*Describe difficulties, if any, that may have blocked your progress.*

*For bonus points, test or describe your approach to running the tests in parallel and more than one browser, i.e. Chrome, Safari and Firefox.*

My first issue was selecting which testing frameworks I was going to use. I love c# so I started there and found that selenium web driver was quite popular and had a c# version.

After a bit of research I found that Protractor was actually something built to help with selenium in regards to angular apps so I used that.

My third issue was deciding how I was going to setup my tests and Nunit for c# was what I found to be a crowd favorite.

(You need to install the Nunit visual studio extension to run my tests from the test explorer in visual studio)

I got to work and quickly found that one of the bigger issues when doing this kind of testing was making sure the browser was in a state to do the tests and wasn’t currently loading or being blocked in a way a real user would know to wait for.

WebDriverWait class was what I found to be the solution.

It was smooth sailing again until it came time to start doing tests on other browsers

Currently Firefox’s geckodriver doesn't support the command moveto causing exceptions on the methods EditToDo and DeleteToDo when I called MoveToElement().

I found also that while using edge the element.Click() function was very unreliable even when using WebDriverWait.Until(ExpectedConditions.ElementToBeClickable(element)));

I put waits in my code where edge would fail the most and noticed an improvement but not a total resolution

Truthfully I never fully solved this issue but I found that Thread.Sleep helped. Often tests that failed in edge when I clicked the run all function in the test explorer in visual studio, would work fine when run in isolation.

Another issue that seemed to only cause issues in edge was the local storage not being cleared by default

The solution to this came with the line ngDriver.ExecuteScript("localStorage.clear();");

Despite these issues in Edge and Firefox, Chrome seemed to work flawlessly even before I added the extra wait called in my code

My final issue came in that Nunit at this time doesn't fully support parallel testing on the individual method level but only on a class level I set it up so the three browsers would perform there tests simultaneously although I understand this won’t fully take advantage of any CPU's with more than three cores. If I was to do this project again I would use something other than Nunit although it seems that running parallel on the method level is something on the agenda for Nunit.

Thanks for your time,

-Danny Moughabghab