Sprint 1-2

Presentation Deck

FYPJ-2023

Updated as of 2/5/2023 by Nasrullah

SPRINT 1
(6-24 March 2023)

Problem

- How can we leverage AWS, Mentimeter & PowerBI to develop a learning analytics system that effectively tracks and measures online learning engagement?

- How can we integrate AWS, Mentimeter, and PowerBI to develop a comprehensive learning analytics solution that provides real-time visualization and insights into online learning engagement?

Objective

- Proof of concept for deploying **learning objects** (existing videos or storyline content) to the Web using Amazon Web Services (AWS).

- **Collect, analyse and report** data about students and their contexts for the purpose of understanding and optimising learning

- Designing and implementing centimetre quizzes

- Explore the use of PowerBI to get broad analysis and visualisation capabilities from data acquired to enable tracking of online learning engagement from various online learning environments

Purpose

Discover learning engagement:

- Behavior (Effort students put into learning activities)

- Cognitive (Type and amount of learning strategies they use)

- Emotional (Their level of interest in learning)

Sprint 1 Schedule

Collapse all

To Do	In Progress	Done

5971 Sprint 1 [AWS] (Week-3, 3 Mar- 24 Mar)
N NASRULLAH
State ● Done

To Do

5980 Uploading eLearning Projects to the Web (S3)
N NASRULLAH
State ● To Do

In Progress

6021 1-day/week SDL for Professional Scrum Developer Certification. (Friday)
N NASRULLAH
State ● In Progress

6157 Performing analytics on S3 bucket using cloudfront analytics and AWS Kinesis
N NASRULLAH
State ● In Progress

Done

5974 Perform research on AWS services
N NASRULLAH
State ● Done

5979 Hosting on-demand streaming video with Amazon S3, Amazon CloudFront, and
N NASRULLAH
State ● Done

5985 AWS Architecture Design v1
N NASRULLAH
State ● Done

5995 Use case summary of AWS Services
N NASRULLAH
State ● Done

6172 Determine metrics to collect
N NASRULLAH
State ● Done

🏠 AWS Services Summary

📄 Mentimeter Course

📄 Amazon Simple Storage Service...

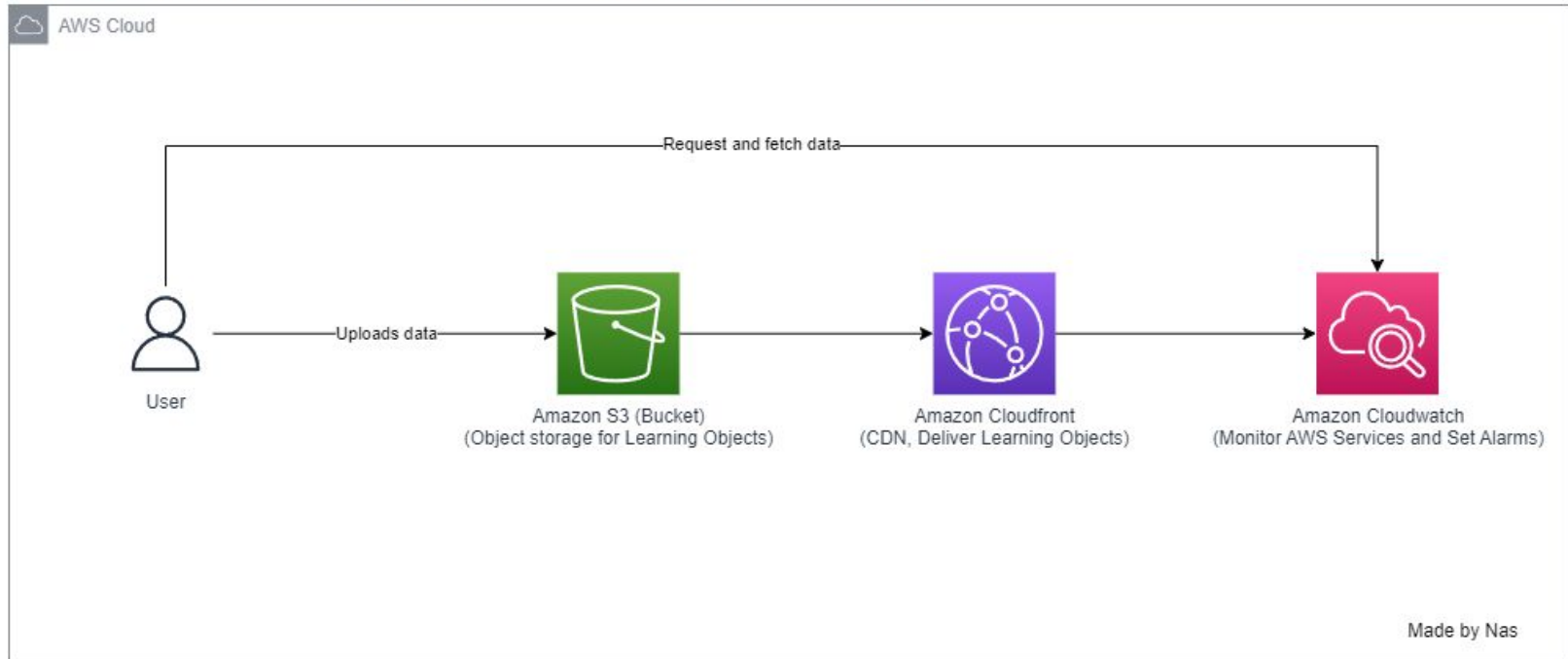📄 AWS Architecture

📄 Resources (For Nas)

📄 OKRs

📄 Project Summary

Initial Research & Challenges

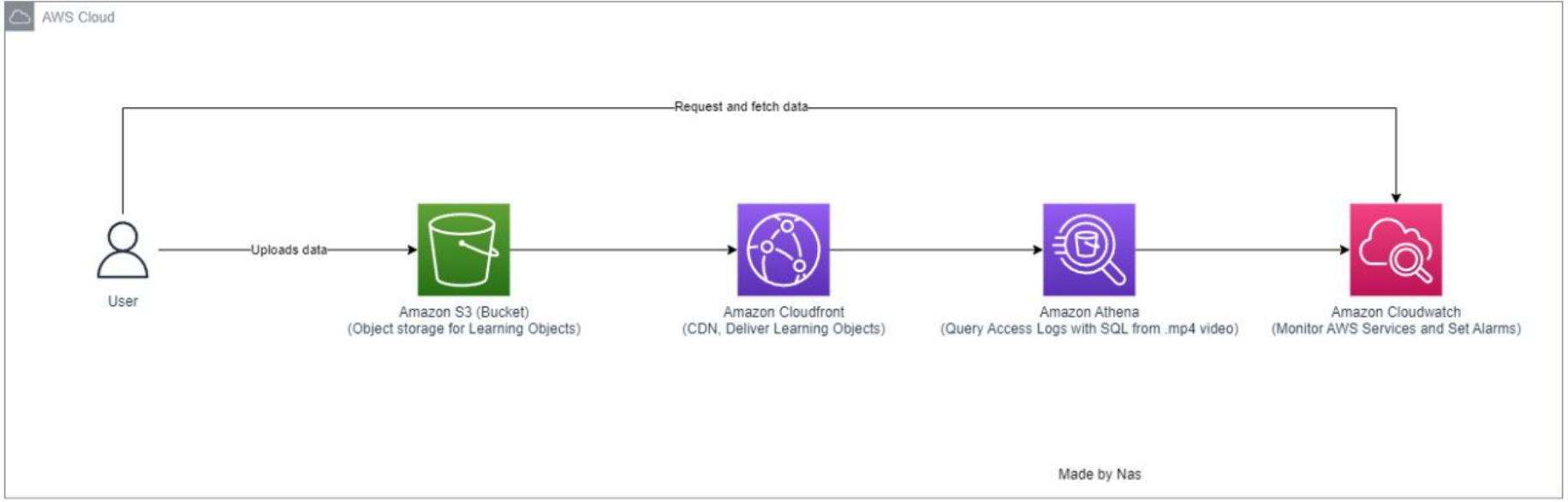| AWS Services	Use Case
Amazon S3	Used for storing the videos and storyline contents
Amazon CloudFront	Used for delivering the learning objects (videos or storyline content) to the end-users with low latency and high transferring speed
Amazon Kinesis Video Streams	Used for collecting and analyzing data about students and their contexts for understanding and optimizing learning
AWS Lambda	Used for processing and transforming the data collected by Amazon Kinesis Data Streams and Amazon Kinesis Video Streams
Amazon DynamoDB	Used as a NoSQL database for storing and querying the data collected by Amazon Kinesis Data Streams & Amazon Kinesis Video Streams
Amazon Athena	Used as a query service for querying data stored in Amazon S3
Amazon CloudWatch	Used for monitoring the AWS services and setting alarms for any unusual activities
Amazon QuickSight	Used for creating interactive visualizations and reports for the analysed data

(Challenge)Initial POC Cloud Architecture

Hosting learning object to AWS using S3, Cloudfront & Cloudwatch

AWS Cloud

Request and fetch data

User

Uploads data

Amazon S3 (Bucket)
(Object storage for Learning Objects)

Amazon Cloudfront
(CDN, Deliver Learning Objects)

Amazon Cloudwatch
(Monitor AWS Services and Set Alarms)

Made by Nas

Successful POC

Existing Successful POC Architecture

AWS Cloud

Request and fetch data

User — Uploads data → Amazon S3 (Bucket)
(Object storage for Learning Objects) → Amazon Cloudfront
(CDN, Deliver Learning Objects) → Amazon Athena
(Query Access Logs with SQL from .mp4 video) → Amazon Cloudwatch
(Monitor AWS Services and Set Alarms)

Made by Nas

Objective Key Results

Metrics to collect to propagate user learning engagement & analytics:

- **View count:** This metric measure the number of requests made to this video URL Link. The total of GET/HIT requests equates to the total number of views the video receives.

- **Completion rate:** This metric measures the percentage of viewers who watched the entire video from start to finish.

- **Drop-off rate:** This metric measures the percentage of viewers who stopped watching the video before the end.

- **Rewatch rate:** This metric measures the percentage of viewers who rewound or rewatched parts of the video.

- **Learning Object's Efficacy:** This metric measures the time taken to obtain the learning object.

Data Obtained

View data about requests received by your

CloudFront distribution:

Cloudfront → Reports & Analytics

- **Cache statistics reports ✅**
- **Popular objects report ✅**
- **Top referrers report ✅**
- **Usage report ✅**
- **Viewers report ✅**

S3 → Storage lens → fyp-dashboard/fyp-advanced-dashboard

- **Total storage ✅**
- **Object count ✅**
- **Average object size ✅**
- **Active buckets ✅**
- **Accounts ✅**
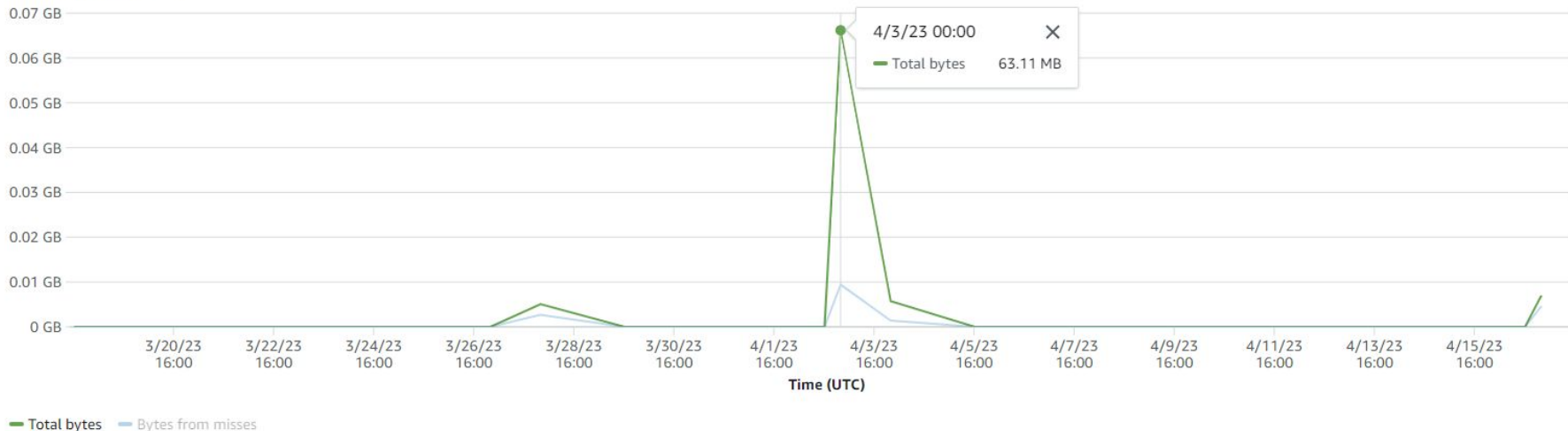- **Buckets ✅**

Cloudfront Statistics
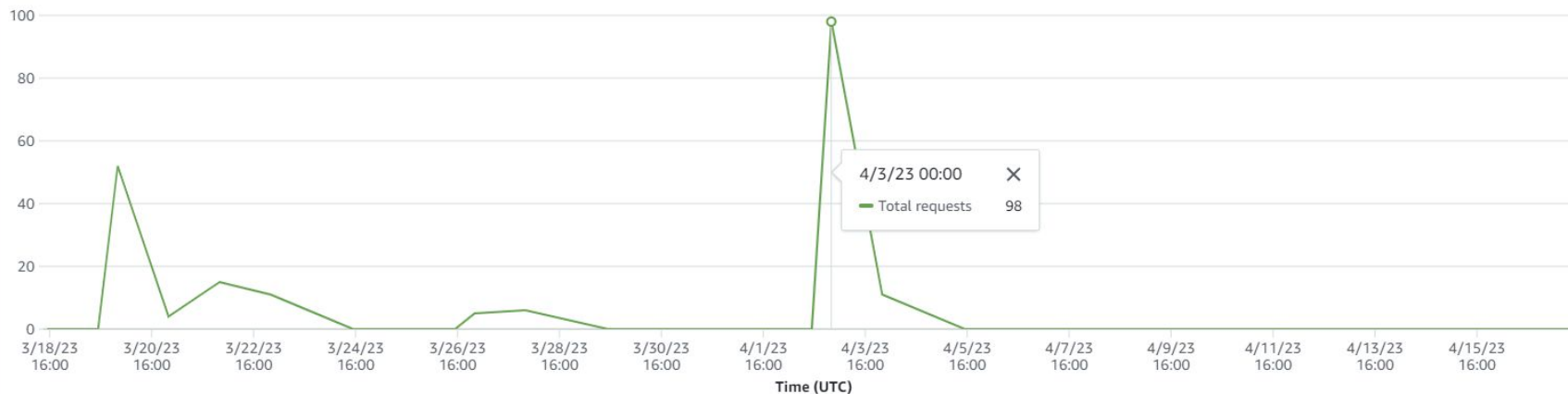
Cloudfront Statistics

Percentage of viewer requests by result type
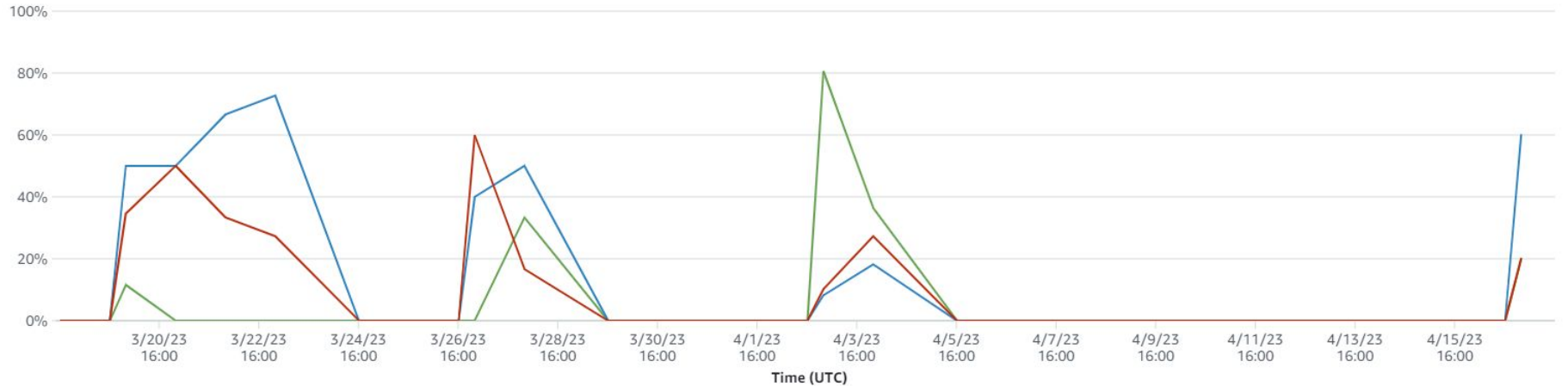
Total hits: 92 (45.54%)   **Total misses:** 64 (31.68%)   **Total errors:** 46 (22.77%)

Cloudfront Statistics

Cloudfront Statistics
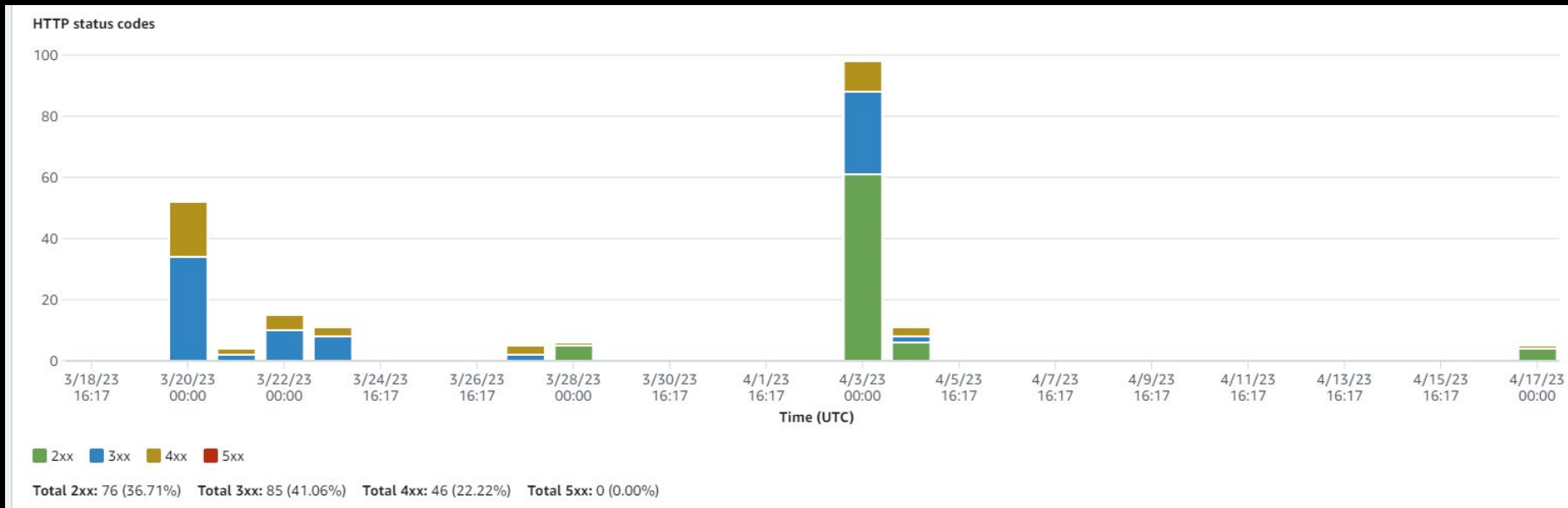
2xx: 200 OK, 201 Created, 204 No Content | **3xx:** 301 Moved Permanently, 302 Found, 307 Temporary Redirect

4xx: 400 Bad Request, 401 Unauthorized, 404 Not Found | **5xx:** 500 Internal Server Error, 502 Bad Gateway, 504 Gateway Timeout

Cloudfront Statistics

Percentage of GET requests that did not finish downloading

Cloudfront Statistics
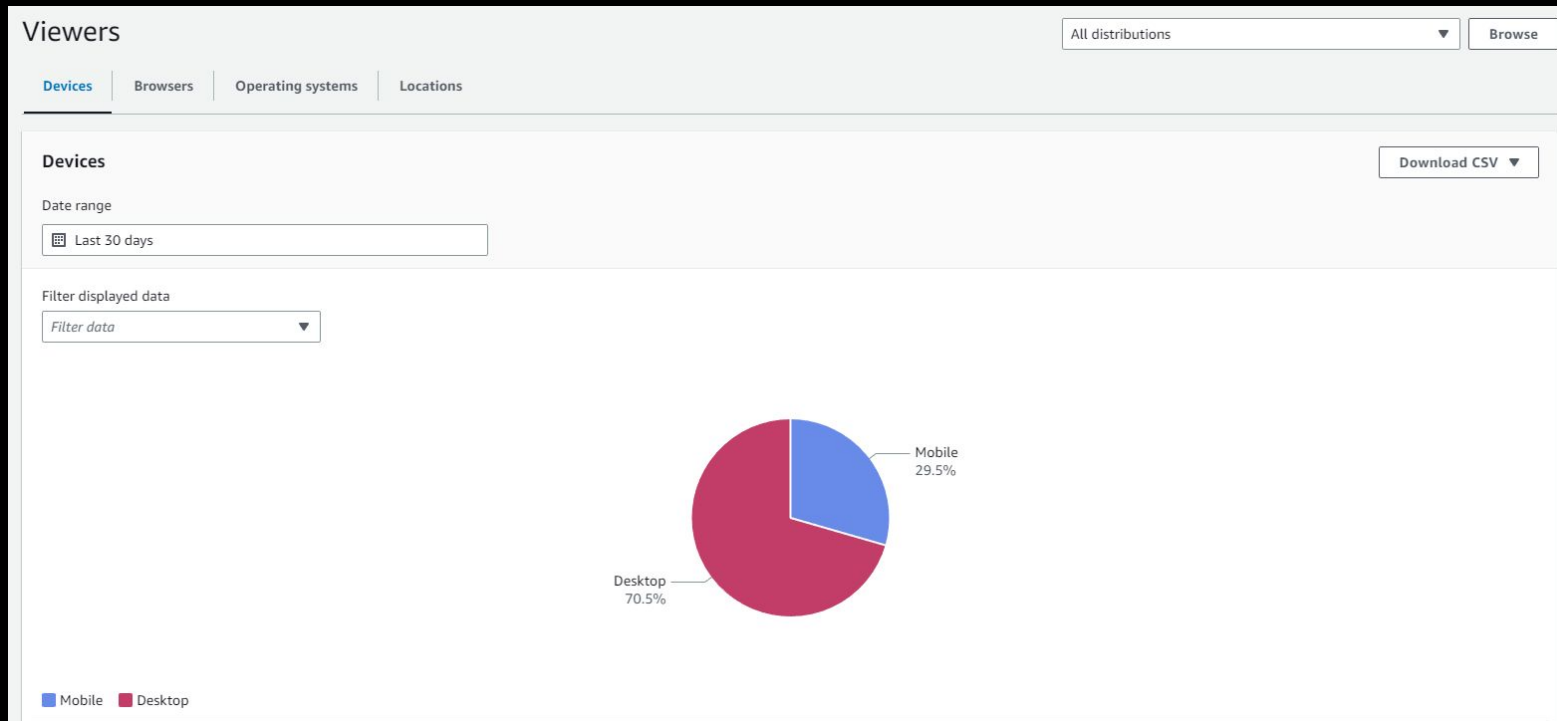
Cloudfront Statistics
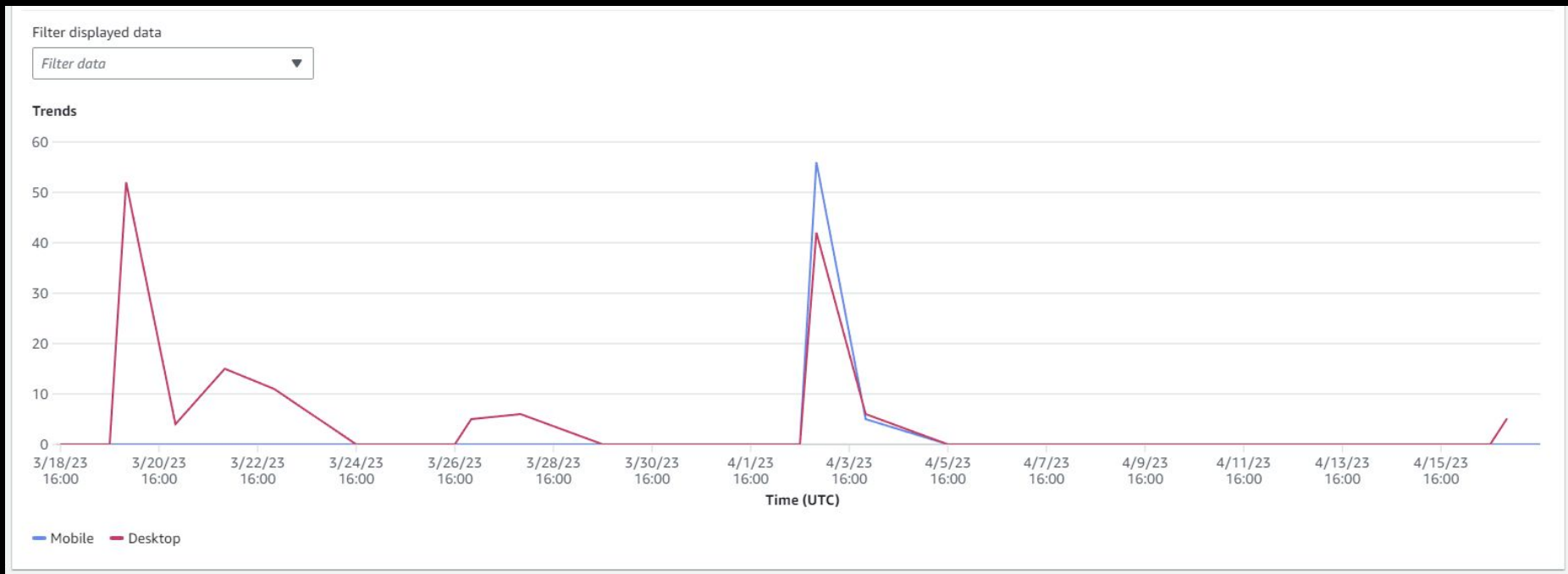
Cloudfront Statistics

Browsers

Date range

📅 Last 30 days

Grouping

Name ▼

Filter displayed data

Filter data ▼

Mobile Safari
29.5%
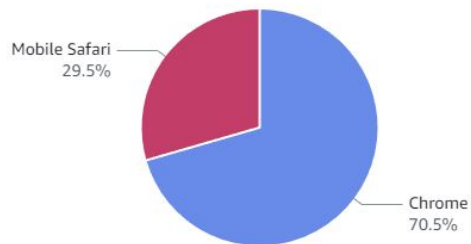
Chrome
70.5%

■ Chrome ■ Mobile Safari

Cloudfront Statistics

Operating systems

Date range

| 📅 Last 30 days |

Grouping

| Name ▼ |

Filter displayed data

| Filter data ▼ |

iOS
29.5%
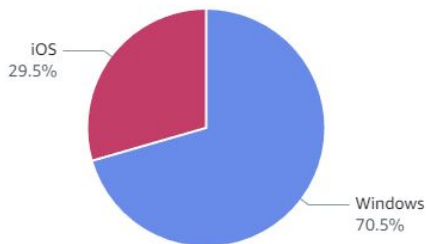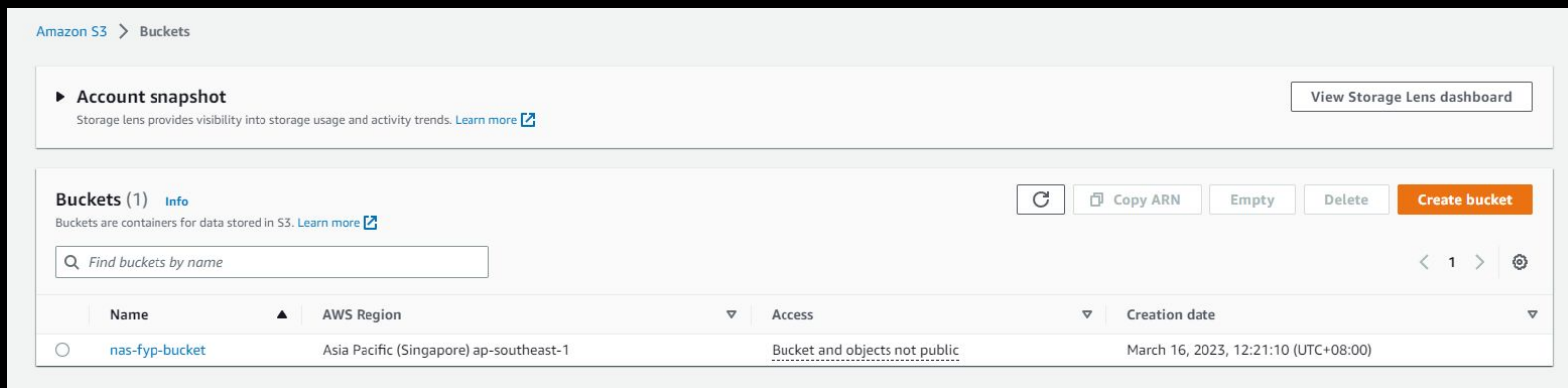
Windows
70.5%

■ Windows ■ iOS

Cloudfront Statistics
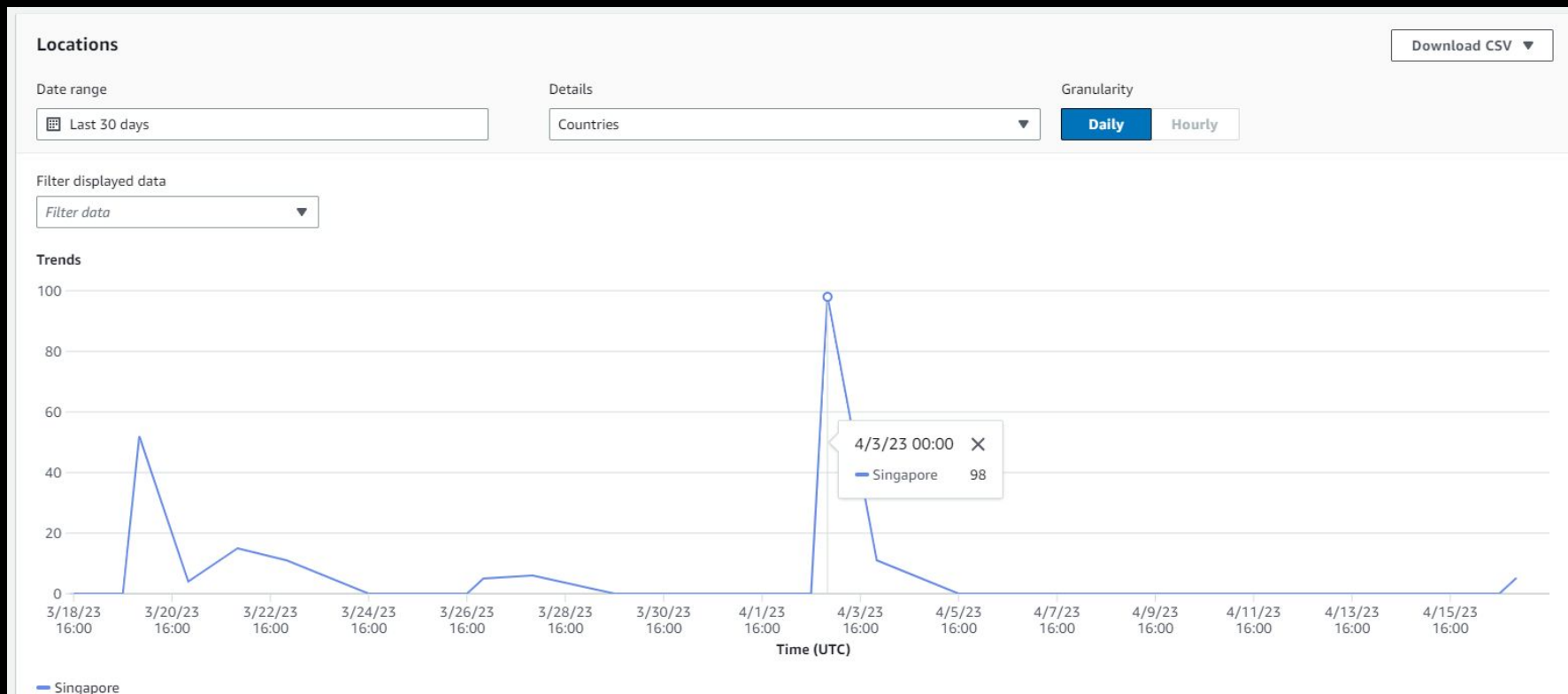
Objective

- Proof of concept for deploying **learning objects** (existing videos or storyline content) to the Web using Amazon Web Services (AWS).

Amazon S3

Amazon S3

Trends and distributions

Primary metric
Total storage ▼

Secondary metric
Object count ▼

Trend for Mar 17 - Apr 16, 2023

Date range
Last 14 days ▼

Aggregation
Daily total ▼

Mar 17 - Apr 16, 2023

— Total storage — Object count
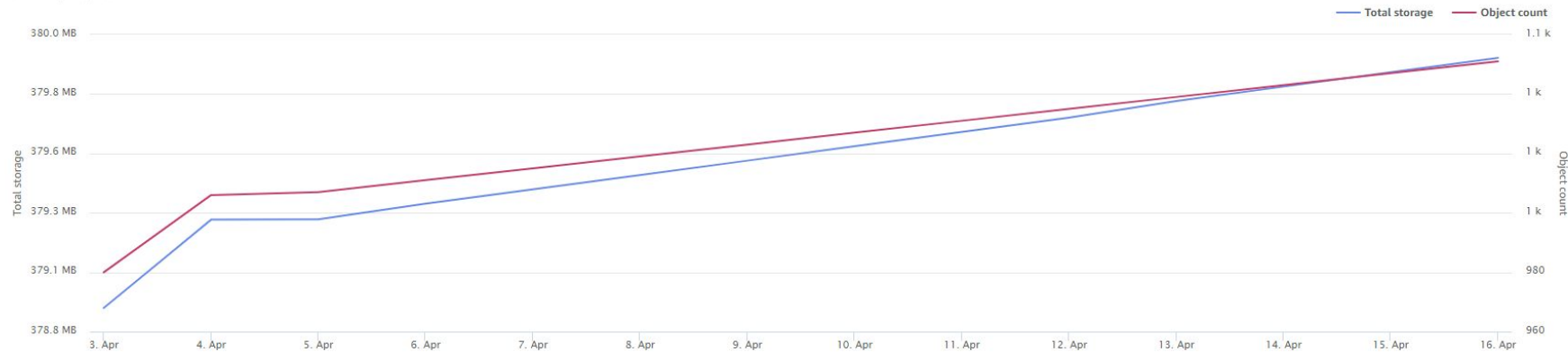
Amazon Athena for Querying

- Creating a database and table to collect metrics and access real-time logs

Cloudfront real-time access logs

1. time: The timestamp of the request.
2. x-edge-location: The edge location that served the request.
3. sc-bytes: The number of bytes served by CloudFront to the viewer.
4. c-ip: The IP address of the viewer.
5. cs-method: The HTTP method used for the request.
6. cs(Host): The domain name of the CloudFront distribution.
7. cs-uri-stem: The URI of the requested object.
8. sc-status: The HTTP status code returned to the viewer.
9. cs(Referer): The URL of the page that referred the viewer to the requested object.
10. cs(User-Agent): The user agent string of the viewer's browser.
11. cs-uri-query: The query string of the request.
12. x-edge-result-type: The result type of the request (e.g. Hit, Miss, Error).
13. x-edge-request-id: The unique ID of the request.
14. x-host-header: The value of the Host header in the viewer's request.
15. cs-protocol: The protocol used for the request (e.g. HTTP/1.1).
16. cs-bytes: The number of bytes in the request.
17. time-taken: The time taken for CloudFront to process the request and serve the response.

```
1  CREATE EXTERNAL TABLE IF NOT EXISTS default.cloudfront_logs (
2    `date` DATE,
3    time STRING,
4    location STRING,
5    bytes BIGINT,
6    request_ip STRING,
7    method STRING,
8    host STRING,
9    uri STRING,
10   status INT,
11   referrer STRING,
12   user_agent STRING,
13   query_string STRING,
14   cookie STRING,
15   result_type STRING,
16   request_id STRING,
17   host_header STRING,
18   request_protocol STRING,
19   request_bytes BIGINT,
20   time_taken FLOAT,
21   xforwarded_for STRING,
22   ssl_protocol STRING,
23   ssl_cipher STRING,
24   response_result_type STRING,
25   http_version STRING,
26   fle_status STRING,
27   fle_encrypted_fields INT,
28   c_port INT,
29   time_to_first_byte FLOAT,
30   x_edge_detailed_result_type STRING,
31   sc_content_type STRING,
32   sc_content_len BIGINT,
33   sc_range_start BIGINT,
34   sc_range_end BIGINT
35  )
36  ROW FORMAT DELIMITED
37  FIELDS TERMINATED BY '\t'
38  LOCATION 's3://nas-fyp-bucket/CloudFrontLogs'
39  TBLPROPERTIES ( 'skip.header.line.count'='2' )
```

Amazon Athena for Querying

- **View count:** This metric measure the number of requests made to this video URL Link. The total of GET/HIT requests equates to the total number of views the video receives.

```
1   SELECT DISTINCT *
2   FROM cloudfront_logs
3   ORDER BY "date", "time"
4
```

```
1   SELECT uri, COUNT(*) AS view_count
2   FROM default.cloudfront_logs
3   WHERE uri LIKE '%.mp4'
4   GROUP BY uri;
5
```

# ▽	uri ▽	view_count
1	/FYPJ_Video_1.mp4	110

Amazon Athena for Querying

- **Completion rate:** This metric measures the percentage of viewers who watched the entire video from start to finish.

```
SELECT REPLACE(uri, ' ', '') AS video_url,
       (SUM(time_taken) / (MAX(time_taken) * COUNT(*))) * 100 AS completion_rate
FROM default.cloudfront_logs
WHERE uri LIKE '%.mp4'
GROUP BY uri;
```

#	▽	video_url	▽	completion_rate
1		/FYPJ_Video_1.mp4		18.054579

Amazon Athena for Querying

- **Drop-off rate:** This metric measures the percentage of viewers who stopped watching the video before the end.

- WHERE uri LIKE '%.mp4%' AND status IN (206, 304) filters the log entries to only include those with URIs that end with ".mp4" and status codes 206 or 304, which indicate successful partial content responses.

```
SELECT
    uri,
    COUNT(*) AS total_views,
    COUNT(CASE WHEN bytes < 1080 THEN 1 END) AS dropoff_views,
    100 * COUNT(CASE WHEN bytes < 1080 THEN 1 END) / COUNT(*) AS dropoff_rate
FROM default.cloudfront_logs
WHERE uri LIKE '%.mp4%' AND status IN (206, 304)
GROUP BY uri
ORDER BY dropoff_rate DESC;
```

#	uri	total_unique_views	dropoff_views	dropoff_rate
1	/FYPJ_Video_1.mp4	97	55	56

Amazon Athena for Querying

- **Rewatch rate:** This metric measures the percentage of viewers who rewound or rewatched parts of the video.

```
SELECT request_ip, uri, COUNT(DISTINCT request_id) AS num_refreshes_or_rewatches
FROM default.cloudfront_logs
WHERE uri LIKE '%.mp4%' AND status = 200
GROUP BY request_ip, uri
ORDER BY request_ip, uri
```

#	request_ip	uri	num_refreshes_or_rewatches
1	202.12.94.240	/FYPJ_Video_1.mp4	12
2	202.12.95.239	/FYPJ_Video_1.mp4	1

Amazon Athena for Querying

- **Learning Object's Efficacy:** This metric measures the time taken to obtain the learning object.

- (in seconds)

```
SELECT AVG(time_taken) AS avg_time_taken
FROM cloudfront_logs
WHERE uri LIKE '%.mp4%'
```

#	▽	avg_time_taken_to_access_vid
1		0.09803636

- The query result indicates that the average time taken to access the video, calculated based on the data in the "access_logs" table, is approximately **0.098** seconds. This means that, on average, it takes users around **0.098** seconds to start accessing or loading the video.

Amazon Athena for Querying

- **Average Engagement:** The average engagement metric represents the average level of engagement of viewers with the e-learning video.

- (in seconds)

```
SELECT AVG(request_bytes) / (1 * 60 * 1000) * 100 AS average_engagement
FROM default.access_logs
WHERE uri LIKE '%.mp4%' AND status = 200;
```

# ▽	average_engagement
1	0.18807692307692306

- Since the video is approximately 1 minute long, the average engagement of **18.8%** implies that viewers, on average, are engaging with the video for around **11.3** seconds **(0.188 * 60 seconds)**.

Amazon Athena for Querying

- **Average View Duration:** Calculate the average time duration for which users watch the video. This metric gives you an indication of user engagement and attention span.

- (in seconds)

```
SELECT AVG(request_bytes) / (SUM(bytes) / (1 * 60 * 1000)) AS average_view_duration
FROM default.access_logs
WHERE uri LIKE '%.mp4%' AND status = 200;
```

#	▽	average_view_duration
1		0.2699668752300331

- The query result indicates that the average view duration of the video, calculated based on the data in the "access_logs" table, is approximately **0.27** minutes. This means that, on average, users are watching around **16.2** seconds of the video before leaving or completing their viewing session.

Conclusion for Sprint 1

R&D and Initiated POC for FYP
(Researched on AWS Apps)

Uploaded Learning Objects
(.mp4 Videos)

Collect Key Metrics for Analysis
(Used Amazon Athena to perform SQL queries to obtained key data points)

SPRINT 2
(27 March - 14 April)

Mentimeter

Objectives

- To understand, deploy and implement Mentimeter quizzes at part of the formative assessment for selected module.

- Complete Mentimeter Course

Objective Key Results

- **Quiz scores:** If the video includes a quiz or assessment, you can collect the scores to measure how well viewers understood the content.

- **User feedback:** Collecting feedback from viewers about the video content, quality, and relevance can provide valuable insights for improving future videos.

Sprint 2 Schedule

Collapse all

To Do

In Progress

6453 Mid-term review presentation via google slides
N NASRULLAH
State — In Progress

6454 Mentimeter Data Cleaning
N NASRULLAH
State — In Progress

6541 Creation of mentimeter quiz
N NASRULLAH
State — In Progress

Done

6452 Mentimeter Course
N NASRULLAH
State — Done

6455 Mentimeter Data Exploration
N NASRULLAH
State — Done

6356 Mentimeter Course
N NASRULLAH
State — Committed

Mentimeter Course

- **Chapter 1: Introduction to Mentimeter Beginner's Course ✅**

- **Chapter 2: What is Mentimeter?✅**

- **Chapter 3: Creating your First Presentation✅**

- **Chapter 4: Exploring the Slide Types✅**

- **Chapter 5: Engaging your audience ✅**

- **Chapter 6: Finishing touches ✅**

Issued: 2023-04-06   Certificate ID: t0mqmp6wwt

THIS CERTIFICATE IS AWARDED TO

Nasrullah Nazaruddin

Has pursued studies and completed all the requirements

Getting Started with Mentimeter - Beginner's Course

Mentimeter
Academy

Mentimeter Downsides

- Data exported from sessions are structured **poorly**, layout and design is **messy** at best.

- Student engagement during sessions are **lacking**.

- With a lack of engagement, commitment to any Mentimeter sessions **decreases** to almost a negligent rate.

- There is no guarantee of students **cheating** through copying of answers.

- Sessions are well designed to look **attractive** but no original use cases.

- **Complicated** to use, there are better alternatives (Slido/Kahoot)

UI/UX Design

What methodology should you use to create innovative and human-centric applications to solve real life problems?

Leaderboard

Points	Name
957 p	ana's mother
942 p	Magical Rhino
937 p	早上好中国 现在我有冰淇淋
929 p	mr kck
928 p	jun hao
919 p	bbbbbbbbbbbbbbbbbbbbbbnbbbb
916 p	Rohanaldo SIUUUUUU
913 p	asyks father
887 p	Black bick
559 p	I'm not here
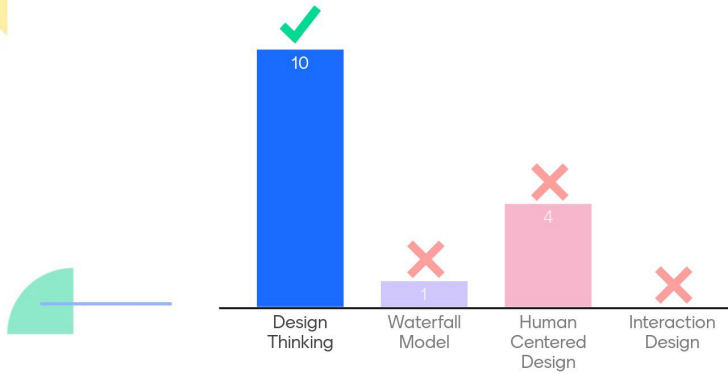
Dataset

Voters | **Session 1** | **Session 2** | **Session 3** | **Session 4**

Note: there are more sheets in this document

Each session is found on its own sheet below. There is a session for each time you have renewed these questions.

Date	Session	Voter	What methodology should you use to create innovative and human-centric applications to solve real life problems?: Name
2023-01-16	1	1	Faris
2023-01-16	2	2	
2023-01-16	3	3	Faris
2023-01-17	4	4	D
2023-01-17	4	5	jun hao
2023-01-17	4	6	Rohanaldo SIUUUUUU
2023-01-17	4	7	bbbbbbbbbbbbbbbbbbbbbnbbbb
2023-01-17	4	8	早上好中国 现在我有冰淇淋
2023-01-17	4	9	asyks father
2023-01-17	4	10	ana's mother
2023-01-17	4	11	mr kck
2023-01-17	4	12	Tigerbaby
2023-01-17	4	13	Magical Rhino
2023-01-17	4	14	I'm not here
2023-01-17	4	15	ben dover
2023-01-17	4	16	Tigermommy
2023-01-17	4	17	Black bick
2023-01-17	4	18	
2023-01-17	4	19	chooongster

Question 1		
Date	2023-01-17	
Session	4	
Type	quiz	
Question	What methodology should you use to create innovative and human-centric applications to solve real life problems?	
Respondents	15	
Choices	Votes	Correct answer
Design Thinking	10	True
Waterfall Model	1	False
Human Centered Design	4	False
Interaction Design	0	False

| Position	Name	Emoji	Score
1	ana's mother	:fire:	957
2	Magical Rhino	:unicorn_face:	942
3	早上好中国 现在我有冰淇淋	:volcano:	937
4	mr kck	:watermelon:	929
5	jun hao	:the_horns:	928
6	bbbbbbbbbbbbbbbbbbbbbnbbbb	:crocodile:	919
7	Rohanaldo SIUUUUUU	:crown:	916
8	asyks father	:crab:	913
9	Black bick	:flag-se:	887
10	I'm not here	:angel:	559
11	ben dover	:four_leaf_clover:	0
12	chooongster	:ghost:	0
13	Tigerbaby	:tiger2:	0
14	Tigermommy	:snowflake:	0
15	D	:articulated_lorry:	0

Solutions

- **Data preparation:** The Excel data will be cleaned and transformed to ensure it is ready for analysis in Power BI.

- **Data modeling:** Appropriate data models will be created to reflect the structure of the Session 4 data and relationships between different fields.

- **Metric definition:** The metrics and KPIs to measure, such as the number of correct responses and response distribution, will be defined to assess the effectiveness of Mentimeter quizzes.

- **Dashboard creation:** Dashboards will be created in Power BI to visualize the Session 4 data and metrics defined, enabling tracking of Mentimeter quiz effectiveness over time.

- **Evaluation and optimization:** The effectiveness of Mentimeter quizzes will be evaluated based on insights gained from Power BI dashboards and optimized to improve formative assessment for the selected module.

Conclusion for Sprint 2
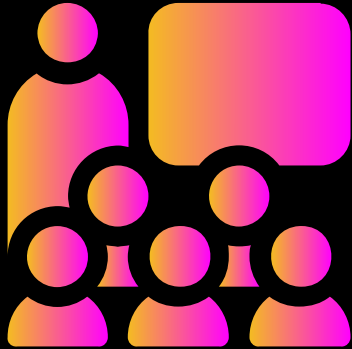
Improved Assessment:
collect quiz scores and measure how well viewers understood the content
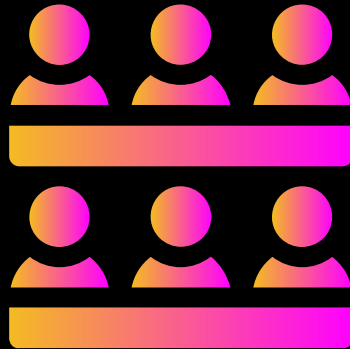
Enhanced User Experience:
improve future experience for students, engaging content, integrate with learning objects from Sprint 1

Streamlined Data Analysis:
data preparation and modeling in Excel, along with metric definition and dashboard creation in Power BI

The Importance for this FYPJ

Potential Deployment

- **Real-life scenarios,** good case studies for data analysis, learning analytics and visualisation-related teaching modules

- **Developing online quizzes** and can be adapted and reused as formative assessment of future teaching modules

- **Empirical research** can also be conducted by combining both data analytics approach and the quantitative/qualitative survey approaches to measure online learning engagement

What I learnt

- **Hands-on experience** deploying learning objects (videos, storyline content) to the web using AWS

- **Practical experience** acquiring requirements, user testing, and implementing e-quizzes via Mentimeter cloud-based gamification tools for formative assessment

- **Develop competencies** in designing and creating interesting visualisation by using many different colours, and adding learning objects in the quizzes

- **Understanding** and **extracting** learning analytics (collection, cleaning, transformation, and modelling) from various online environments

Challenges for Sprint 1-2

Data collection challenges

difficulties in acquiring necessary data and ensuring data quality is good
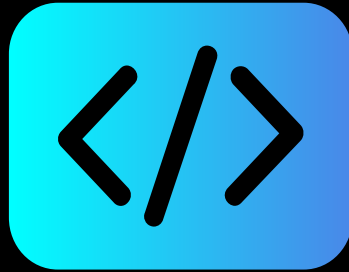
Technical challenges

Researching SQL Statements for queries and researching the proper use of AWS apps

Time management challenges

Struggling to find solutions through to keep to the sprint schedules

👏 **Thank You** 🎉
Any Questions?