

# The Scalable Dashboard Solution

WPI x Juniper Networks



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# Meet the Team



**Maria del Carmen  
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Senior

Computer Science



**Pradnya Mahurkar**

Senior

Computer Science



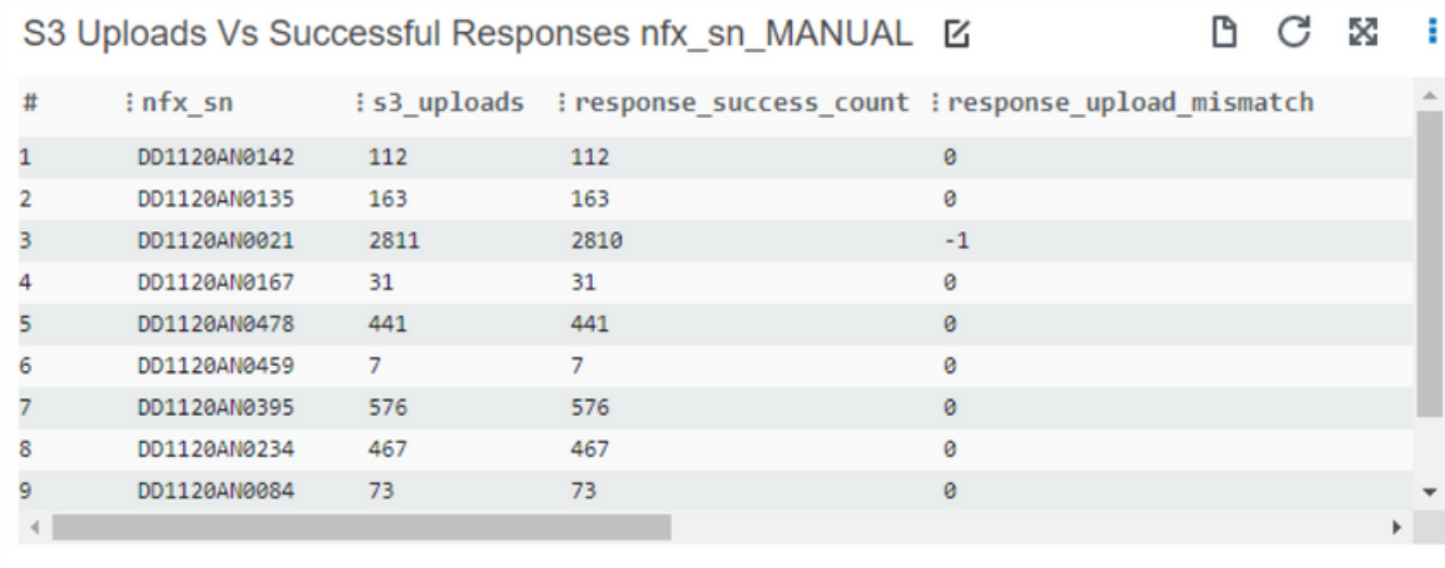
**Tyler Bouwens**

Senior

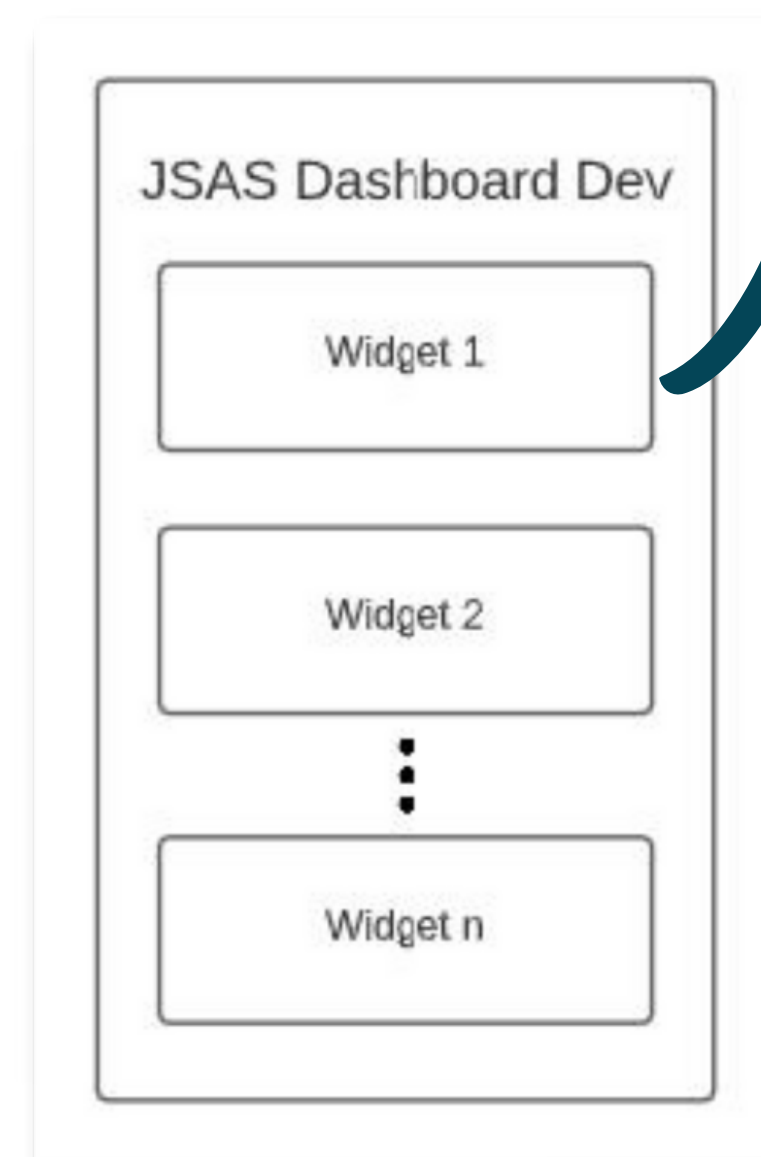
Computer Science

# Introductions to Dashboards

- Devices at client locations send logs to the JSAS' AWS CloudWatch
- Logs help keep track of device status and enable troubleshooting
- A huge volume of logs is imported on a daily basis
- Dashboards are made up of widgets

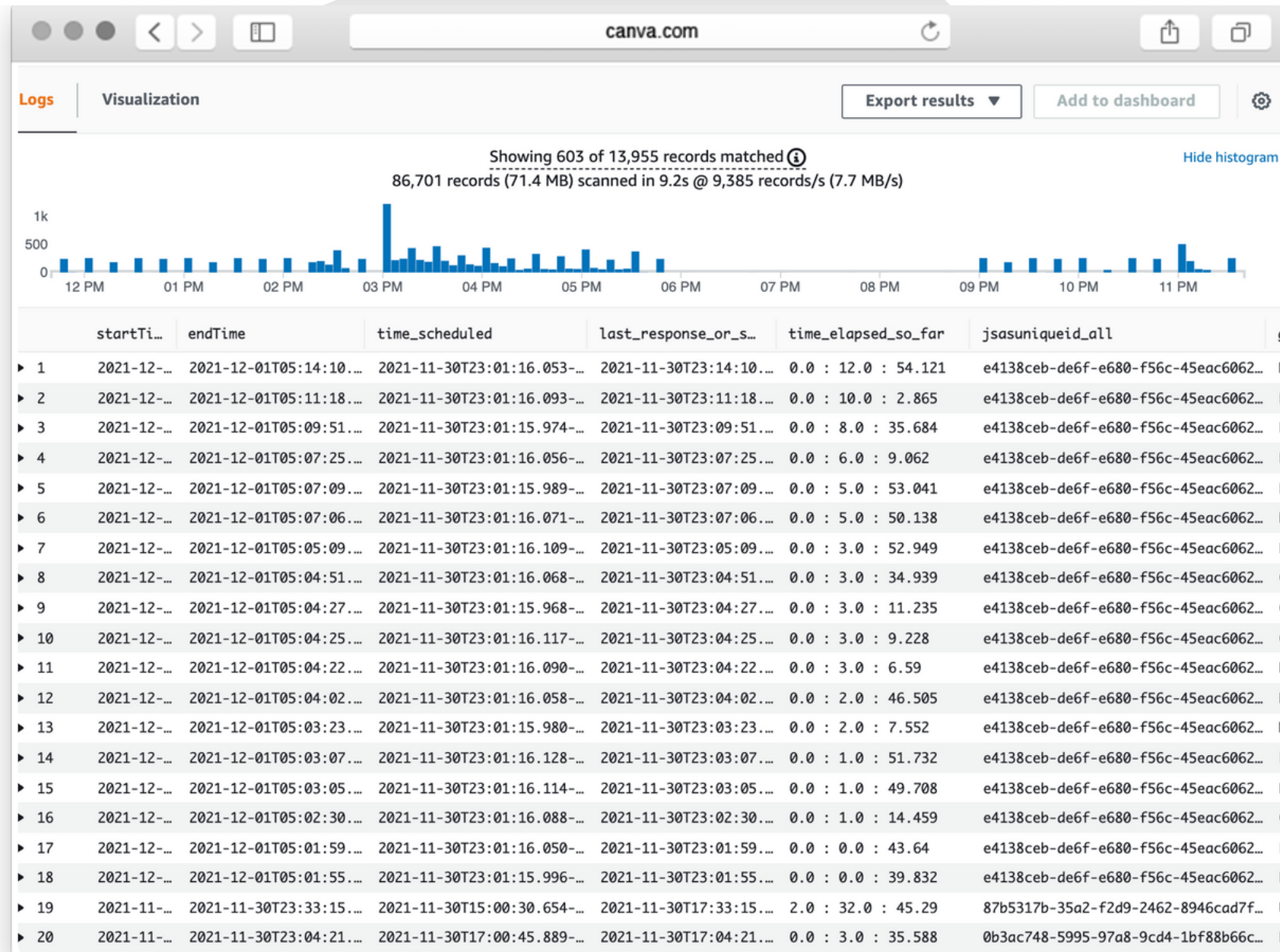


#	nfx_sn	s3_uploads	response_success_count	response_upload_mismatch
1	DD1120AN0142	112	112	0
2	DD1120AN0135	163	163	0
3	DD1120AN0021	2811	2810	-1
4	DD1120AN0167	31	31	0
5	DD1120AN0478	441	441	0
6	DD1120AN0459	7	7	0
7	DD1120AN0395	576	576	0
8	DD1120AN0234	467	467	0
9	DD1120AN0084	73	73	0



# Assessing Need

Over the years...



# 20+

## Client Devices

The Beta version of the JSAS has been deployed at an increasing number of client sites

# 10000+

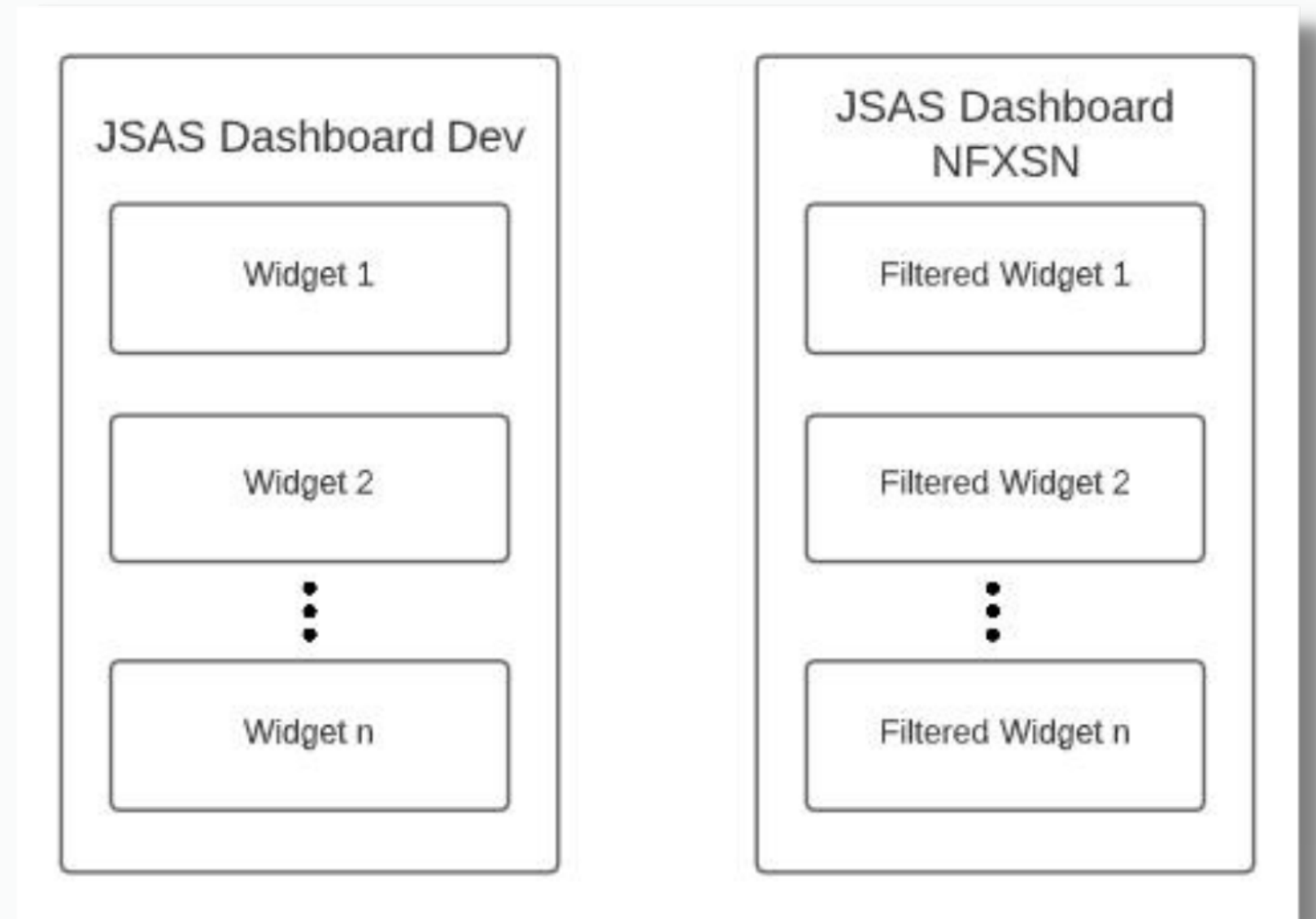
## Log Messages

Thousands of log messages are received every day by the AWS CloudWatch Console

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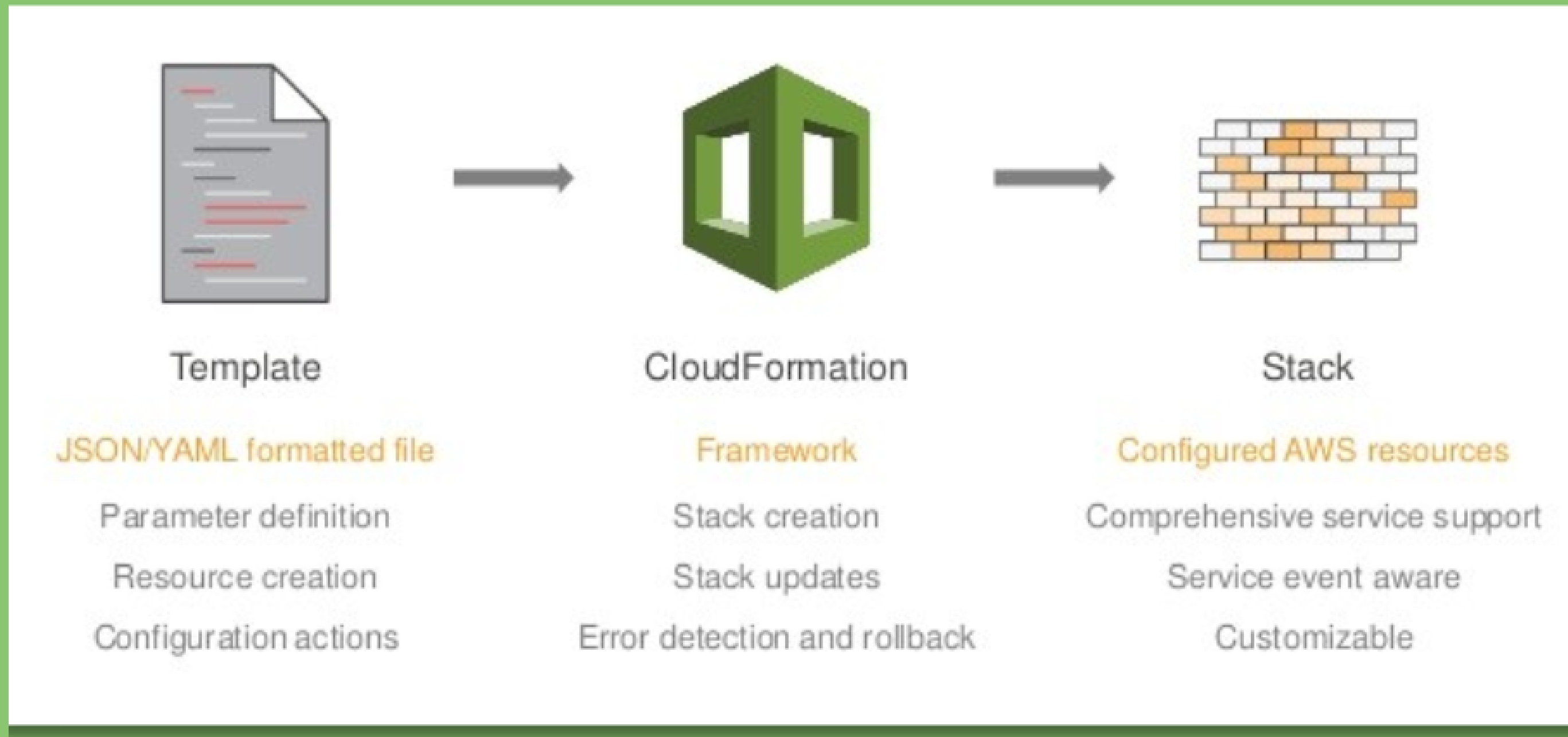
Develop **scalable, filtered, and organized dashboards** to facilitate **faster debugging** and provide an **enhanced user experience** with increased readability of logs

---





# Dashboard Creation Using AWS CloudFormation



# Methodology



# JSAS Dashboard Solution Approaches

01

Naive Stack Approach



## Stacks (40)

Filter by stack name

	Stack name	Status
<input type="radio"/>	jsas-dashboard-test-DD1120AN0130dev	✔ CREATE_COMPLETE
<input type="radio"/>	jsas-dashboard-test-DD1120AN0274dev	✔ CREATE_COMPLETE
<input type="radio"/>	jsas-dashboard-test-DD2316AF0102dev	✔ CREATE_COMPLETE
<input type="radio"/>	jsas-dashboard-test-DD1120AN0115dev	✔ CREATE_COMPLETE
<input type="radio"/>	jsas-dashboard-test-DD1120AN0421dev	✔ CREATE_COMPLETE
<input type="radio"/>	jsas-dashboard-test-DD1120AN0281dev	✔ CREATE_COMPLETE
<input type="radio"/>	jsas-dashboard-test-DD1120AN0084dev	✔ CREATE_COMPLETE
<input type="radio"/>	jsas-dashboard-test-DD1120AN0167dev	✔ CREATE_COMPLETE
<input type="radio"/>	jsas-dashboard-test-DD1120AN0142dev	✔ CREATE_COMPLETE
<input type="radio"/>	jsas-dashboard-test-DD1120AN0144dev	✔ CREATE_COMPLETE
<input type="radio"/>	jsas-dashboard-test-DD1120AN0165dev	✔ CREATE_COMPLETE
<input type="radio"/>	jsas-dashboard-test-DD1120AN0329dev	✔ CREATE_COMPLETE
<input type="radio"/>	jsas-dashboard-test-DD1120AN0260dev	✔ CREATE_COMPLETE
<input type="radio"/>	jsas-dashboard-test-DD1120AN0036dev	✔ CREATE_COMPLETE
<input type="radio"/>	jsas-dashboard-test-DD1120AN0395dev	✔ CREATE_COMPLETE
<input type="radio"/>	jsas-dashboard-test-DD1120AN0478dev	✔ CREATE_COMPLETE

# Naïve Stack Approach



## Design

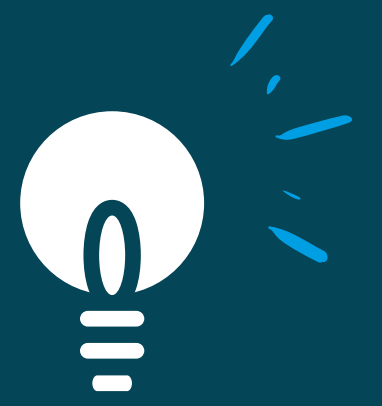
- IaC iteratively builds templates and stacks for each filtered dashboard

## Stacks (40)

🔍 Filter by stack name

	Stack name	Status
<input type="radio"/>	jsas-dashboard-test-DD1120AN0130dev	✔️ CREATE_COMPLETE
<input type="radio"/>	jsas-dashboard-test-DD1120AN0274dev	✔️ CREATE_COMPLETE
<input type="radio"/>	jsas-dashboard-test-DD2316AF0102dev	✔️ CREATE_COMPLETE
<input type="radio"/>	jsas-dashboard-test-DD1120AN0115dev	✔️ CREATE_COMPLETE
<input type="radio"/>	jsas-dashboard-test-DD1120AN0421dev	✔️ CREATE_COMPLETE
<input type="radio"/>	jsas-dashboard-test-DD1120AN0281dev	✔️ CREATE_COMPLETE
<input type="radio"/>	jsas-dashboard-test-DD1120AN0084dev	✔️ CREATE_COMPLETE
<input type="radio"/>	jsas-dashboard-test-DD1120AN0167dev	✔️ CREATE_COMPLETE
<input type="radio"/>	jsas-dashboard-test-DD1120AN0142dev	✔️ CREATE_COMPLETE
<input type="radio"/>	jsas-dashboard-test-DD1120AN0144dev	✔️ CREATE_COMPLETE
<input type="radio"/>	jsas-dashboard-test-DD1120AN0165dev	✔️ CREATE_COMPLETE
<input type="radio"/>	jsas-dashboard-test-DD1120AN0329dev	✔️ CREATE_COMPLETE
<input type="radio"/>	jsas-dashboard-test-DD1120AN0260dev	✔️ CREATE_COMPLETE
<input type="radio"/>	jsas-dashboard-test-DD1120AN0036dev	✔️ CREATE_COMPLETE
<input type="radio"/>	jsas-dashboard-test-DD1120AN0395dev	✔️ CREATE_COMPLETE
<input type="radio"/>	jsas-dashboard-test-DD1120AN0478dev	✔️ CREATE_COMPLETE

# Naïve Stack Approach



## Benefits

- Separate filtered dashboards
- Increased readability of log data
- Programmatic creation

## Stacks (40)

🔍 Filter by stack name

	Stack name	Status
<input type="radio"/>	jsas-dashboard-test-DD1120AN0130dev	✔️ CREATE_COMPLETE
<input type="radio"/>	jsas-dashboard-test-DD1120AN0274dev	✔️ CREATE_COMPLETE
<input type="radio"/>	jsas-dashboard-test-DD2316AF0102dev	✔️ CREATE_COMPLETE
<input type="radio"/>	jsas-dashboard-test-DD1120AN0115dev	✔️ CREATE_COMPLETE
<input type="radio"/>	jsas-dashboard-test-DD1120AN0421dev	✔️ CREATE_COMPLETE
<input type="radio"/>	jsas-dashboard-test-DD1120AN0281dev	✔️ CREATE_COMPLETE
<input type="radio"/>	jsas-dashboard-test-DD1120AN0084dev	✔️ CREATE_COMPLETE
<input type="radio"/>	jsas-dashboard-test-DD1120AN0167dev	✔️ CREATE_COMPLETE
<input type="radio"/>	jsas-dashboard-test-DD1120AN0142dev	✔️ CREATE_COMPLETE
<input type="radio"/>	jsas-dashboard-test-DD1120AN0144dev	✔️ CREATE_COMPLETE
<input type="radio"/>	jsas-dashboard-test-DD1120AN0165dev	✔️ CREATE_COMPLETE
<input type="radio"/>	jsas-dashboard-test-DD1120AN0329dev	✔️ CREATE_COMPLETE
<input type="radio"/>	jsas-dashboard-test-DD1120AN0260dev	✔️ CREATE_COMPLETE
<input type="radio"/>	jsas-dashboard-test-DD1120AN0036dev	✔️ CREATE_COMPLETE
<input type="radio"/>	jsas-dashboard-test-DD1120AN0395dev	✔️ CREATE_COMPLETE
<input type="radio"/>	jsas-dashboard-test-DD1120AN0478dev	✔️ CREATE_COMPLETE

# Naïve Stack Approach



## Drawbacks

- Abundant memory required
- Individual deployment, update and deletion
- Time consuming build

# JSAS Dashboard Solution Approaches

**01**

**Brute Force Approach**

**02**

**Singular Stack Solution**

# Singular Stack Solution



## Benefit

- Time efficient
- Doesn't clutter stack storage

## Design

- IaC tool generates templates and deploys them all in one stack
- Utilizes S3 to avoid CLI size limits

## Drawbacks

- New file size limit concerns
- Process lacks automation at points

```
-----  
Starting job 27A59411-6AAF-46CB-8E8D-AA1BAE6CE740; logging to ./deployment.log  
-----  
Sourcing params.env...  
Creating a temporary .yaml file with injected dashboard.json object into DASHBO  
Linting the CloudFormation templates...  
E1002 The template file size (1315371 bytes) exceeds the limit (1000000 bytes)  
./tmp/temp-template.yaml:1:1
```



# JSAS Dashboard Solution Approaches

**01**

**Brute Force Approach**

**02**

**Singular Stack Solution**

**03**

**Nested Stack Approach**

# Nested Stack Solution



	Stack name
<input type="radio"/>	jsas-dashboard-dev-Substack1-1VA4YF9KR8OQX <b>NESTED</b>
<input type="radio"/>	jsas-dashboard-dev

## Benefit

- Prevents file size limit issues
- Complete automation

## Design

- IaC tool handles template creation utilizing nested stack logic
- S3 Buckets store templates to bypass file size limits



# JSAS Dashboard Solution Approaches

**01**

**Brute Force Approach**

**02**

**Singular Stack Solution**

**03**

**Nested Stack Approach**

**04**

**Organizing Dashboard Data**

# Everything in One Place Widget

startTime	endTime	time_scheduled	last_response_or_s3_u...	time_elapsed_so_f...	jsasuniqueid_all	expectedTargetCou...	actualTargetCou...	s3_uploads	success_count	failure_count	unaccounted_process_respon...	unaccounted_s3_uploa...
2021-11-30T06:20:16.333	2021-11-30T06:20:17.472	2021-11-30T06:00:46.235Z	2021-11-30T06:20:17.472Z	0.0 : 19.0 : 31.237	79003938-bcc2-1616-956e-781	110	110	82	82	28	0	0
2021-11-30T06:16:53.940	2021-11-30T06:16:54.768	2021-11-30T06:00:46.231Z	2021-11-30T06:16:54.768Z	0.0 : 16.0 : 8.537	79003938-bcc2-1616-956e-781	87	87	85	85	2	0	0
2021-11-30T06:16:41.558	2021-11-30T06:16:42.440	2021-11-30T06:00:46.400Z	2021-11-30T06:16:42.440Z	0.0 : 15.0 : 56.04	79003938-bcc2-1616-956e-781	103	103	102	102	1	0	0
2021-11-30T06:12:51.846	2021-11-30T06:12:53.678	2021-11-30T06:00:46.249Z	2021-11-30T06:12:53.678Z	0.0 : 12.0 : 7.429	79003938-bcc2-1616-956e-781	62	62	62	62	0	0	0
2021-11-30T06:11:12.940	2021-11-30T06:11:14.012	2021-11-30T06:00:46.292Z	2021-11-30T06:11:14.012Z	0.0 : 10.0 : 27.72	79003938-bcc2-1616-956e-781	54	54	54	54	0	0	0
2021-11-30T06:09:57.577	2021-11-30T06:09:58.289	2021-11-30T06:00:46.285Z	2021-11-30T06:09:58.289Z	0.0 : 9.0 : 12.004	79003938-bcc2-1616-956e-781	37	37	31	31	6	0	0
2021-11-30T06:08:45.408	2021-11-30T06:08:46.231	2021-11-30T06:00:32.966Z	2021-11-30T06:08:46.231Z	0.0 : 8.0 : 13.265	dd8b054b-cfe6-741f-e4f2-264	98	98	98	98	0	0	0
2021-11-30T06:06:54.649	2021-11-30T06:06:55.624	2021-11-30T06:01:00.750Z	2021-11-30T06:06:55.624Z	0.0 : 5.0 : 54.874	46f297fd-ffe6-b839-62af-4d3	52	52	23	23	29	0	0
2021-11-30T06:05:50.152	2021-11-30T06:05:51.325	2021-11-30T06:00:46.578Z	2021-11-30T06:05:51.325Z	0.0 : 5.0 : 4.747	79003938-bcc2-1616-956e-781	16	16	16	16	0	0	0
2021-11-30T06:05:27.785	2021-11-30T06:05:29.371	2021-11-30T06:00:46.258Z	2021-11-30T06:05:29.371Z	0.0 : 4.0 : 43.113	79003938-bcc2-1616-956e-781	16	16	16	16	0	0	0

## Organized Logs

The widget displays the completed events first followed by in-progress events

## Centralized Widget

Joins multiple log streams to display multiple statistics in one log table

## Highlight Inconsistencies

The unaccounted columns display any unusual or inconsistent behaviors

# Future Work



1

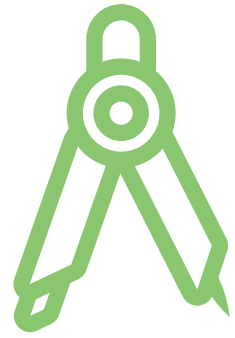
Data visualization and insights

2

Improving the user experience of the AWS Dashboards

3

Adding filters for log tables in AWS Dashboards



# Conclusion



These are our results from this term of work

## Filtered Dashboards

Dashboards with content filtered to specific serial numbers, to ensure ease of viewing specified log data

## JSAS Dashboard Creation IaC Tool

A robust, scaled, and tested tool to create, package, and deploy nested stacks containing filtered dashboards

## Everything in One Place Widget

A dashboard widget which displays a plethora of relevant and important data, enabling quicker access to vital info



# Acknowledgements



**MARK CLAYPOOL**  
Advisor



**JOHN SADLIER**  
Mentor



**JAMES AUSTIN**  
Mentor



**NIKHIL JUKAR**  
Mentor



# Thank you, it's been a pleasure!

*Any Questions?*



Carmen Sacristan, Pradnya Mahurkar, Tyler Bouwens