Unit Testing

Unit Testing A Business Layer Method

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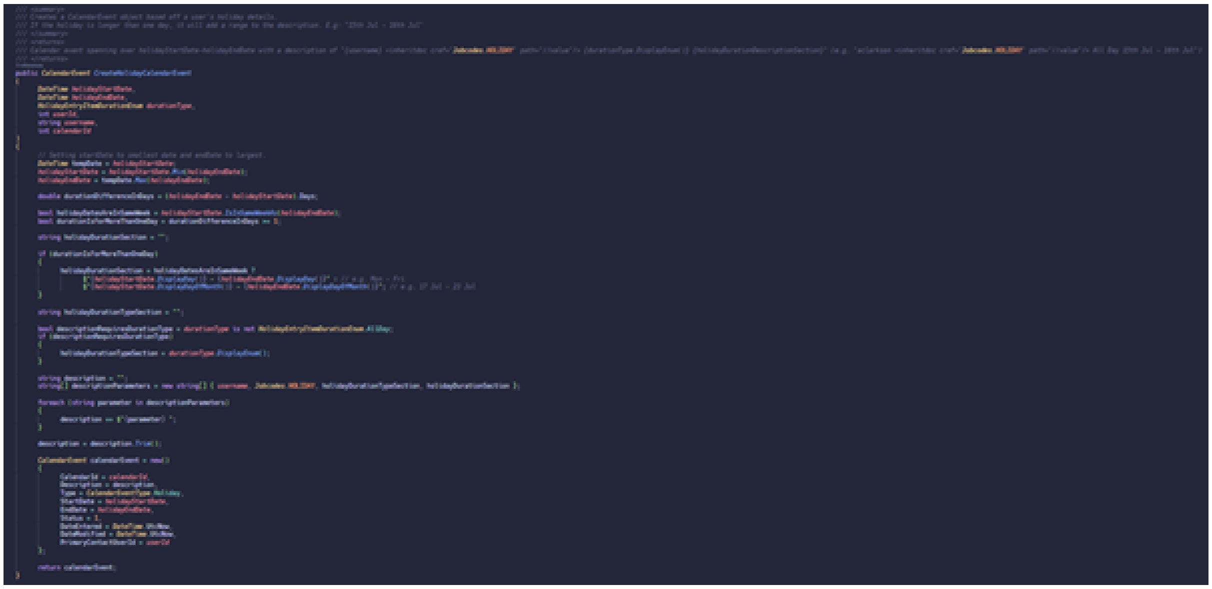
The holiday management system on the intranet allows users to book a range of dates which they want to take holiday for. I was assigned the task of adding some quality-of-life features to this such as: better UI/UX, the ability to book off mornings/afternoons, and updating the text shown on our calendar module.

The final feature had the following spec:

- If the range of dates was only for 1 day, the text should just be: “{username} HOL}”
- If the range of dates spanned multiple days within the same week, the text should be for example: “{username} HOL Mon - Wed”.

- If the range of dates has been set to morning/afternoon, the text should be: “{username} HOL AM”
  - If the range spanned across weeks the text should be: “{username} HOL 15 Jul - 22 Jul”

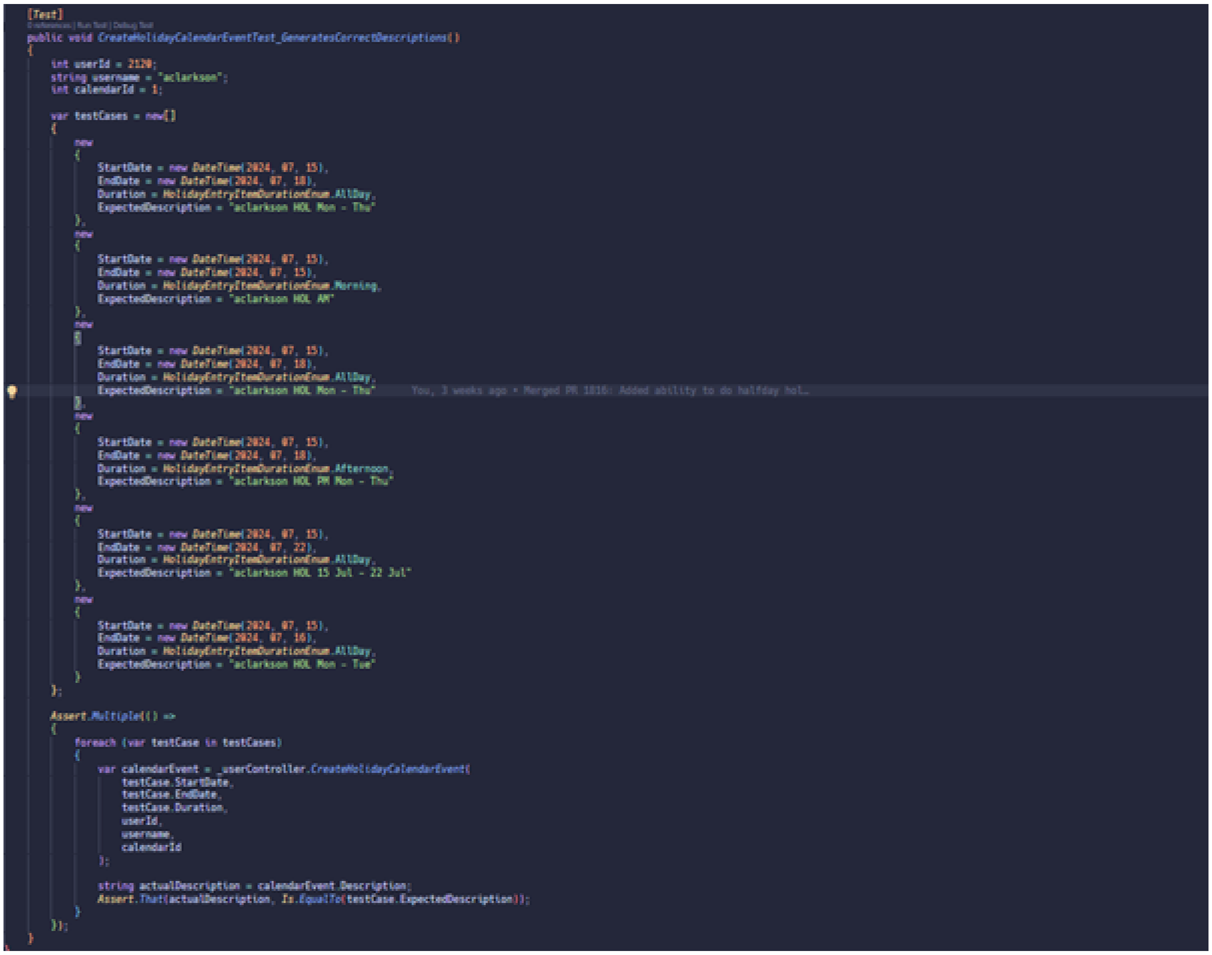
After reading this spec I came up with this method:



```
/// <summary>
/// Creates a CalendarEvent object based off a user's holiday details.
/// If the holiday is longer than one day, it will add a range to the description. E.g: "15th Jul - 18th Jul"
/// </summary>
/// <returns>
/// Calendar event spanning over holidayStartDate-holidayEndDate with a description of '{username} <inheritdoc cref="Jobcodes.HOLIDAY" path="//value"/> {durationType.DisplayEnum()} {holidayDurationDescriptionSection}' (e.g. 'aclarkson <inheritdoc cref="Jobcodes.HOLIDAY" path="//value"/> All Day 15th Jul - 18th Jul')
/// </returns>
public CalendarEvent CreateHolidayCalendarEvent
(
    DateTime holidayStartDate,
    DateTime holidayEndDate,
    HolidayEntryItemDurationEnum durationType,
    int userId,
    string username,
    int calendarId
)
{
    // Setting startDate to smallest date and endDate to largest.
    DateTime tempDate = holidayStartDate;
    holidayStartDate = holidayStartDate.Min(holidayEndDate);
    holidayEndDate = tempDate.Max(holidayEndDate);

    double durationDifferenceInDays = (holidayEndDate - holidayStartDate).Days;

    bool holidayDatesAreInSameWeek = holidayStartDate.IsInSameWeekAs(holidayEndDate);
    bool durationIsForMoreThanOneDay = durationDifferenceInDays >= 1;

    string holidayDurationSection = "";

    if (durationIsForMoreThanOneDay)
    {
        holidayDurationSection = holidayDatesAreInSameWeek ?
            $"{holidayStartDate.DisplayDay()} - {holidayEndDate.DisplayDay()}" : // e.g. Mon - Fri
            $"{holidayStartDate.DisplayDayOfMonth()} - {holidayEndDate.DisplayDayOfMonth()}"; // e.g. 15 Jul - 22 Jul
    }

    string holidayDurationTypeSection = "";

    bool descriptionRequiresDurationType = durationType is not HolidayEntryItemDurationEnum.AllDay;
    if (descriptionRequiresDurationType)
    {
        holidayDurationTypeSection = durationType.DisplayEnum();
    }

    string description = "";
    string[] descriptionParameters = new string[] { username, Jobcodes.HOLIDAY, holidayDurationTypeSection, holidayDurationSection };

    foreach (string parameter in descriptionParameters)
    {
        description += $"{parameter} ";
    }

    description = description.Trim();

    CalendarEvent calendarEvent = new()
    {
        CalendarId = calendarId,
        Description = description,
        Type = CalendarEventType.Holiday,
        StartDate = holidayStartDate,
        EndDate = holidayEndDate,
        Status = 1,
        DateEntered = DateTime.UtcNow,
        DateModified = DateTime.UtcNow,
        PrimaryContactUserId = userId
    };

    return calendarEvent;
}
```

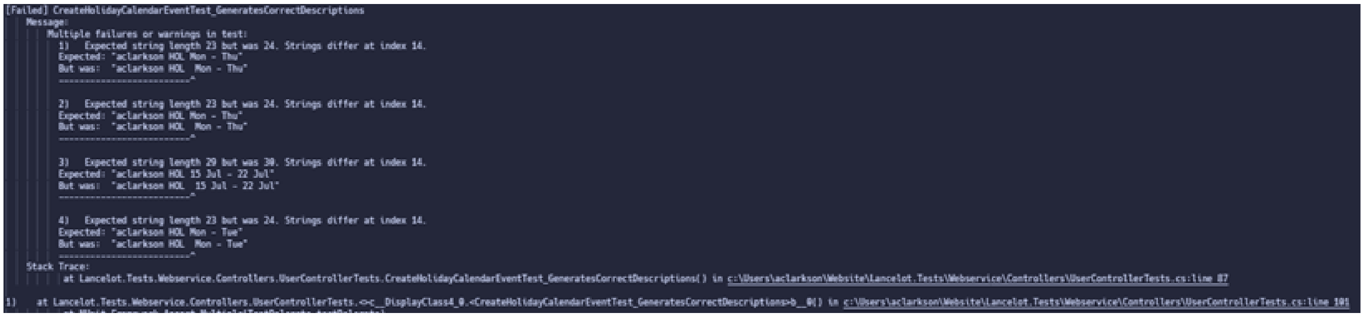
With there being many permutations with this method, I decided to unit test it.

Using C#’s NUnit testing framework I came up with the following test data:



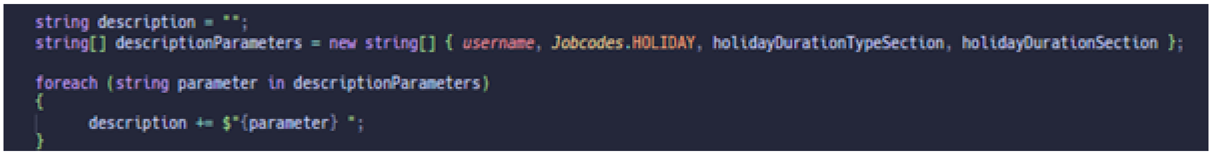
```
[Test]
0 references | Run Test | Debug Test
public void CreateHolidayCalendarEventTest_GeneratesCorrectDescriptions()
{
    int userId = 2120;
    string username = "aclarkson";
    int calendarId = 1;

    var testCases = new[]
    {
        new
        {
            StartDate = new DateTime(2024, 07, 15),
            EndDate = new DateTime(2024, 07, 18),
            Duration = HolidayEntryItemDurationEnum.AllDay,
            ExpectedDescription = "aclarkson HOL Mon - Thu"
        },
        new
        {
            StartDate = new DateTime(2024, 07, 15),
            EndDate = new DateTime(2024, 07, 15),
            Duration = HolidayEntryItemDurationEnum.Morning,
            ExpectedDescription = "aclarkson HOL AM"
        },
        new
        {
            StartDate = new DateTime(2024, 07, 15),
            EndDate = new DateTime(2024, 07, 18),
            Duration = HolidayEntryItemDurationEnum.AllDay,
            ExpectedDescription = "aclarkson HOL Mon - Thu"      You, 3 weeks ago • Merged PR 1816: Added ability to do halfday hol…
        },
        new
        {
            StartDate = new DateTime(2024, 07, 15),
            EndDate = new DateTime(2024, 07, 18),
            Duration = HolidayEntryItemDurationEnum.Afternoon,
            ExpectedDescription = "aclarkson HOL PM Mon - Thu"
        },
        new
        {
            StartDate = new DateTime(2024, 07, 15),
            EndDate = new DateTime(2024, 07, 22),
            Duration = HolidayEntryItemDurationEnum.AllDay,
            ExpectedDescription = "aclarkson HOL 15 Jul - 22 Jul"
        },
        new
        {
            StartDate = new DateTime(2024, 07, 15),
            EndDate = new DateTime(2024, 07, 16),
            Duration = HolidayEntryItemDurationEnum.AllDay,
            ExpectedDescription = "aclarkson HOL Mon - Tue"
        }
    };

    Assert.Multiple(() =>
    {
        foreach (var testCase in testCases)
        {
            var calendarEvent = _userController.CreateHolidayCalendarEvent(
                testCase.StartDate,
                testCase.EndDate,
                testCase.Duration,
                userId,
                username,
                calendarId
            );

            string actualDescription = calendarEvent.Description;
            Assert.That(actualDescription, Is.EqualTo(testCase.ExpectedDescription));
        }
    });
}
```

After running the test, I get failure on the following cases:



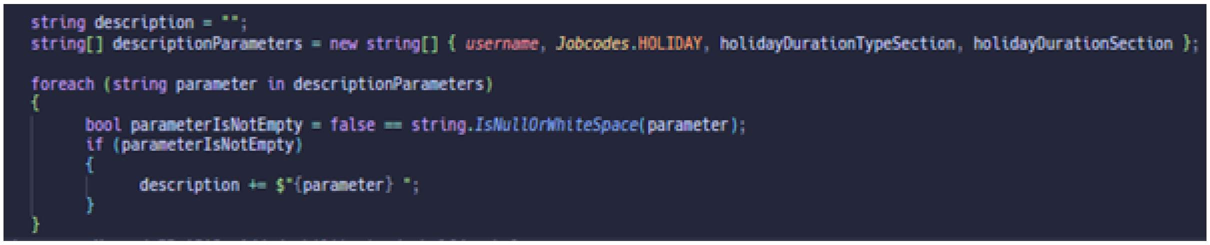
```
[Failed] CreateHolidayCalendarEventTest_GeneratesCorrectDescriptions
    Message:
        Multiple failures or warnings in test:
          1)   Expected string length 23 but was 24. Strings differ at index 14.
          Expected: "aclarkson HOL Mon - Thu"
          But was:  "aclarkson HOL  Mon - Thu"
          -------------------------^

          2)   Expected string length 23 but was 24. Strings differ at index 14.
          Expected: "aclarkson HOL Mon - Thu"
          But was:  "aclarkson HOL  Mon - Thu"
          -------------------------^

          3)   Expected string length 29 but was 30. Strings differ at index 14.
          Expected: "aclarkson HOL 15 Jul - 22 Jul"
          But was:  "aclarkson HOL  15 Jul - 22 Jul"
          -------------------------^

          4)   Expected string length 23 but was 24. Strings differ at index 14.
          Expected: "aclarkson HOL Mon - Tue"
          But was:  "aclarkson HOL  Mon - Tue"
          -------------------------^
    Stack Trace:
           at Lancelot.Tests.Webservice.Controllers.UserControllerTests.CreateHolidayCalendarEventTest_GeneratesCorrectDescriptions() in c:\Users\aclarkson\Website\Lancelot.Tests\Webservice\Controllers\UserControllerTests.cs:line 87

1)    at Lancelot.Tests.Webservice.Controllers.UserControllerTests.<>c__DisplayClass4_0.<CreateHolidayCalendarEventTest_GeneratesCorrectDescriptions>b__0() in c:\Users\aclarkson\Website\Lancelot.Tests\Webservice\Controllers\UserControllerTests.cs:line 101
```

It looked like it was trying to add null/empty parameters to the description text, adding a random space to the string, due to this code:



```
string description = "";
string[] descriptionParameters = new string[] { username, Jobcodes.HOLIDAY, holidayDurationTypeSection, holidayDurationSection };

foreach (string parameter in descriptionParameters)
{
    description += $"{parameter} ";
}
```

I decided to add the following null check:



```
string description = "";
string[] descriptionParameters = new string[] { username, Jobcodes.HOLIDAY, holidayDurationTypeSection, holidayDurationSection };

foreach (string parameter in descriptionParameters)
{
    bool parameterIsNotEmpty = false == string.IsNullOrWhiteSpace(parameter);
    if (parameterIsNotEmpty)
    {
        description += $"{parameter} ";
    }
}
```

After running the test again, it managed to pass all cases.