async Task<ActionResult<TodoItem>> PostTodoItem(TodoItem todoItem)
{
    _context.TodoItems.Add(todoItem);
    await _context.SaveChangesAsync();

    //return CreatedAtAction("GetTodoItem", new { id = todoItem.Id }, todoItem);
    return CreatedAtAction(nameof(GetTodoItem), new { id = todoItem.Id }, todoItem);
}
```

The preceding code is an HTTP POST method, as indicated by the [HttpPost] attribute. The method gets the value of the to-do item from the body of the HTTP request.

The CreatedAtAction method:

- Returns an HTTP 201 status code if successful. HTTP 201 is the standard response for an HTTP POST method that creates a new resource on the server.
- Adds a Location header to the response. The `Location` header specifies the URI of the newly created to-do item. For more information, see 10.2.2 201 Created.
- References the `GetTodoItem` action to create the `Location` header's URI. The C# `nameof` keyword is used to avoid hard-coding the action name in the `CreatedAtAction` call.

## Install Postman

This tutorial uses Postman to test the web API.

- Install Postman
- Start the web app.
- Start Postman.
- Disable **SSL certificate verification**
  - From **File** > **Settings** (**General** tab), disable **SSL certificate verification**.

    **Warning**

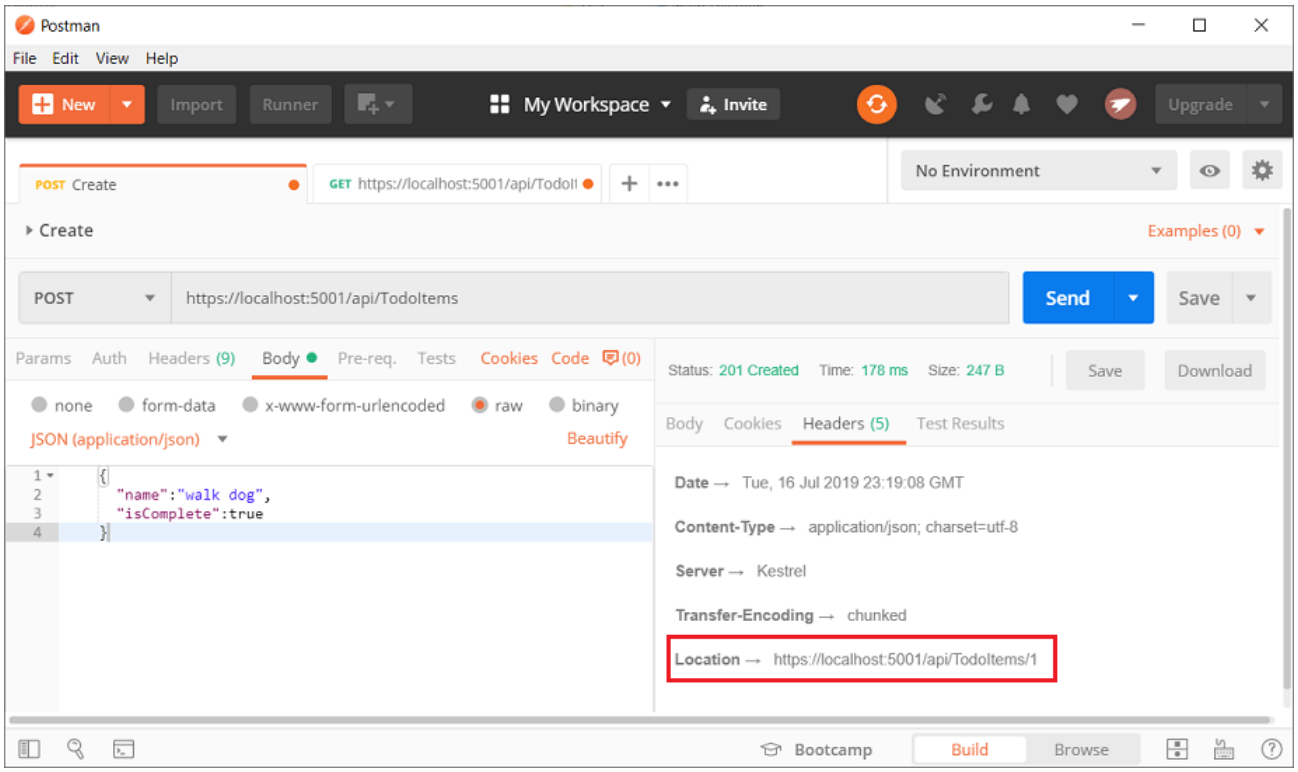
    Re-enable SSL certificate verification after testing the controller.

## Test PostTodoItem with Postman

- Create a new request.
- Set the HTTP method to `POST`.
- Set the URI to `https://localhost:<port>/api/TodoItems`. For example, `https://localhost:5001/api/TodoItems`.
- Select the **Body** tab.
- Select the **raw** radio button.
- Set the type to **JSON (application/json)**.
- In the request body enter JSON for a to-do item:

```
{
  "name":"walk dog",
  "isComplete":true
}
```

- Select **Send**.

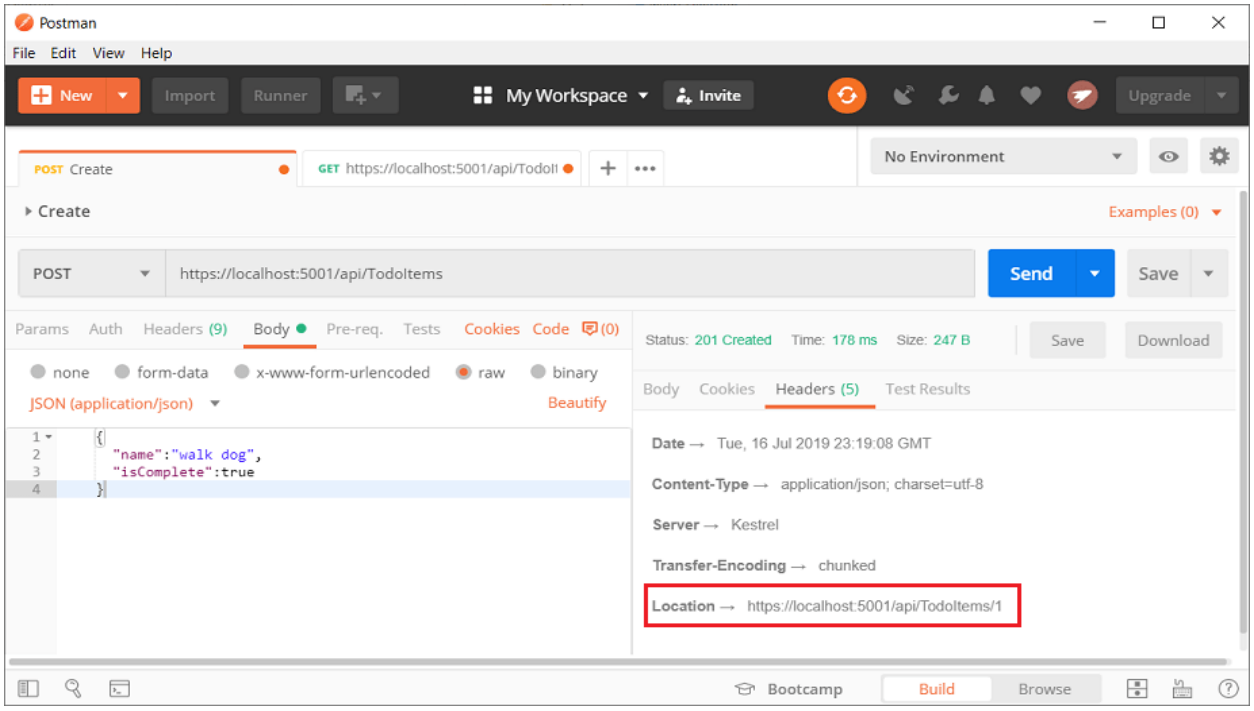



## Test the location header URI

The location header URI can be tested in the browser. Copy and paste the location header URI into the browser.

To test in Postman:

- Select the **Headers** tab in the **Response** pane.
- Copy the **Location** header value:




- Set the HTTP method to `GET`.
- Set the URI to `https://localhost:<port>/api/TodoItems/1`. For example, `https://localhost:5001/api/TodoItems/1`.
- Select **Send**.

# Examine the GET methods

Two GET endpoints are implemented:

- `GET /api/TodoItems`
- `GET /api/TodoItems/{id}`

Test the app by calling the two endpoints from a browser or Postman. For example:

- `https://localhost:5001/api/TodoItems`
- `https://localhost:5001/api/TodoItems/1`

A response similar to the following is produced by the call to `GetTodoItems`:

```
[
  {
    "id": 1,
    "name": "Item1",
    "isComplete": false
  }
]
```

### Test Get with Postman

- Create a new request.
- Set the HTTP method to **GET**.
- Set the request URI to `https://localhost:<port>/api/TodoItems`. For example, `https://localhost:5001/api/TodoItems`.
- Set **Two pane view** in Postman.
- Select **Send**.

This app uses an in-memory database. If the app is stopped and started, the preceding GET request will not return any data. If no data is returned, POST data to the app.

## Routing and URL paths

The [HttpGet] attribute denotes a method that responds to an HTTP GET request. The URL path for each method is constructed as follows:

- Start with the template string in the controller's `Route` attribute:

```
 [Route("api/[controller]")]
[ApiController]
public class TodoItemsController : ControllerBase
{
    private readonly TodoContext _context;

    public TodoItemsController(TodoContext context)
    {
        _context = context;
    }
```

- Replace `[controller]` with the name of the controller, which by convention is the controller class name minus the "Controller" suffix. For this sample, the controller class name is **TodoItems**Controller, so the controller name is "TodoItems". ASP.NET Core routing is case insensitive.
- If the `[HttpGet]` attribute has a route template (for example, `[HttpGet("products")]`), append that to the path.

In the following `GetTodoItem` method, `"{id}"` is a placeholder variable for the unique identifier of the to-do item. When `GetTodoItem` is invoked, the value of `"{id}"` in the URL is provided to the method in its `id` parameter.

```
// GET: api/TodoItems/5
[HttpGet("{id}")]
public async Task<ActionResult<TodoItem>> GetTodoItem(long id)
```

```
{
    var todoItem = await _context.TodoItems.FindAsync(id);

    if (todoItem == null)
    {
        return NotFound();
    }

    return todoItem;
}
```

## Return values

The return type of the `GetTodoItems` and `GetTodoItem` methods is ActionResult<T> type. ASP.NET Core automatically serializes the object to JSON and writes the JSON into the body of the response message. The response code for this return type is 200 OK, assuming there are no unhandled exceptions. Unhandled exceptions are translated into 5xx errors.

`ActionResult` return types can represent a wide range of HTTP status codes. For example, `GetTodoItem` can return two different status values:

- If no item matches the requested ID, the method returns a 404 status NotFound error code.
- Otherwise, the method returns 200 with a JSON response body. Returning `item` results in an HTTP 200 response.

## The PutTodoItem method

Examine the `PutTodoItem` method:

```
// PUT: api/TodoItems/5
[HttpPut("{id}")]
public async Task<IActionResult> PutTodoItem(long id, TodoItem todoItem)
{
    if (id != todoItem.Id)
    {
        return BadRequest();
    }

    _context.Entry(todoItem).State = EntityState.Modified;

    try
    {
        await _context.SaveChangesAsync();
    }
    catch (DbUpdateConcurrencyException)
```

```
    {
        if (!TodoItemExists(id))
        {
            return NotFound();
        }
        else
        {
            throw;
        }
    }

    return NoContent();
}
```

`PutTodoItem` is similar to `PostTodoItem`, except it uses HTTP PUT. The response is 204 (No Content). According to the HTTP specification, a PUT request requires the client to send the entire updated entity, not just the changes. To support partial updates, use HTTP PATCH.

If you get an error calling `PutTodoItem`, call `GET` to ensure there's an item in the database.

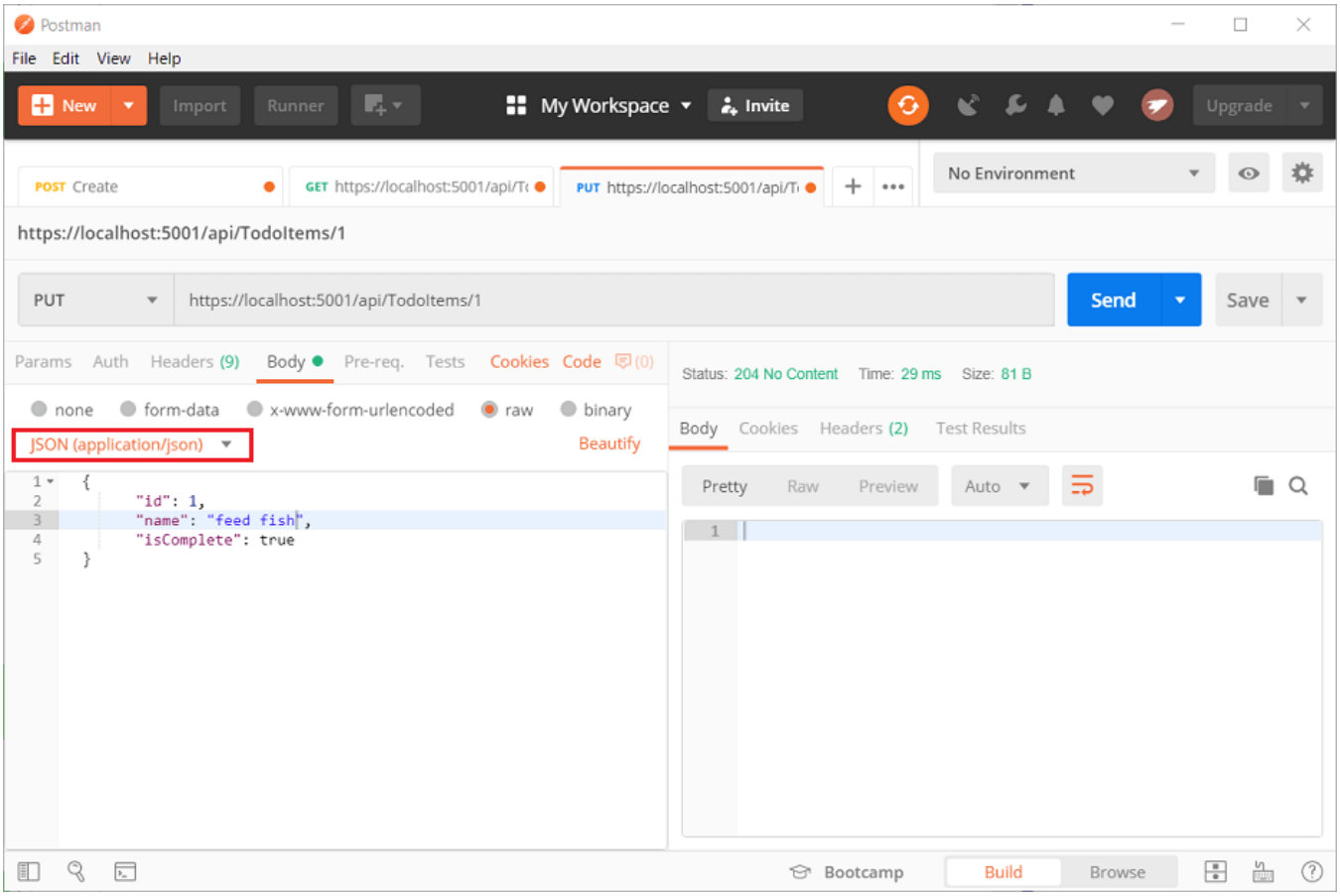
## Test the PutTodoItem method

This sample uses an in-memory database that must be initialized each time the app is started. There must be an item in the database before you make a PUT call. Call GET to ensure there's an item in the database before making a PUT call.

Update the to-do item that has Id = 1 and set its name to `"feed fish"`:

```
  {
    "Id":1,
    "name":"feed fish",
    "isComplete":true
  }
```

The following image shows the Postman update:




# The DeleteTodoItem method

Examine the `DeleteTodoItem` method:

```
// DELETE: api/TodoItems/5
[HttpDelete("{id}")]
public async Task<IActionResult> DeleteTodoItem(long id)
{
    var todoItem = await _context.TodoItems.FindAsync(id);
    if (todoItem == null)
    {
        return NotFound();
    }

    _context.TodoItems.Remove(todoItem);
    await _context.SaveChangesAsync();

    return NoContent();
}
```

## Test the DeleteTodoItem method

Use Postman to delete a to-do item:

- Set the method to `DELETE`.
- Set the URI of the object to delete (for example `https://localhost:5001/api/TodoItems/1`).
- Select **Send**.