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HUNGARIAN SOFTWARE TESTING FORUM

The Road to Full Automation: How We Implemented Continuous Delivery at Signal

Tomasz Klepacki

10/10/2024

The Signal Group

THE SIGNAL GROUP

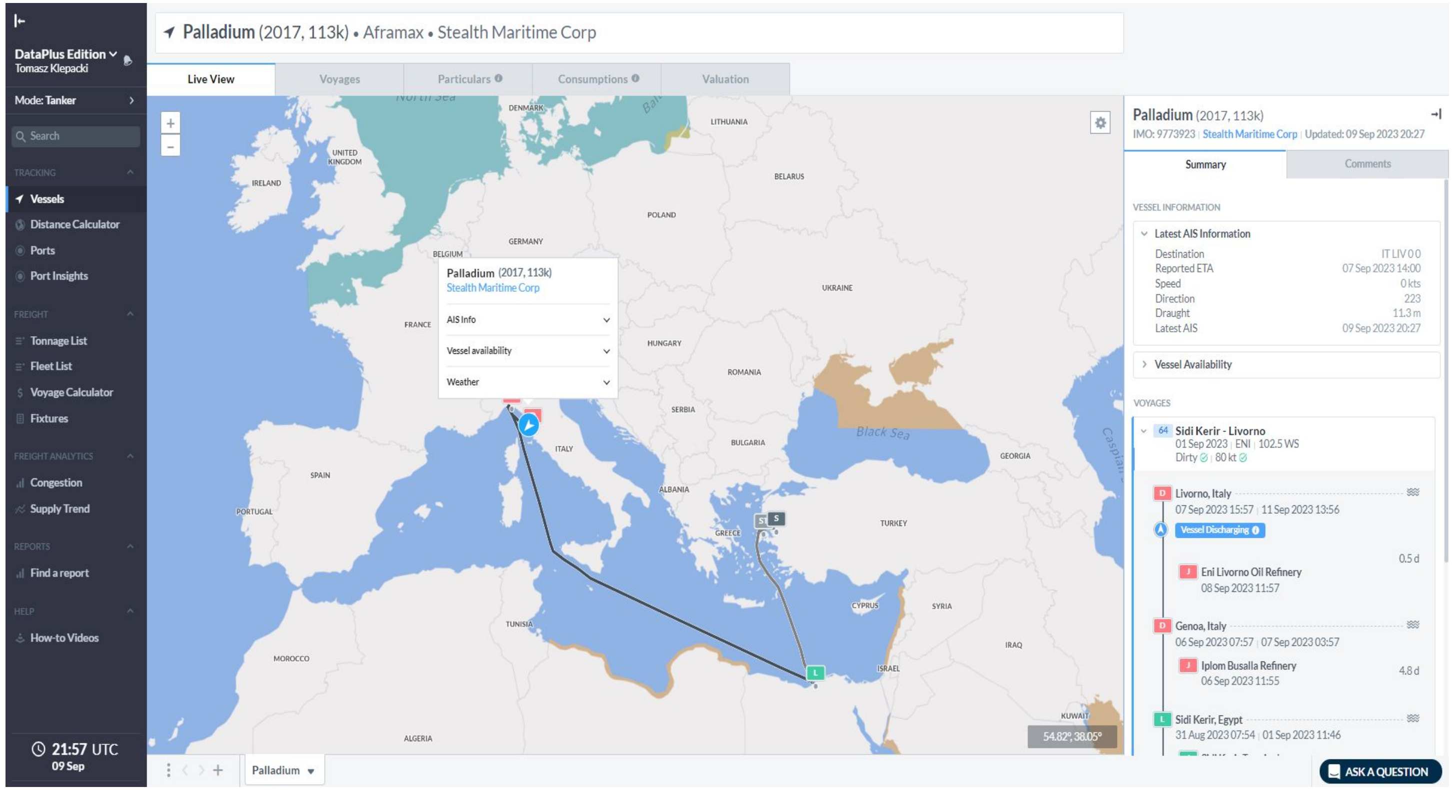
SIGNAL MARITIME

SIGNAL OCEAN

SIGNAL™ VENTURES

Signal Ocean Platform

- Fleet monitoring
- Freight market forecasting
- Shipping route optimization
- Data analysis
- Decision support



Palladium (2017, 113k) • Aframax • Stealth Maritime Corp

Palladium (2017, 113k)
Stealth Maritime Corp

Palladium (2017, 113k)
IMO: 9773923 | Stealth Maritime Corp | Updated: 09 Sep 2023 20:27

VESSEL INFORMATION

Latest AIS Information

Destination	IT LIV 0 0
Reported ETA	07 Sep 2023 14:00
Speed	0 kts
Direction	223
Draught	11.3 m
Latest AIS	09 Sep 2023 20:27

Vessel Availability

VOYAGES

64 Sidi Kerir - Livorno
01 Sep 2023 | ENI | 102.5 WS
Dirty ✓ | 80 kt ✓

D Livorno, Italy
07 Sep 2023 15:57 | 11 Sep 2023 13:56
Vessel Discharging

0.5 d
J Eni Livorno Oil Refinery
08 Sep 2023 11:57

D Genoa, Italy
06 Sep 2023 07:57 | 07 Sep 2023 03:57

J Iplom Busalla Refinery
06 Sep 2023 11:55
4.8 d

L Sidi Kerir, Egypt
31 Aug 2023 07:54 | 01 Sep 2023 11:46

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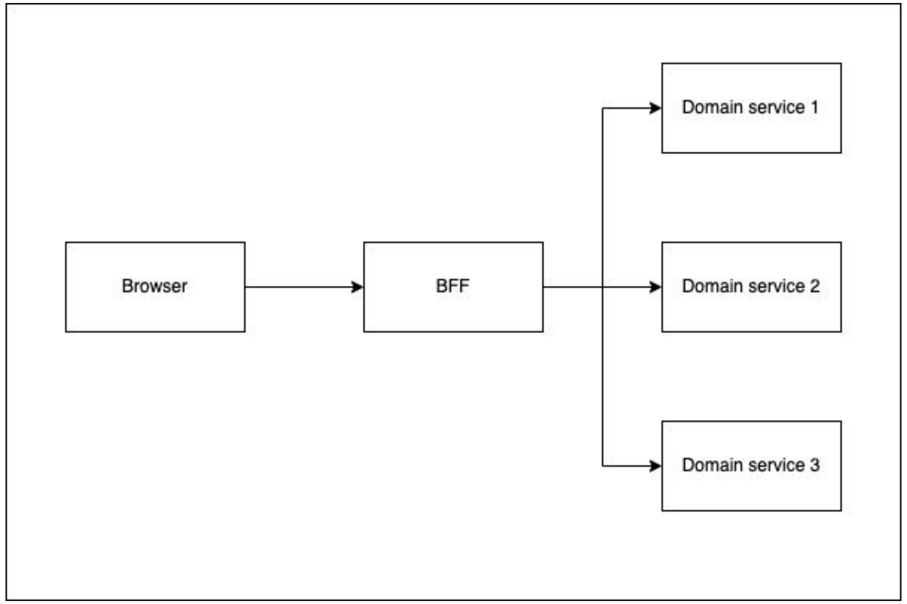
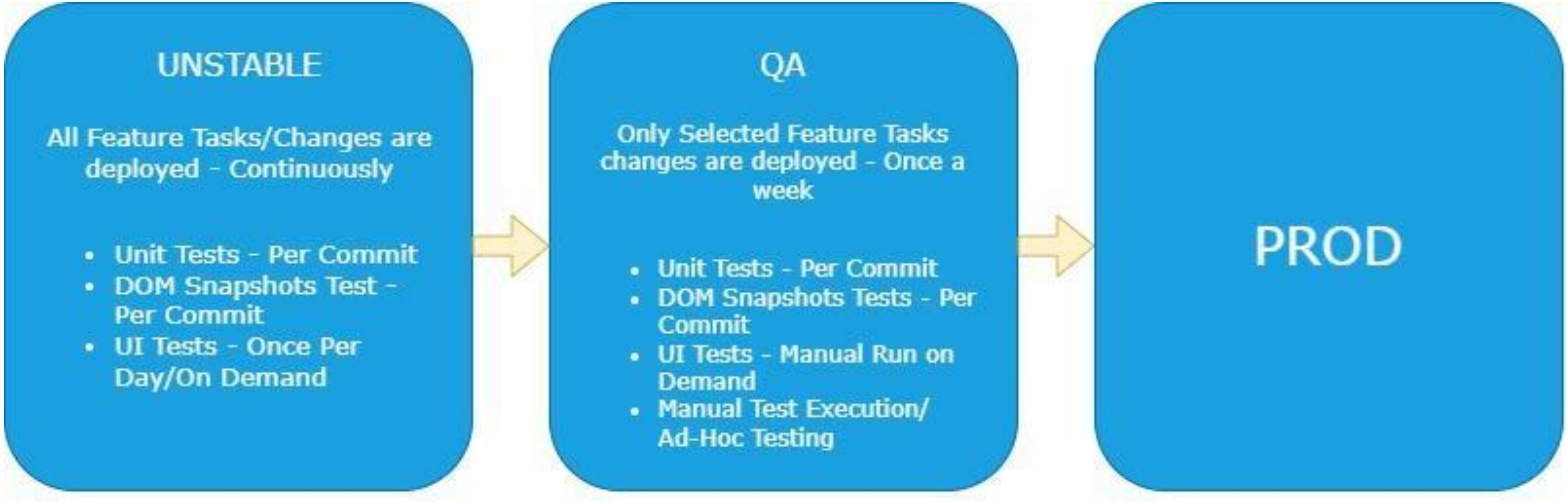
Signal Ocean Platform - Architecture

- Microservice architecture – **BFF – Backend for Frontend – .NET** or **Python** based API
- Frontend - **ReactJS**
- The entire infrastructure, both production and development, is based on Azure Cloud



Testing and CI/CD process at Signal – 2020



UNSTABLE

All Feature Tasks/Changes are deployed - Continuously

- Unit Tests - Per Commit
- DOM Snapshots Test - Per Commit
- UI Tests - Once Per Day/On Demand

QA

Only Selected Feature Tasks changes are deployed - Once a week

- Unit Tests - Per Commit
- DOM Snapshots Tests - Per Commit
- UI Tests - Manual Run on Demand
- Manual Test Execution/ Ad-Hoc Testing

PROD

Why wasn't it enough?

- No separate environment for testing a given PR for a specific task - (development tests)

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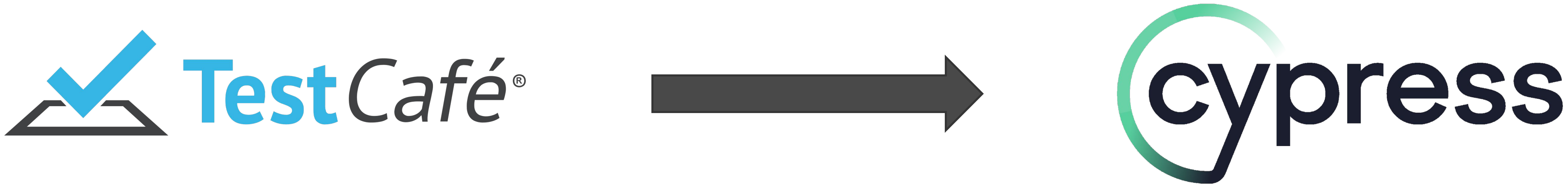
- Chaos - fixes added to the release branch, bypassing the unstable branch - frequent backmerges.

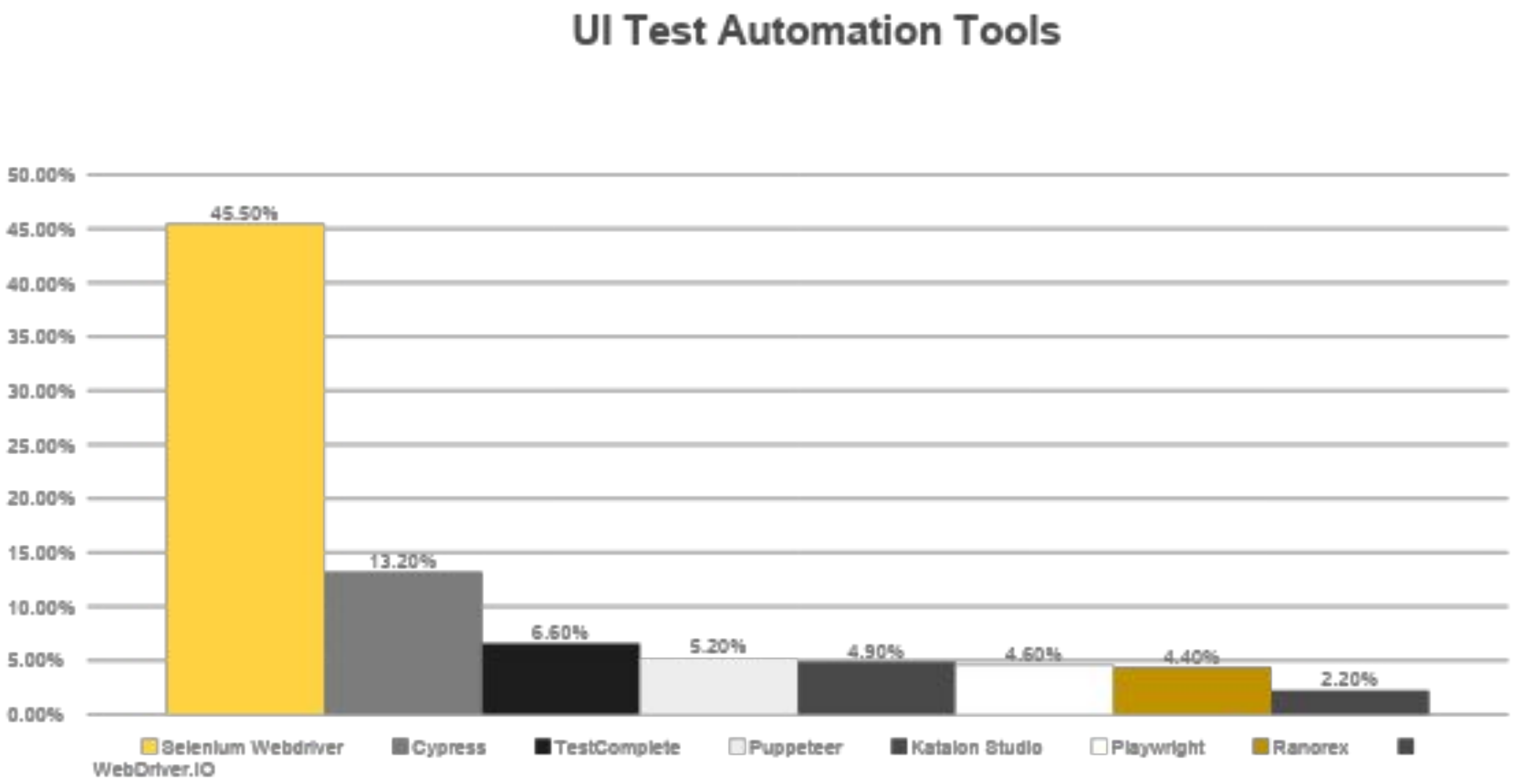
Signal – New UI Testing Tool Evaluation



Signal Ocean Platform UI Tests with TestCafe

- Hard to debug
- No solution for mocking the API layer of web applications
- Non-optimal test parallelization mechanism

State of Testing Report 2021



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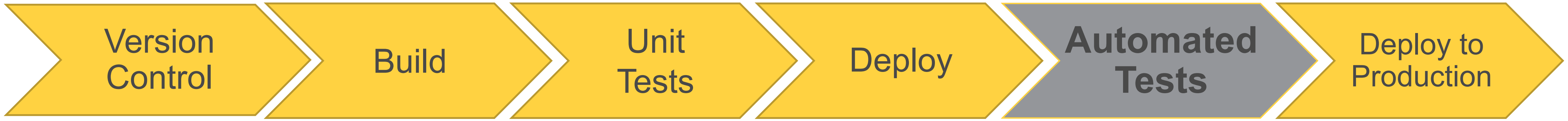
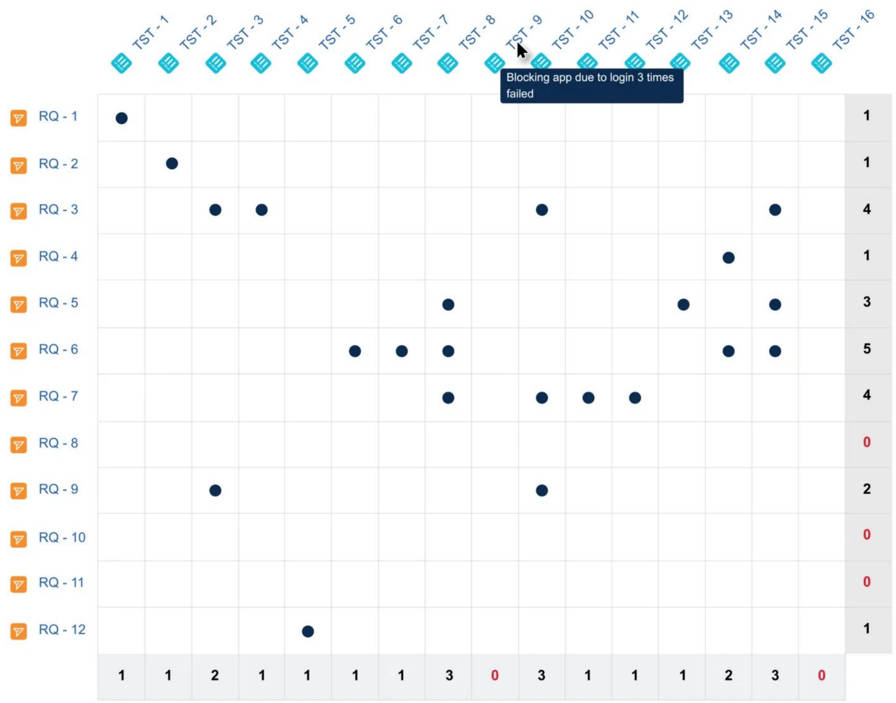
UI Testing in the CI/CD process



UI Test – Increasing functionality coverage with tests

- FEBE – 220 tests
- Mocked (Visual/Regression) - 620 tests

Traceability Matrix



Blocking app due to login 3 times failed

	TST - 1	TST - 2	TST - 3	TST - 4	TST - 5	TST - 6	TST - 7	TST - 8	TST - 9	TST - 10	TST - 11	TST - 12	TST - 13	TST - 14	TST - 15	TST - 16	
RQ - 1	●																1
RQ - 2		●															1
RQ - 3			●	●						●					●		4
RQ - 4														●			1
RQ - 5								●					●		●		3
RQ - 6						●	●	●						●	●		5
RQ - 7								●		●	●	●					4
RQ - 8																	0
RQ - 9			●							●							2
RQ - 10																	0
RQ - 11																	0
RQ - 12					●												1
	1	1	2	1	1	1	1	3	0	3	1	1	1	2	3	0	

UI Tests – Number of tests and test execution speed

PR Runner UI Tests/Slot Swap UI Tests:

- **UI Mock Tests**: **620** tests run in **14** min
- **UI FEBE Sanity Tests**: **22** tests run in **4** min

Other (run once a day on Unstable environment)

- **UI Unstable Mock Tests: 620** tests run in **14** min
- **UI FEBE Tests: 220** tests run in **11** min

UI Test Type	No. of Test Runs
UI Test Mock - PR Runner	67
UI Test FEBE Sanity - PR Runner	46
UI Test FEBE Sanity - Slot Swap Runner	72
UI Test Mock - Unstable Morning Run	30
UI Test FEBE - Unstable Morning Run	30

245 Test Runs - November

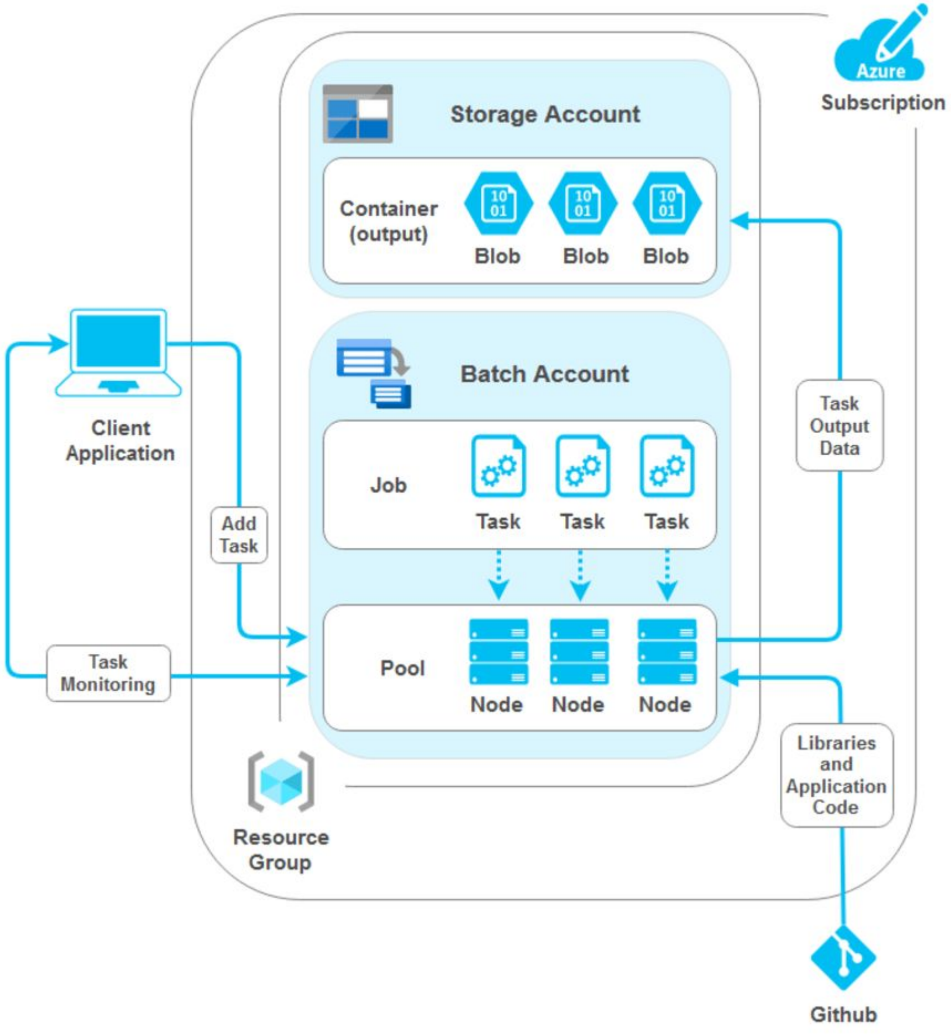
Two levels of test execution parallelism

- **Level I**: Simultaneous execution on 4 VMs (2 x Azure Cloud + 2 x VMWare) – parallelization mechanism provided by TeamCity (CI Server)
- **Level II:** Running multiple Cypress instances simultaneously on each VM – 4 instances – parallelization mechanism provided by NodeJS concurrently library
- The tests were run on 16 threads (browsers) simultaneously

Infrastructure for UI Tests - Limitations

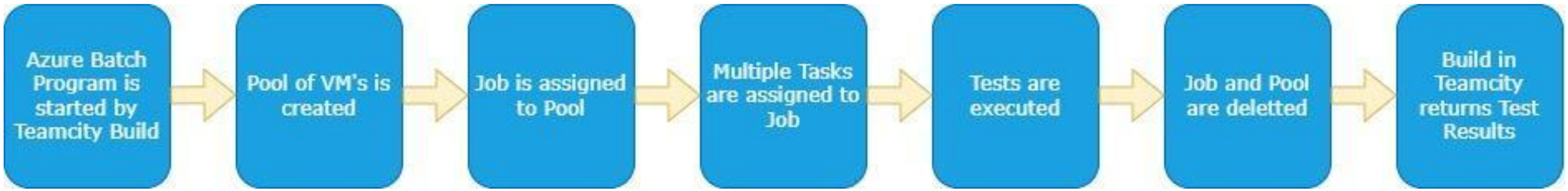
- Too few virtual machines available
- Need to assign TC agent to VM (additional cost of buying TC agent licence)

Azure Batch Service



Azure Batch as an infrastructure for UI Testing

Steps performed by the Azure Batch process:



Azure Batch Program is started by Teamcity Build

Pool of VM's is created

Job is assigned to Pool

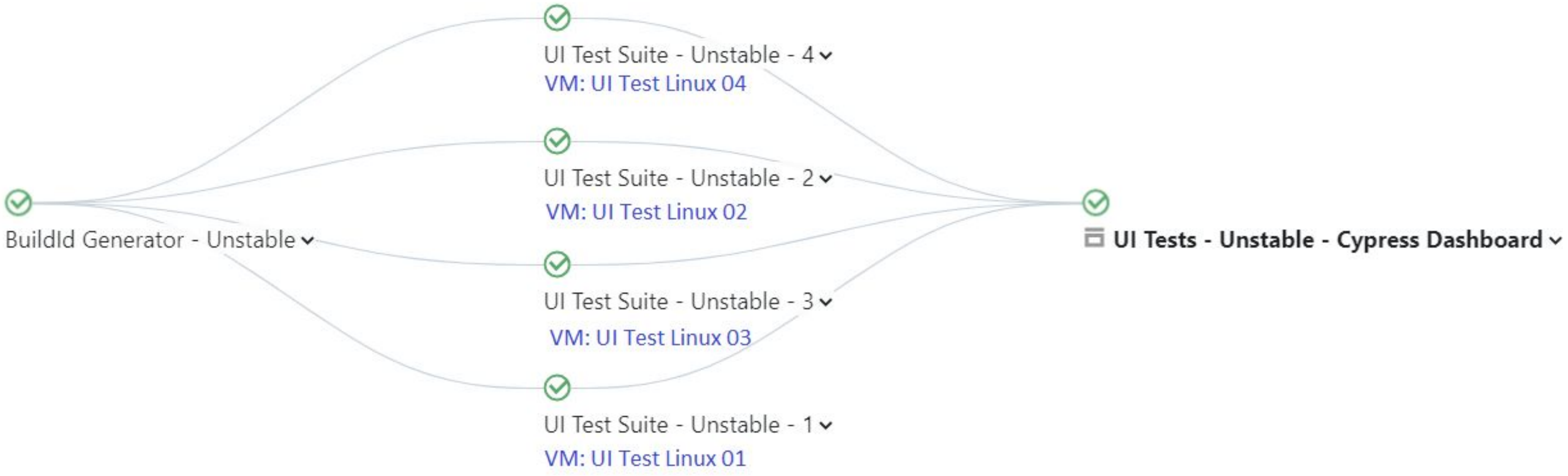
Multiple Tasks are assigned to Job

Tests are executed

Job and Pool are deletted

Build in Teamcity returns Test Results

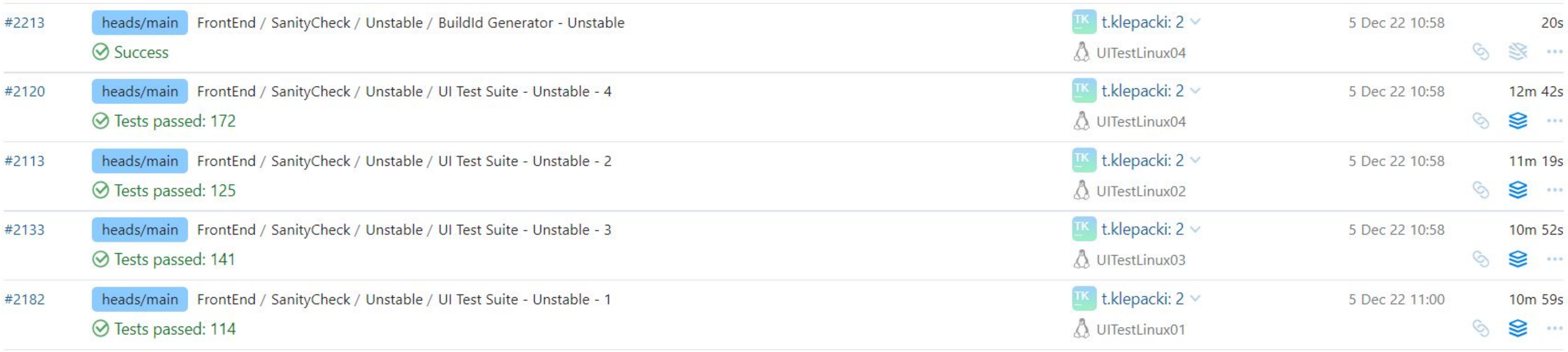
Standard Solution vs Azure Batch – TeamCity Agents


UI Test Suite - Unstable - 4
VM: UI Test Linux 04
UI Test Suite - Unstable - 2
VM: UI Test Linux 02
BuildId Generator - Unstable
UI Tests - Unstable - Cypress Dashboard
UI Test Suite - Unstable - 3
VM: UI Test Linux 03
UI Test Suite - Unstable - 1
VM: UI Test Linux 01

4 Agents vs 1 Agent

Only 1 Agent needed to run Azure Batch program and collect test results

Standard Solution vs Azure Batch – Test Durations



#2213	heads/main	FrontEnd / SanityCheck / Unstable / BuildId Generator - Unstable Success	t.klepacki: 2 UITestLinux04	5 Dec 22 10:58	20s
#2120	heads/main	FrontEnd / SanityCheck / Unstable / UI Test Suite - Unstable - 4 Tests passed: 172	t.klepacki: 2 UITestLinux04	5 Dec 22 10:58	12m 42s
#2113	heads/main	FrontEnd / SanityCheck / Unstable / UI Test Suite - Unstable - 2 Tests passed: 125	t.klepacki: 2 UITestLinux02	5 Dec 22 10:58	11m 19s
#2133	heads/main	FrontEnd / SanityCheck / Unstable / UI Test Suite - Unstable - 3 Tests passed: 141	t.klepacki: 2 UITestLinux03	5 Dec 22 10:58	10m 52s
#2182	heads/main	FrontEnd / SanityCheck / Unstable / UI Test Suite - Unstable - 1 Tests passed: 114	t.klepacki: 2 UITestLinux01	5 Dec 22 11:00	10m 59s

1. VCS Root Checkout and Build .Net Solutions - **0:45**
2. Azure batch Script Run: **14:45**
   - Pool Node creation – 10VMs: **2:15**
   - VM's dependencies instalation (docker container, project build etc): **2:50**
   - Test Run 10 VM's at once per 3 Browser Threads: **8:40**
   - Pool Nodes deletion: **1:00**

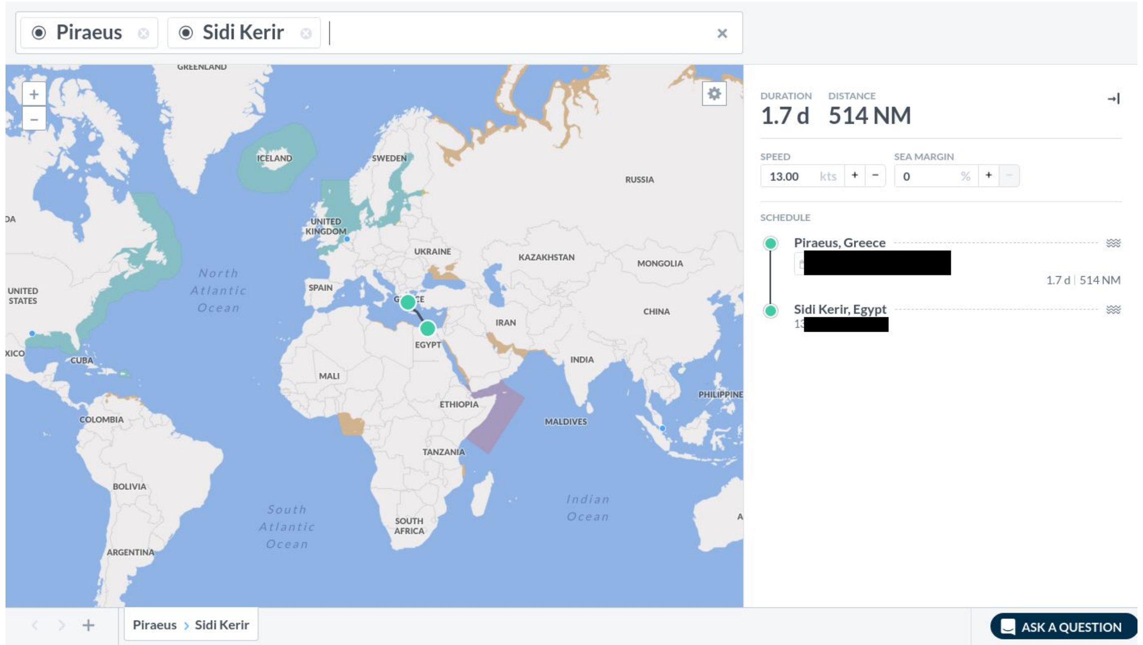
Total Test Time Duration: **14m 12s**

VS

Total Test Time Duration: **15m 30s**

The important role of visual regression testing in the Platform

- The only effective way to verify that maps are displayed correctly
- Cypress + Cypress Image Snapshots
- Mocking responses to keep the same data in the test



DURATION 1.7 d

DISTANCE 514 NM

SPEED 13.00 kts

SEA MARGIN 0 %

SCHEDULE

Piraeus, Greece

[redacted]

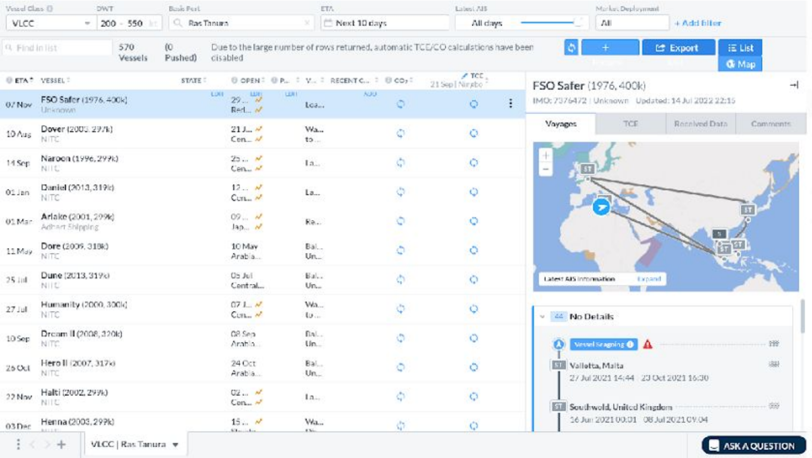
1.7 d | 514 NM

Sidi Kerir, Egypt

[redacted]

The important role of visual regression testing in the Platform

Expected



Vessel Class: VLCC | DWT: 200 - 550 kt | Basis Port: Ras Tanura | ETA: Next 10 days | Latest AIS: All days | Market Deployment: All | + Add filter

Find in list | 570 Vessels | (0 Pushed) | Due to the large number of rows returned, automatic TCE/CO calculations have been disabled

ETA	VESSEL	STATE	OPEN	P...	V...	RECENT C...	CO₂	TCE 21 Sep | Ningbo
07 Nov	FSO Safer (1976, 400k) Unknown		29 ... Red...		Loa...			
10 Aug	Dover (2003, 297k) NITC		21 J... Cen...		Wa... to ...			
14 Sep	Naroon (1996, 299k) NITC		25 ... Cen...		La...			
01 Jan	Daniel (2013, 319k) NITC		12 ... Cen...		La...			
01 Mar	Arlake (2001, 299k) Adhart Shipping		09 ... Jap...		Ke...			
11 May	Dore (2009, 318k) NITC		10 May Arabia...		Bal... Un...			
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27 Jul	Humanity (2000, 300k) NITC		07 J... Cen...		Wa... to ...			
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26 Oct	Hero II (2007, 317k) NITC		24 Oct Arabia...		Bal... Un...			
22 Nov	Halti (2002, 299k) NITC		02 ... Cen...		La...			
03 Dec	Henna (2003, 299k)		15 ...		Wa...			

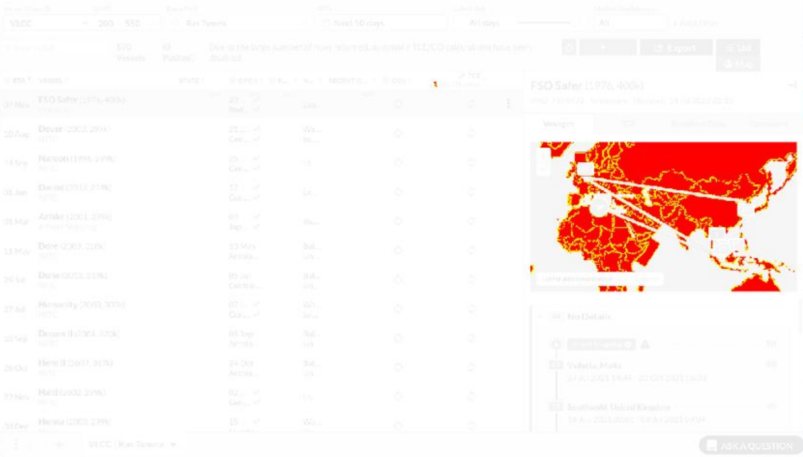
FSO Safer (1976, 400k)
IMO: 7376472 | Unknown Updated: 14 Jul 2022 22:15

No Details

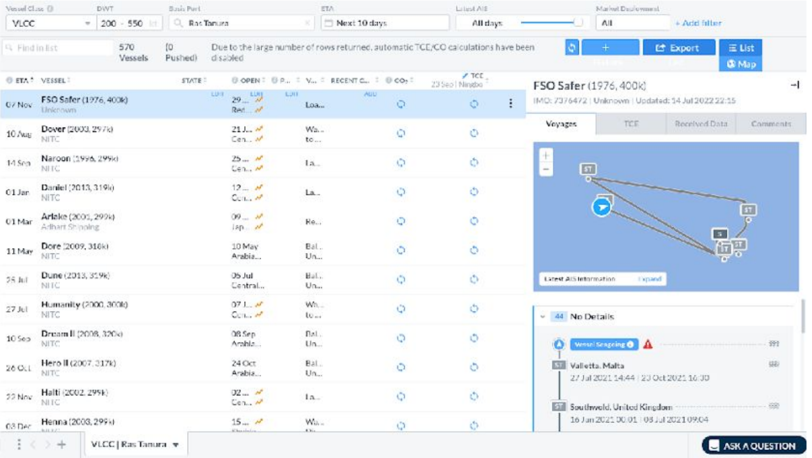
Valletta, Malta
27 Jul 2021 14:44 23 Oct 2021 16:30

Southwold, United Kingdom
16 Jun 2021 00:01 08 Jul 2021 09:04

Difference



Actual



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11 May	Dore (2009, 318k) NITC		10 May Arabia...		Bal... Un...			
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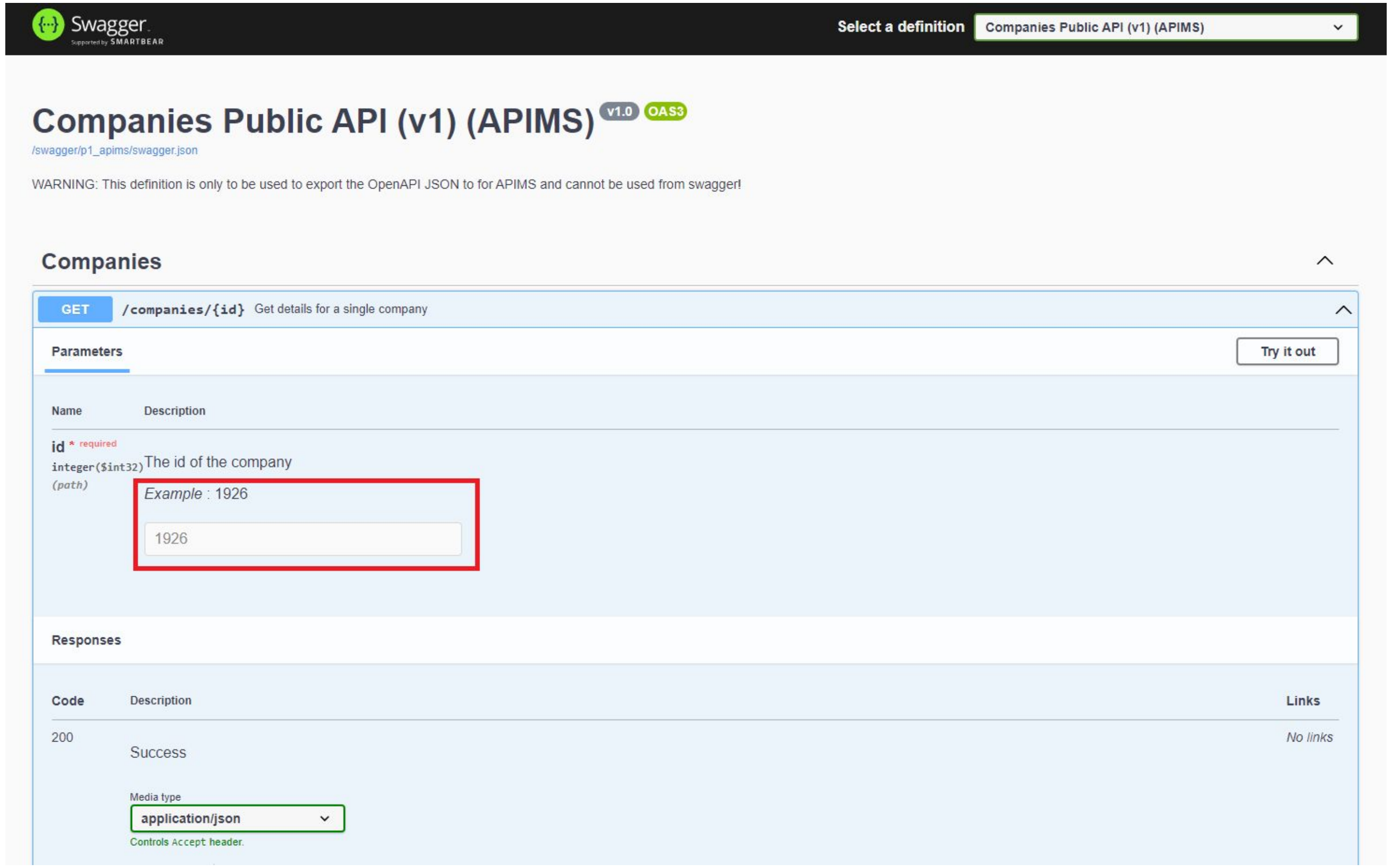
FEBE API/Backend Services tests

- Added Backend for Frontend layer API tests
- Added API tests for the most important Backend services: Postman + Swagger Examples



Companies Public API (v1) (APIMS) v1.0 OAS3

/swagger/p1_apims/swagger.json

WARNING: This definition is only to be used to export the OpenAPI JSON to for APIMS and cannot be used from swagger!

Companies

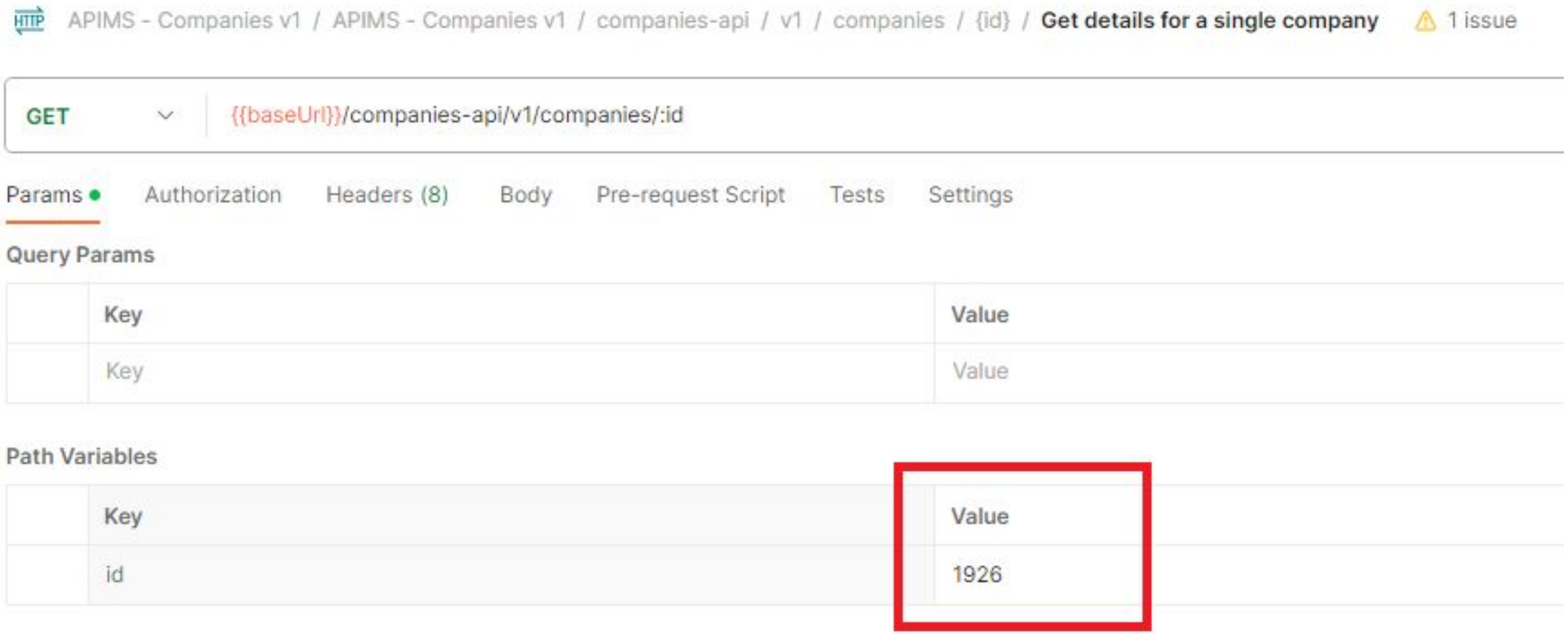
GET /companies/{id} Get details for a single company

Name	Description
id * required integer($int32) (path)	The id of the company *Example* : 1926 1926

Responses

Code	Description	Links
200	Success Media type application/json Controls Accept header.	*No links*

Backend Services Tests – Examples



APIMS - Companies v1 / APIMS - Companies v1 / companies-api / v1 / companies / {id} / **Get details for a single company** ⚠ 1 issue

```
GET  {{baseUrl}}/companies-api/v1/companies/:id
```

Query Params

Key	Value
Key	Value

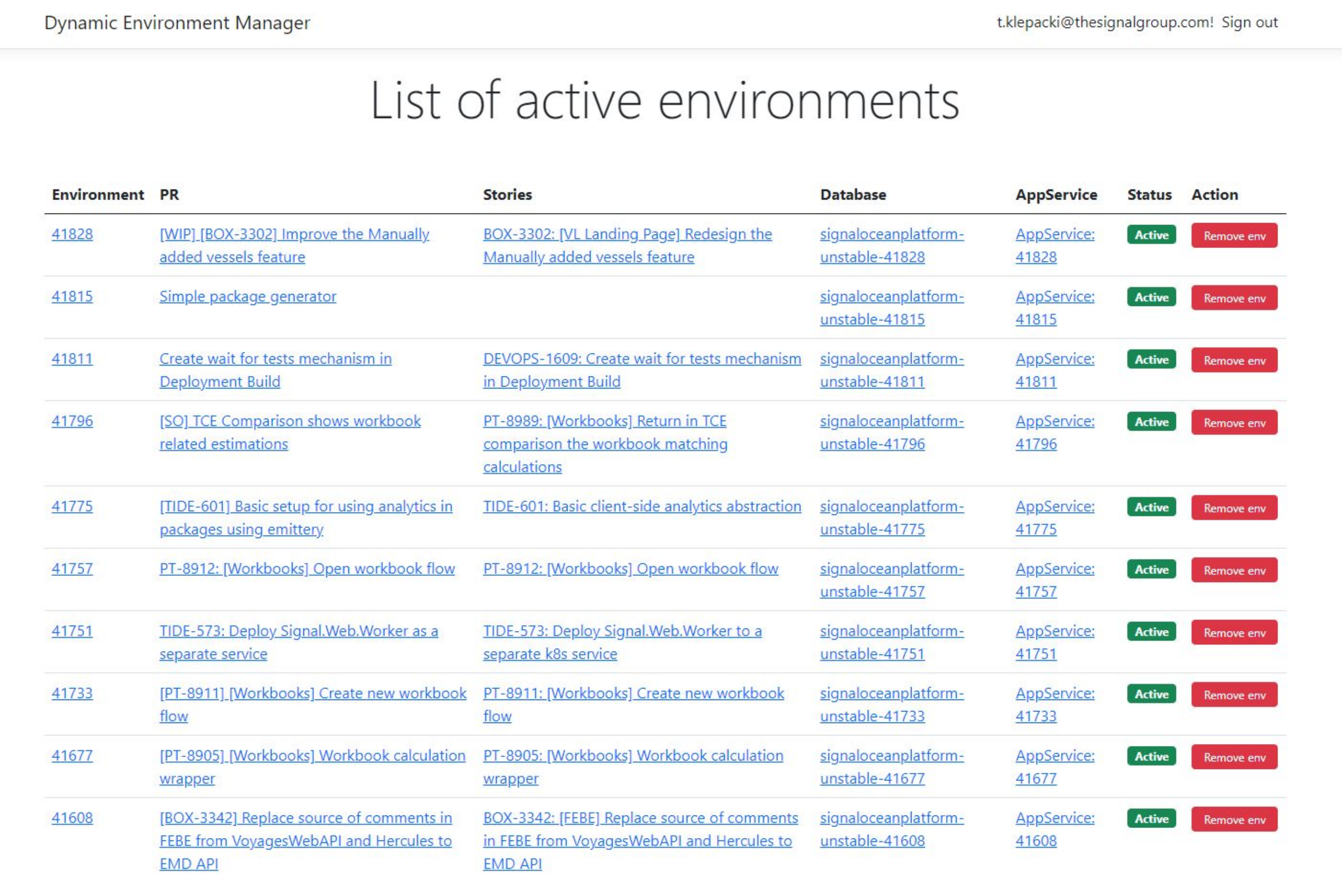
Path Variables

Key	Value
id	1926

Service monitoring and observability

- SO Healthchecks/Alerts
- Azure Application Insight, Jaeger, Rapid7
- Monitoring the production environment with UI tests

Creating dynamic environments for every PR



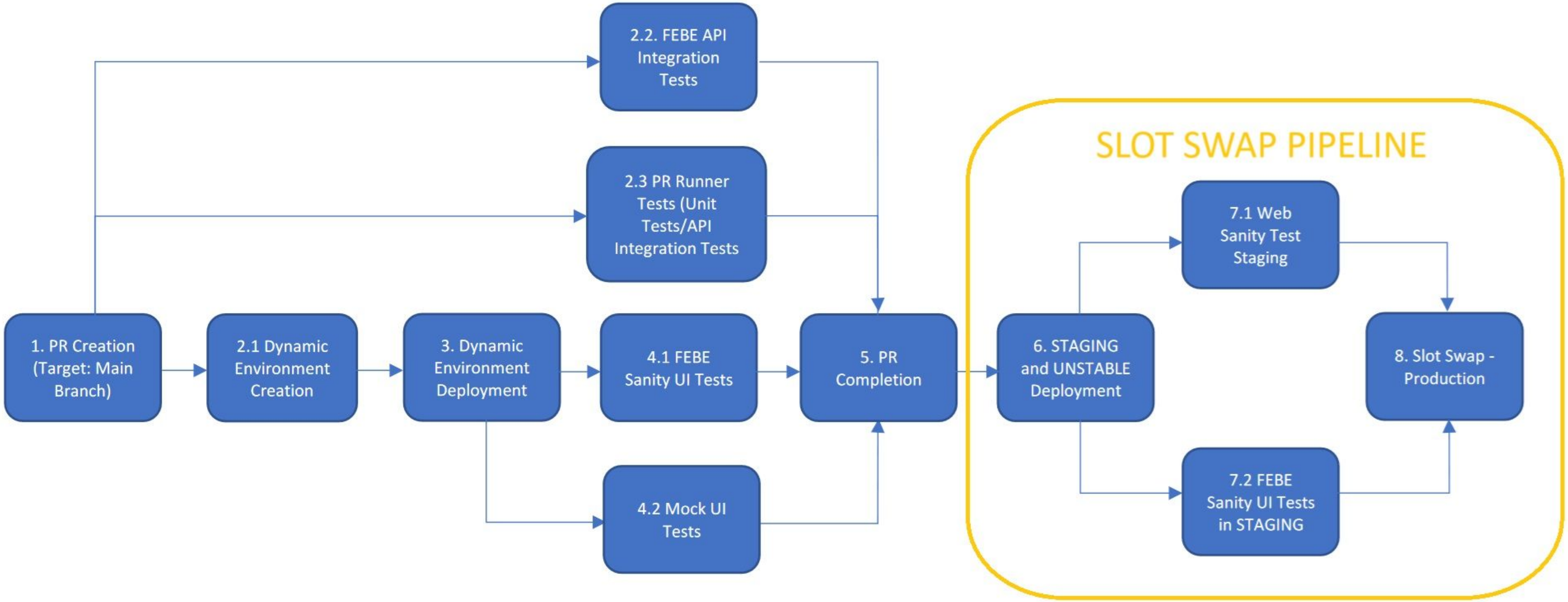
Dynamic Environment Manager

t.klepacki@thesignalgroup.com! Sign out

List of active environments

Environment	PR	Stories	Database	AppService	Status	Action
41828	[WIP] [BOX-3302] Improve the Manually added vessels feature	BOX-3302: [VL Landing Page] Redesign the Manually added vessels feature	signaloceanplatform-unstable-41828	AppService: 41828	Active	Remove env
41815	Simple package generator		signaloceanplatform-unstable-41815	AppService: 41815	Active	Remove env
41811	Create wait for tests mechanism in Deployment Build	DEVOPS-1609: Create wait for tests mechanism in Deployment Build	signaloceanplatform-unstable-41811	AppService: 41811	Active	Remove env
41796	[SO] TCE Comparison shows workbook related estimations	PT-8989: [Workbooks] Return in TCE comparison the workbook matching calculations	signaloceanplatform-unstable-41796	AppService: 41796	Active	Remove env
41775	[TIDE-601] Basic setup for using analytics in packages using emittery	TIDE-601: Basic client-side analytics abstraction	signaloceanplatform-unstable-41775	AppService: 41775	Active	Remove env
41757	PT-8912: [Workbooks] Open workbook flow	PT-8912: [Workbooks] Open workbook flow	signaloceanplatform-unstable-41757	AppService: 41757	Active	Remove env
41751	TIDE-573: Deploy Signal.Web.Worker as a separate service	TIDE-573: Deploy Signal.Web.Worker to a separate k8s service	signaloceanplatform-unstable-41751	AppService: 41751	Active	Remove env
41733	[PT-8911] [Workbooks] Create new workbook flow	PT-8911: [Workbooks] Create new workbook flow	signaloceanplatform-unstable-41733	AppService: 41733	Active	Remove env
41677	[PT-8905] [Workbooks] Workbook calculation wrapper	PT-8905: [Workbooks] Workbook calculation wrapper	signaloceanplatform-unstable-41677	AppService: 41677	Active	Remove env
41608	[BOX-3342] Replace source of comments in FEBE from VoyagesWebAPI and Hercules to EMD API	BOX-3342: [FEBE] Replace source of comments in FEBE from VoyagesWebAPI and Hercules to EMD API	signaloceanplatform-unstable-41608	AppService: 41608	Active	Remove env

Continuous Delivery in Signal



2.2. FEBE API Integration Tests
2.3 PR Runner Tests (Unit Tests/API Integration Tests
SLOT SWAP PIPELINE
7.1 Web Sanity Test Staging
1. PR Creation (Target: Main Branch)
2.1 Dynamic Environment Creation
3. Dynamic Environment Deployment
4.1 FEBE Sanity UI Tests
5. PR Completion
6. STAGING and UNSTABLE Deployment
8. Slot Swap - Production
7.2 FEBE Sanity UI Tests in STAGING
4.2 Mock UI Tests

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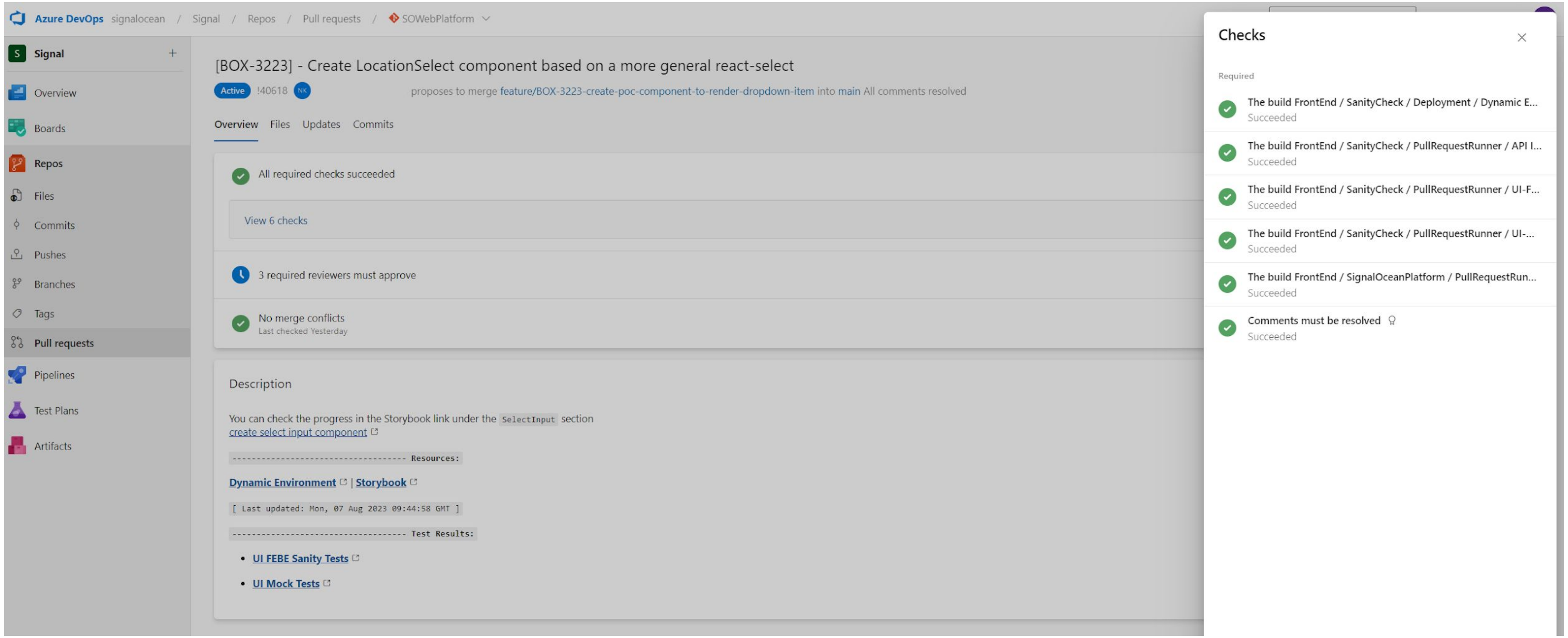
Pull Request (Azure Devops)



[BOX-3223] - Create LocationSelect component based on a more general react-select

Active !40618 NK proposes to merge feature/BOX-3223-create-poc-component-to-render-dropdown-item into main All comments resolved

✓ All required checks succeeded

View 6 checks

3 required reviewers must approve

✓ No merge conflicts
Last checked Yesterday

Description

You can check the progress in the Storybook link under the `SelectInput` section
create select input component

```
------------------------------------ Resources:
```

Dynamic Environment | Storybook

```
[ Last updated: Mon, 07 Aug 2023 09:44:58 GMT ]
```

```
------------------------------------ Test Results:
```

- UI FEBE Sanity Tests
- UI Mock Tests

Checks

Required

✓ The build FrontEnd / SanityCheck / Deployment / Dynamic E...
Succeeded

✓ The build FrontEnd / SanityCheck / PullRequestRunner / API I...
Succeeded

✓ The build FrontEnd / SanityCheck / PullRequestRunner / UI-F...
Succeeded

✓ The build FrontEnd / SanityCheck / PullRequestRunner / UI-...
Succeeded

✓ The build FrontEnd / SignalOceanPlatform / PullRequestRun...
Succeeded

✓ Comments must be resolved
Succeeded

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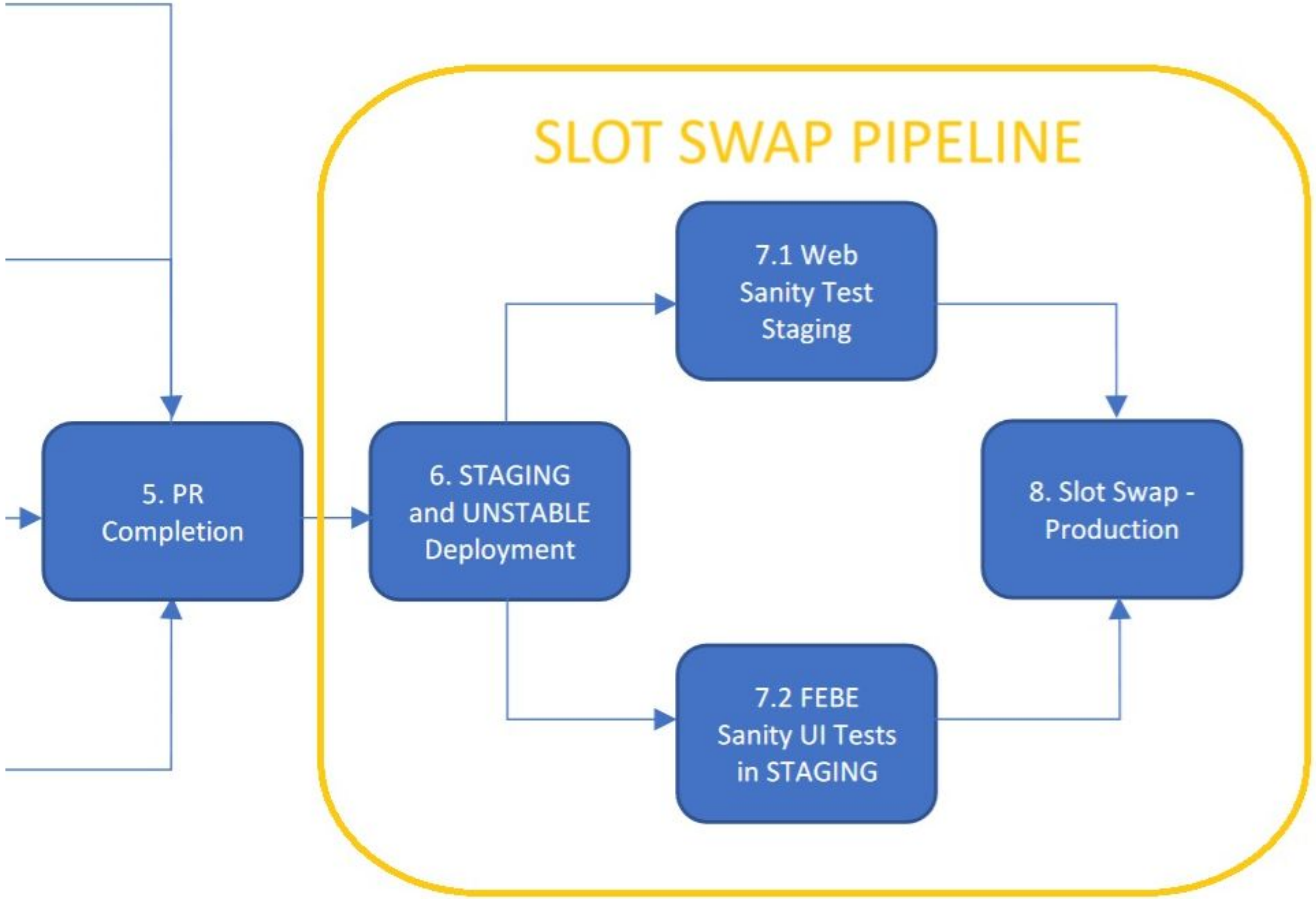
Automatic Deployment to PROD – Slot Swap


SLOT SWAP PIPELINE
5. PR Completion
6. STAGING and UNSTABLE Deployment
7.1 Web Sanity Test Staging
7.2 FEBE Sanity UI Tests in STAGING
8. Slot Swap - Production

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Summary

- Continuous implementations to production—around 20 per week, rather than many at once weekly
- Improved platform quality through early error detection and comprehensive test coverage
- Improved efficiency for implementing and testing via dynamic creation of environments per PR
- Migrating UI tests to Cypress simplified error diagnosis, request mocking, and test parallelization
- Using Azure Batch for UI testing improved frequency and speed
- Enhanced monitoring and observability of dependent services

Thank you! ☺

Questions?