

MICHIGAN STATE

U N I V E R S I T Y

Beta Presentation

Test Driven Development for Embedded Software

The Capstone Experience

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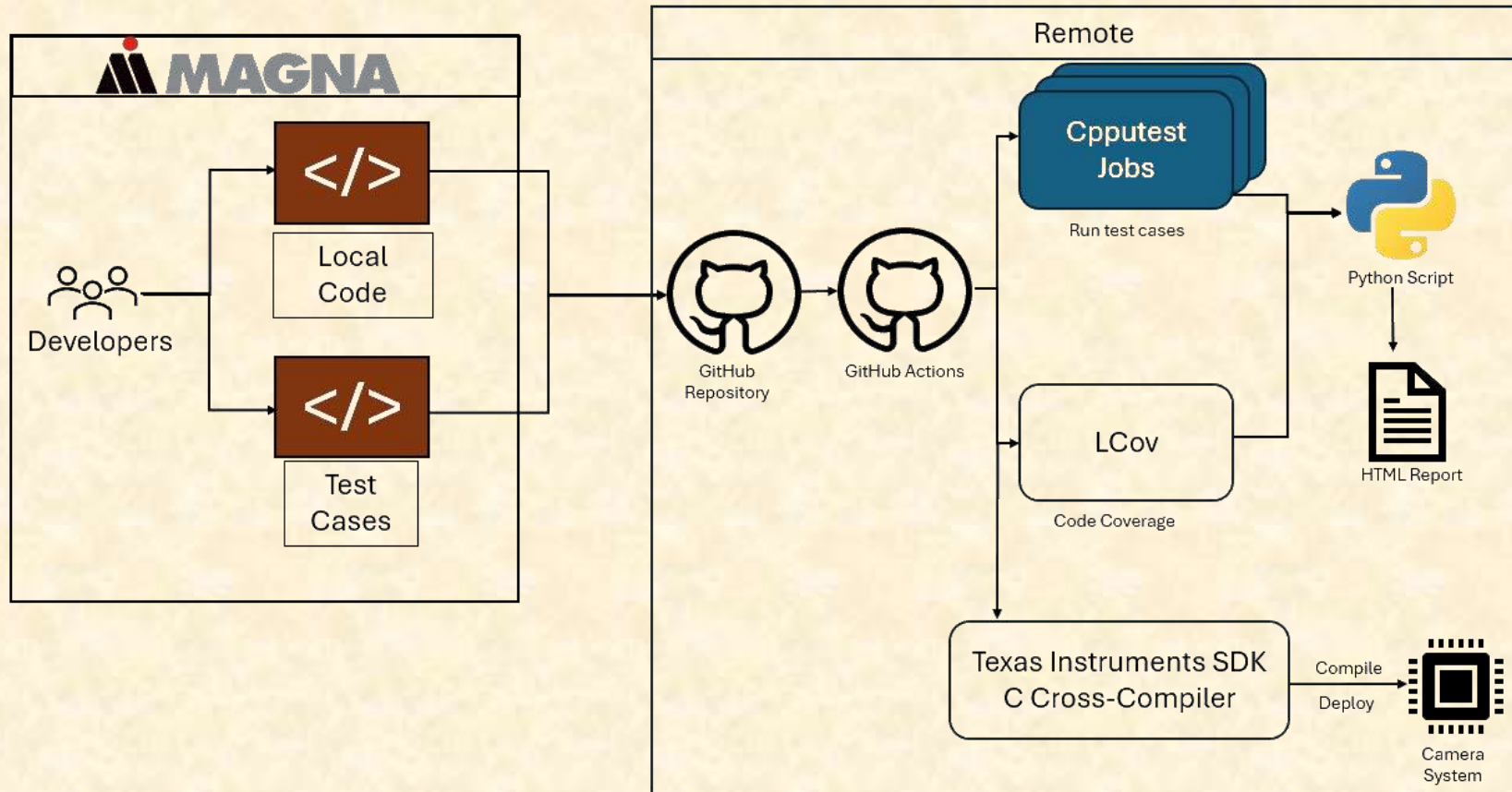
*From Students...
...to Professionals*

Project Overview

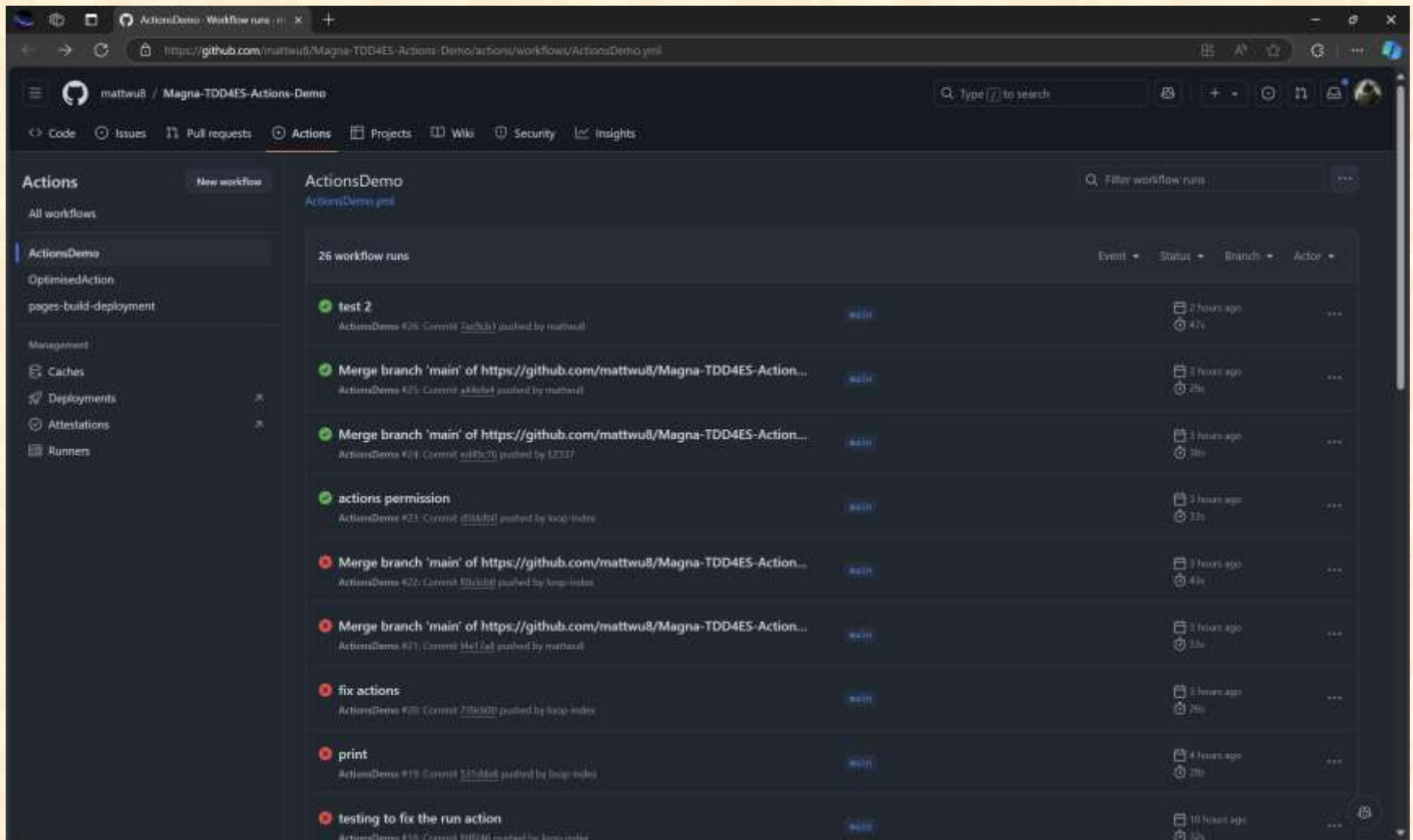
- Magna is one of the largest automotive suppliers.
- Problem: Engineers are working with large, untested code bases
- Provide test cases for embedded software code
- Create a continuous integration pipeline to run test cases



System Architecture



GitHub Actions – Build Workflow



The screenshot displays the GitHub Actions interface for a repository named 'Magna-TDD4ES-Actions-Demo'. The left sidebar shows the 'Actions' tab with a list of workflows: 'ActionsDemo', 'OptimisedAction', and 'pages-build-deployment'. The main area shows the 'ActionsDemo' workflow with 26 workflow runs. The runs are listed in a table with columns for status, name, actor, and time ago. The runs are as follows:

Status	Name	Actor	Time Ago
Success	test 2	matthew	2 hours ago
Success	Merge branch 'main' of https://github.com/mattwu8/Magna-TDD4ES-Action...	matthew	3 hours ago
Success	Merge branch 'main' of https://github.com/mattwu8/Magna-TDD4ES-Action...	matthew	3 hours ago
Success	actions permission	loop-index	3 hours ago
Failure	Merge branch 'main' of https://github.com/mattwu8/Magna-TDD4ES-Action...	loop-index	3 hours ago
Failure	Merge branch 'main' of https://github.com/mattwu8/Magna-TDD4ES-Action...	matthew	3 hours ago
Failure	fix actions	loop-index	3 hours ago
Failure	print	loop-index	4 hours ago
Failure	testing to fix the run action	loop-index	10 hours ago



Parallel Jobs - Independent Test Cases

The image displays two side-by-side screenshots of GitHub Actions workflow runs. The left screenshot shows the 'OptimisedAction' workflow with 17 workflow runs. The right screenshot shows the 'ActionsDemo' workflow with 26 workflow runs. Both screenshots show a list of workflow runs with columns for Event, Status, Branch, Actor, and duration. The 'test 2' job in both workflows is highlighted, showing its status and duration.

Workflow	Job Name	Status	Branch	Actor	Duration
OptimisedAction	test 2	Failed	main	matthew8	2 hours ago
OptimisedAction	Merge branch 'main' of https://github.com/matthew8/Magna-TDD4ES-Actions-Demo	Failed	main	matthew8	2 hours ago
OptimisedAction	Merge branch 'main' of https://github.com/matthew8/Magna-TDD4ES-Actions-Demo	Failed	main	EZ337	3 hours ago
OptimisedAction	actions permission	Failed	main	loop-index	3 hours ago
OptimisedAction	Merge branch 'main' of https://github.com/matthew8/Magna-TDD4ES-Actions-Demo	Failed	main	loop-index	3 hours ago
OptimisedAction	Merge branch 'main' of https://github.com/matthew8/Magna-TDD4ES-Actions-Demo	Failed	main	matthew8	3 hours ago
OptimisedAction	fix actions	Failed	main	matthew8	3 hours ago
ActionsDemo	test 2	Passed	main	matthew8	2 hours ago
ActionsDemo	Merge branch 'main' of https://github.com/matthew8/Magna-TDD4ES-Actions-Demo	Passed	main	matthew8	2 hours ago
ActionsDemo	Merge branch 'main' of https://github.com/matthew8/Magna-TDD4ES-Actions-Demo	Passed	main	EZ337	3 hours ago
ActionsDemo	actions permission	Passed	main	loop-index	3 hours ago
ActionsDemo	Merge branch 'main' of https://github.com/matthew8/Magna-TDD4ES-Actions-Demo	Failed	main	loop-index	3 hours ago
ActionsDemo	Merge branch 'main' of https://github.com/matthew8/Magna-TDD4ES-Actions-Demo	Failed	main	matthew8	3 hours ago
ActionsDemo	fix actions	Failed	main	matthew8	3 hours ago



Generated Test Report

MAGNA
Testing Reports

Test results

Expand all [View Coverage](#)

cpputest_TDD4ES.Demo_app_create_aewb_test.xml (3/3)

Test Name	Time	Status
applssGetDCCBuff2ANotSuccess	0.001s	PASS
dcc_buff_size_Equal0	0.001s	PASS
FailureAtvxMapUserDataObject	0.000s	PASS

cpputest_TDD4ES.Demo_app_send_test_frame.xml (2/2)

cpputest_TDD4ES.Demo_fail_demo.xml (1/3)

Test Name	Time	Status
Fail	0.000s	PASS

MemoryLeakTest:
AssertionFailedError: matthew_test.cpp:77: Memory leak(s) found.(newline)Alloc num (433) Leak size: 4
Allocated at: matthew_test.cpp and line: 79. Type: "malloc"(newline) Memory: <0x5568217fa750> Content:



LCOV – Code Coverage Report

LCOV - code coverage report

Current view: [top level - tests - matthew_test.cpp](#) (source / functions)

Test: **coverage.info**
Date: **2024-10-09 22:12:20**

	Hit	Total	Coverage
Lines:	176	183	96.2 %
Functions:	30	30	100.0 %

```
187     2 :         status = appIssGetDCCBuff2A(obj->sensor_name, sensor_wdr_mode, dcc_2a_buf, dcc_buff_size_driver);
188     2 :         if(status != VX_SUCCESS)
189     :         {
190     2 :             printf("Couldn't get 2A DCC buffer from sensor driver \n");
191     2 :             status = VX_SUCCESS;
192     :         }
193     :
194     : #ifdef __x86_64__
195     2 :         if(dcc_buff_size_fs > 0)
196     :         {
197     0 :             memcpy(dcc_2a_buf+dcc_buff_size_driver, obj->fs_dcc_buf_2a, dcc_buff_size_fs);
198     :         }
199     : #endif
200     :     }
201     4 :     vxUnmapUserDataObject(obj->dcc_param_2a, dcc_2a_buf_map_id);
202     :     }
203     : }
204     : else
205     : {
206     0 :     obj->dcc_param_2a = NULL;
207     : }
208     6 :     obj->ae_awb_result =
209     6 :         vxCreateUserDataObject(obj->context, "tivx_ae_awb_params_t",
210     :         sizeof(tivx_ae_awb_params_t), NULL);
211     6 :     if (vxGetStatus((vx_reference)obj->ae_awb_result) != VX_SUCCESS)
212     :     {
213     0 :         APP_PRINTF("obj->ae_awb_result) create failed\n");
214     0 :         return VX_FAILURE;
215     :     }
216     :
217     6 :     obj->node_aewb = tivxAewbNode(obj->graph,
218     :         obj->aewb_config,
```



What's left to do?

- Features
 - GitHub Actions integration for Multi-Cam codebase
- Stretch Goals
 - GitHub Status Badges
 - Additional GitHub Actions integration (pull request blocker, email notifications)
- Other Tasks
 - Technical documentation
 - Project Video



Questions?

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