Lab Task 1

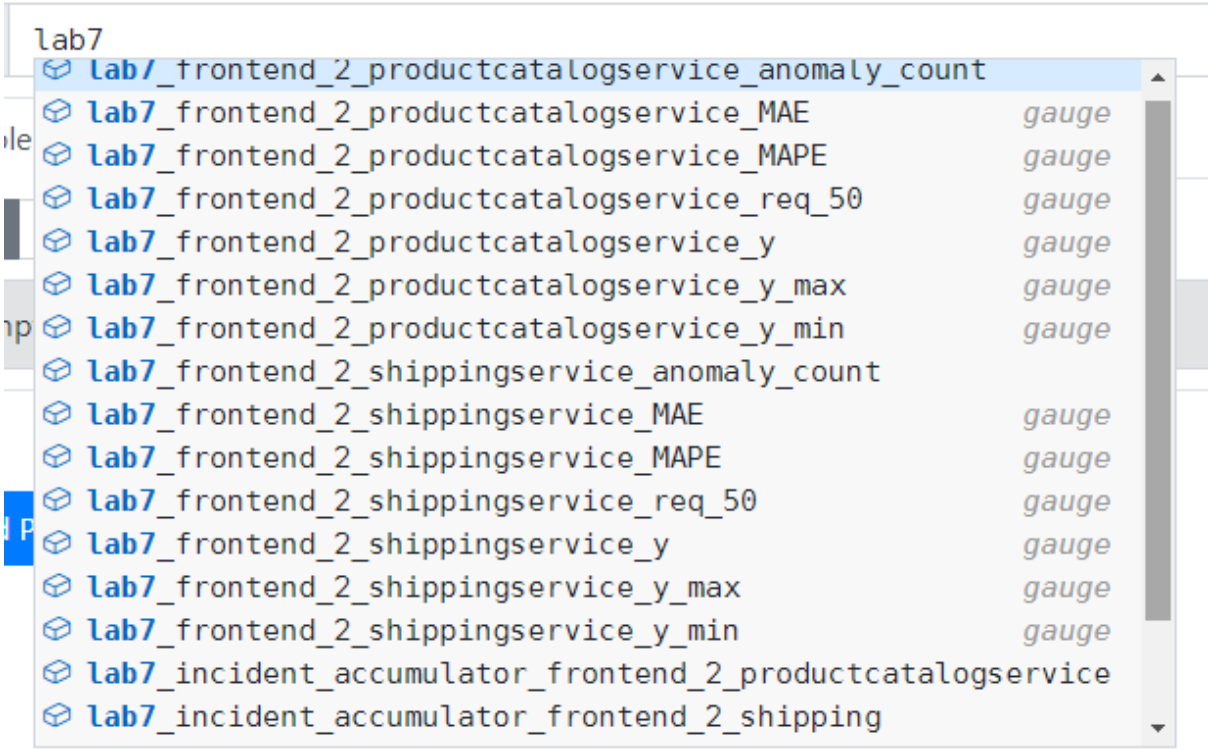
Console log for frontend to shippingservice

```
emiles@Emiles:/mnt/c/WINDOWS/system32/AIOpsdir/lab7/microservices-demo/src/monitor$ kubectl logs lab7-monitor-frontendtoshipping-69d776d9db-rrhhs
15:15:57 - cmdstanpy - INFO - Chain [1] start processing
15:15:57 - cmdstanpy - INFO - Chain [1] done processing
          ds                   y      yhat  yhat_lower  yhat_upper
0 1970-01-01  6.607142857142858  1.523974   -5.541439     8.01909
The MAE for the model is 5.083168440757724
The MAPE for the model is 0.769344412655223
             Timestamp       MAE      MAPE  Anomalies
0  2023-12-13 15:15:57  5.083168  0.769344          0
          ds                   y      yhat  yhat_lower  yhat_upper
0 1970-01-01  4.545454545454545  1.523974   -4.591094    7.863926
The MAE for the model is 3.0214801290694115
The MAPE for the model is 0.6647256283952706
             Timestamp       MAE      MAPE  Anomalies
0  2023-12-13 15:15:57  5.083168  0.769344          0
1  2023-12-13 15:15:57  3.021480  0.664726          0
          ds                   y      yhat  yhat_lower  yhat_upper
0 1970-01-01  3.358974358974359  1.523974    -4.99783    7.879195
The MAE for the model is 1.8349999425892256
          ds                   y      yhat  yhat_lower  yhat_upper
0 1970-01-01  9.421641791044776  1.523974     -4.4416    7.518882
The MAE for the model is 7.897667374659642
The MAPE for the model is 0.838247467884667
             Timestamp       MAE      MAPE  Anomalies
0   2023-12-13 15:15:57  5.083168  0.769344          0
1   2023-12-13 15:15:57  3.021480  0.664726          0
2   2023-12-13 15:15:57  1.835000  0.546298          0
3   2023-12-13 15:15:57  3.700385  0.708294          0
4   2023-12-13 15:15:57  2.238457  0.594950          0
5   2023-12-13 15:15:57  5.164622  0.772153          0
6   2023-12-13 15:15:57  3.749135  0.710991          0
7   2023-12-13 15:15:57  7.018970  0.821610          1
8   2023-12-13 15:15:57  8.032477  0.840529          1
9   2023-12-13 15:15:57  7.676533  0.834360          1
10  2023-12-13 15:15:57  8.331289  0.845364          1
11  2023-12-13 15:15:57  7.897667  0.838247          1
          ds     y      yhat  yhat_lower  yhat_upper
0 1970-01-01  6.25  1.523974   -4.597372    7.176163
The MAE for the model is 4.726025583614867
The MAPE for the model is 0.7561640933783786
```

Console log for frontend to productcatalogservice

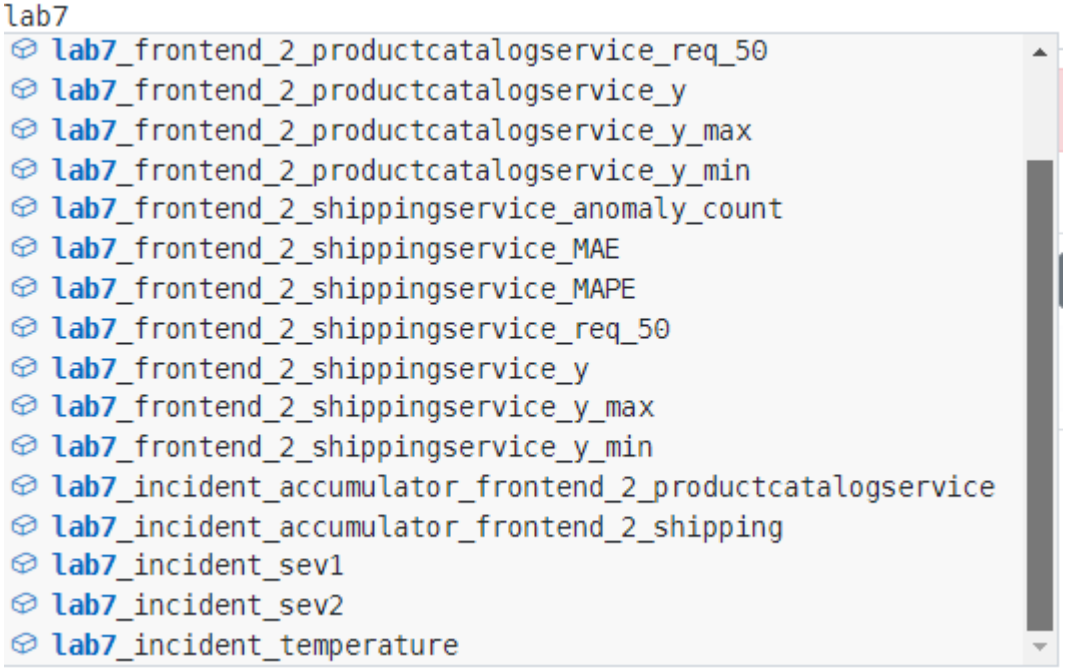
```
emiles@Emiles:/mnt/c/WINDOWS/system32/AIOpsdir/lab7/microservices-demo/src/monitor$ kubectl logs lab7-monitor-frontendtoproduct-847c955d7f-vbtlb
15:15:43 - cmdstanpy - INFO - Chain [1] start processing
15:15:43 - cmdstanpy - INFO - Chain [1] done processing
          ds                   y      yhat  yhat_lower  yhat_upper
0 1970-01-01  6.076388888888889  1.565561   -5.328993    8.180554
The MAE for the model is 4.510828072609675
The MAPE for the model is 0.7423534199494779
             Timestamp       MAE      MAPE  Anomalies
0  2023-12-13 15:15:43  4.510828  0.742353          0
          ds                   y      yhat  yhat_lower  yhat_upper
0 1970-01-01  4.102702702702703  1.565561   -4.823066    9.454967
The MAE for the model is 2.5371418864234885
The MAPE for the model is 0.6184074426723918
             Timestamp       MAE      MAPE  Anomalies
0  2023-12-13 15:15:43  4.510828  0.742353          0
1  2023-12-13 15:15:43  2.537142  0.618407          0
          ds                   y      yhat  yhat_lower  yhat_upper
0 1970-01-01  3.5217391304347823  1.565561   -5.427342    9.004537
The MAE for the model is 1.9561783141555678
The MAPE for the model is 0.5554580398219514
             Timestamp       MAE      MAPE  Anomalies
0  2023-12-13 15:15:43  4.510828  0.742353          0
1  2023-12-13 15:15:43  2.537142  0.618407          0
2  2023-12-13 15:15:43  1.956178  0.555458          0
          ds                   y      yhat  yhat_lower  yhat_upper
0 1970-01-01  4.921153030945316  1.565561   -5.493586    8.912055
The MAE for the model is 3.3555922146661015
The MAPE for the model is 0.681871137427628
             Timestamp         MAE       MAPE  Anomalies
0  2023-12-13 15:15:43    4.510828   0.742353          0
1  2023-12-13 15:15:43    2.537142   0.618407          0
2  2023-12-13 15:15:43    1.956178   0.555458          0
3  2023-12-13 15:15:43    3.355592   0.681871          0
4  2023-12-13 15:15:43    2.512674   0.616118          0
5  2023-12-13 15:15:43    5.881352   0.789771          0
6  2023-12-13 15:15:43    5.070217   0.764073          0
7  2023-12-13 15:15:43   11.055554   0.875957          1
8  2023-12-13 15:15:43   12.785256   0.890908          1
9  2023-12-13 15:15:43   17.204078   0.916591          1
          ds                   y      yhat  yhat_lower  yhat_upper
0 1970-01-01  18.57006571973712  1.565561   -4.869748    8.737726
The MAE for the model is 17.004504903457907
The MAPE for the model is 0.9156943847207141
```

Prometheus list of metric names created by monitor



Lab Task 2

Prometheus list of metric names from both instances running of monitor



Lab Task 3

Console log of running incident detector with custom load but no Istio faults.

```
emiles@Emiles:/mnt/c/WINDOWS/system32/AIOpsdir/lab7/microservices-demo/src/monitor$ python3 incident_detector.py
+---------------------+---------------------+---------------------+---------------+-----------------+-----------------+
| Timestamp           | Accumulator_F_2_S   | Accumulator_F_2_P   |   Temperature |   Incident_Sev_1 |   Incident_Sev_2 |
|---------------------+---------------------+---------------------+---------------+-----------------+-----------------|
| 2023-12-13 23:56:45 | False               | False               |             0 |               0 |               0 |
+---------------------+---------------------+---------------------+---------------+-----------------+-----------------+
+---------------------+---------------------+---------------------+---------------+-----------------+-----------------+
| Timestamp           | Accumulator_F_2_S   | Accumulator_F_2_P   |   Temperature |   Incident_Sev_1 |   Incident_Sev_2 |
|---------------------+---------------------+---------------------+---------------+-----------------+-----------------|
| 2023-12-13 23:56:45 | False               | False               |             0 |               0 |               0 |
| 2023-12-13 23:56:45 | False               | False               |             0 |               0 |               0 |
+---------------------+---------------------+---------------------+---------------+-----------------+-----------------+
+---------------------+---------------------+---------------------+---------------+-----------------+-----------------+
| Timestamp           | Accumulator_F_2_S   | Accumulator_F_2_P   |   Temperature |   Incident_Sev_1 |   Incident_Sev_2 |
|---------------------+---------------------+---------------------+---------------+-----------------+-----------------|
| 2023-12-13 23:56:45 | False               | False               |             0 |               0 |               0 |
| 2023-12-13 23:56:45 | False               | False               |             0 |               0 |               0 |
| 2023-12-13 23:56:45 | False               | False               |             0 |               0 |               0 |
+---------------------+---------------------+---------------------+---------------+-----------------+-----------------+
+---------------------+---------------------+---------------------+---------------+-----------------+-----------------+
| Timestamp           | Accumulator_F_2_S   | Accumulator_F_2_P   |   Temperature |   Incident_Sev_1 |   Incident_Sev_2 |
|---------------------+---------------------+---------------------+---------------+-----------------+-----------------|
| 2023-12-13 23:56:45 | False               | False               |             0 |               0 |               0 |
| 2023-12-13 23:56:45 | False               | False               |             0 |               0 |               0 |
| 2023-12-13 23:56:45 | False               | False               |             0 |               0 |               0 |
| 2023-12-13 23:56:45 | False               | False               |             0 |               0 |               0 |
+---------------------+---------------------+---------------------+---------------+-----------------+-----------------+
+---------------------+---------------------+---------------------+---------------+-----------------+-----------------+
| Timestamp           | Accumulator_F_2_S   | Accumulator_F_2_P   |   Temperature |   Incident_Sev_1 |   Incident_Sev_2 |
|---------------------+---------------------+---------------------+---------------+-----------------+-----------------|
| 2023-12-13 23:56:45 | False               | False               |             0 |               0 |               0 |
| 2023-12-13 23:56:45 | False               | False               |             0 |               0 |               0 |
| 2023-12-13 23:56:45 | False               | False               |             0 |               0 |               0 |
| 2023-12-13 23:56:45 | False               | False               |             0 |               0 |               0 |
| 2023-12-13 23:56:45 | False               | False               |             0 |               0 |               0 |
+---------------------+---------------------+---------------------+---------------+-----------------+-----------------+
```

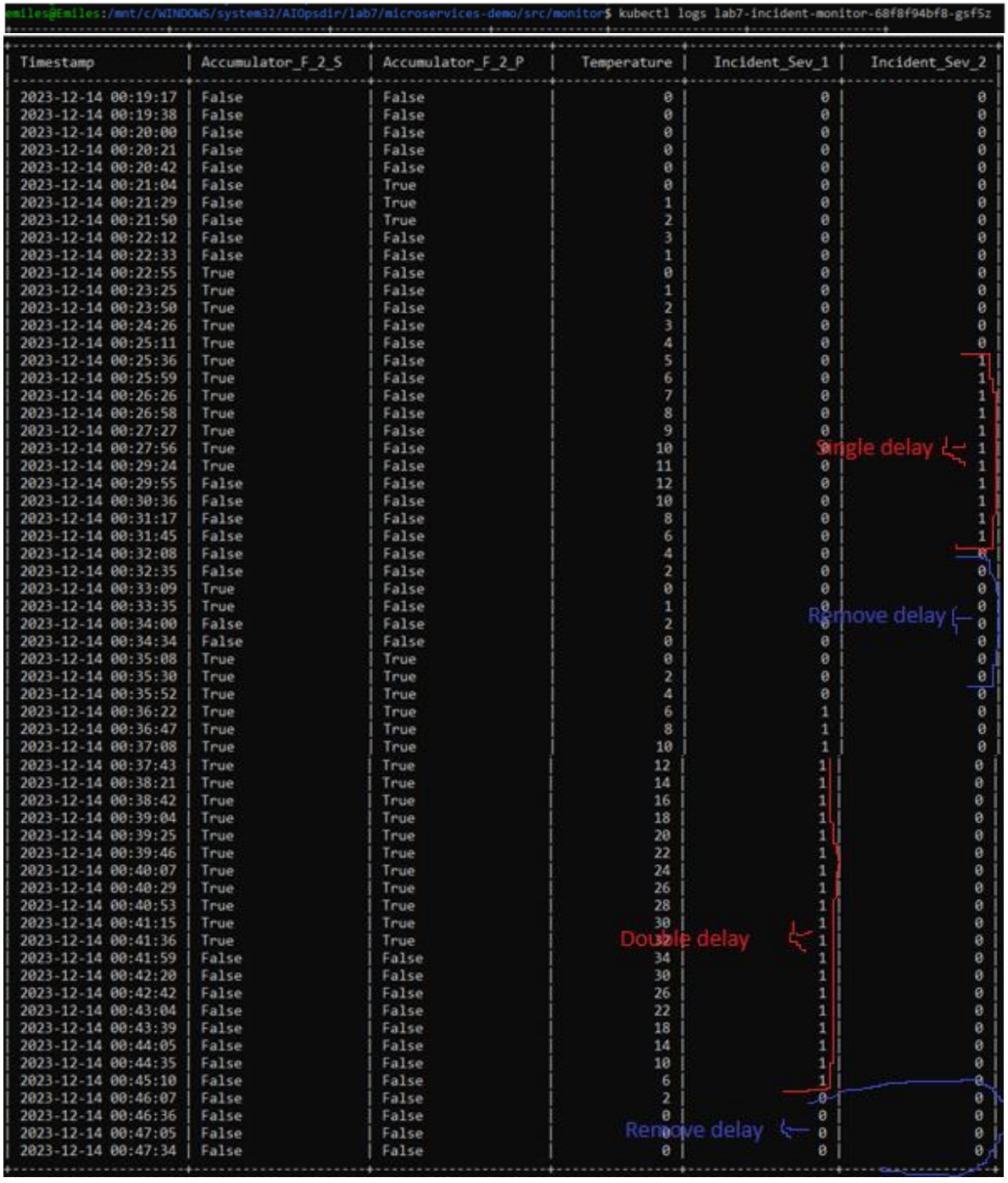
```
+---------------------+---------------------+---------------------+---------------+-----------------+-----------------+
| Timestamp           | Accumulator_F_2_S   | Accumulator_F_2_P   |   Temperature |   Incident_Sev_1 |   Incident_Sev_2 |
|---------------------+---------------------+---------------------+---------------+-----------------+-----------------|
| 2023-12-13 23:56:45 | False               | False               |             0 |               0 |               0 |
| 2023-12-13 23:56:45 | False               | False               |             0 |               0 |               0 |
| 2023-12-13 23:56:45 | False               | False               |             0 |               0 |               0 |
| 2023-12-13 23:56:45 | False               | False               |             0 |               0 |               0 |
| 2023-12-13 23:56:45 | False               | False               |             0 |               0 |               0 |
| 2023-12-13 23:56:45 | False               | False               |             0 |               0 |               0 |
| 2023-12-13 23:56:45 | False               | False               |             0 |               0 |               0 |
| 2023-12-13 23:56:45 | False               | False               |             0 |               0 |               0 |
| 2023-12-13 23:56:45 | False               | False               |             0 |               0 |               0 |
| 2023-12-13 23:56:45 | False               | False               |             0 |               0 |               0 |
| 2023-12-13 23:56:45 | False               | False               |             0 |               0 |               0 |
| 2023-12-13 23:56:45 | False               | False               |             0 |               0 |               0 |
| 2023-12-13 23:56:45 | False               | False               |             0 |               0 |               0 |
+---------------------+---------------------+---------------------+---------------+-----------------+-----------------+
```

This is how I refined the flowchart and the reason:

The primary condition checks whether the sum of certain accumulators exceeds a predefined threshold. If true, the severity of the incident is determined based on two additional conditions: if both shipping and product category services accumulators surpass their respective thresholds, it is classified as severity level 1; if only one of them exceeds its threshold, it is considered severity level 2. If the primary condition is false, both severity metrics are set to 0. I used this logic to categorize incidents into different severity levels based on configurable thresholds and accumulator values, providing a systematic approach to incident detection and classification in a broader system context.

Lab Task 4

Console log showing detected anomalies Sev 2 (for single delay) and Sev 1 (for double delay)



Timestamp	Accumulator_F_2_S	Accumulator_F_2_P	Temperature	Incident_Sev_1	Incident_Sev_2
2023-12-14 00:19:17	False	False	0	0	0
2023-12-14 00:19:38	False	False	0	0	0
2023-12-14 00:20:00	False	False	0	0	0
2023-12-14 00:20:21	False	False	0	0	0
2023-12-14 00:20:42	False	False	0	0	0
2023-12-14 00:21:04	False	True	0	0	0
2023-12-14 00:21:29	False	True	1	0	0
2023-12-14 00:21:50	False	True	2	0	0
2023-12-14 00:22:12	False	False	3	0	0
2023-12-14 00:22:33	False	False	1	0	0
2023-12-14 00:22:55	True	False	0	0	0
2023-12-14 00:23:25	True	False	1	0	0
2023-12-14 00:23:50	True	False	2	0	0
2023-12-14 00:24:26	True	False	3	0	0
2023-12-14 00:25:11	True	False	4	0	0
2023-12-14 00:25:36	True	False	5	0	1
2023-12-14 00:25:59	True	False	6	0	1
2023-12-14 00:26:26	True	False	7	0	1
2023-12-14 00:26:58	True	False	8	0	1
2023-12-14 00:27:27	True	False	9	0	1
2023-12-14 00:27:56	True	False	10	0	1
2023-12-14 00:29:24	True	False	11	0	1
2023-12-14 00:29:55	False	False	12	0	1
2023-12-14 00:30:36	False	False	10	0	1
2023-12-14 00:31:17	False	False	8	0	1
2023-12-14 00:31:45	False	False	6	0	1
2023-12-14 00:32:08	False	False	4	0	0
2023-12-14 00:32:35	False	False	2	0	0
2023-12-14 00:33:09	True	False	0	0	0
2023-12-14 00:33:35	True	False	1	0	0
2023-12-14 00:34:00	False	False	2	0	0
2023-12-14 00:34:34	False	False	0	0	0
2023-12-14 00:35:08	True	True	0	0	0
2023-12-14 00:35:30	True	True	2	0	0
2023-12-14 00:35:52	True	True	4	0	0
2023-12-14 00:36:22	True	True	6	1	0
2023-12-14 00:36:47	True	True	8	1	0
2023-12-14 00:37:08	True	True	10	1	0
2023-12-14 00:37:43	True	True	12	1	0
2023-12-14 00:38:21	True	True	14	1	0
2023-12-14 00:38:42	True	True	16	1	0
2023-12-14 00:39:04	True	True	18	1	0
2023-12-14 00:39:25	True	True	20	1	0
2023-12-14 00:39:46	True	True	22	1	0
2023-12-14 00:40:07	True	True	24	1	0
2023-12-14 00:40:29	True	True	26	1	0
2023-12-14 00:40:53	True	True	28	1	0
2023-12-14 00:41:15	True	True	30	1	0
2023-12-14 00:41:36	True	True	32	1	0
2023-12-14 00:41:59	False	False	34	1	0
2023-12-14 00:42:20	False	False	30	1	0
2023-12-14 00:42:42	False	False	26	1	0
2023-12-14 00:43:04	False	False	22	1	0
2023-12-14 00:43:39	False	False	18	1	0
2023-12-14 00:44:05	False	False	14	1	0
2023-12-14 00:44:35	False	False	10	1	0
2023-12-14 00:45:10	False	False	6	1	0
2023-12-14 00:46:07	False	False	2	0	0
2023-12-14 00:46:36	False	False	0	0	0
2023-12-14 00:47:05	False	False	0	0	0
2023-12-14 00:47:34	False	False	0	0	0

This how delay for single and double delays were injected.

```
emiles@Emiles:/mnt/c/WINDOWS/system32/AIOpsdir/lab7/microservices-demo/src$ kubectl apply -f lab7_finject_sv1.yaml
virtualservice.networking.istio.io/shippingservice created
emiles@Emiles:/mnt/c/WINDOWS/system32/AIOpsdir/lab7/microservices-demo/src$
```

```
emiles@Emiles:/mnt/c/WINDOWS/system32/AIOpsdir/lab7/microservices-demo/src$ kubectl apply -f lab7_finject.yaml
virtualservice.networking.istio.io/shippingservice created
virtualservice.networking.istio.io/productcatalogservice created
```

Lab Task 5

Console logs showing transient generation and associated anomaly and incident detection.

```
emiles@Emiles:/mnt/c/WINDOWS/system32/AIOpsdir/lab7/microservices-demo/src/monitor$ kubectl logs lab7-incident-monitor-86b9564c94-v7fzq
```

Timestamp	Accumulator_F_2_S	Accumulator_F_2_P	Temperature	Incident_Sev_1	Incident_Sev_2
2023-12-15 17:48:02	False	False	0	0	0
2023-12-15 17:48:08	False	False	0	0	0
2023-12-15 17:48:15	False	False	0	0	0
2023-12-15 17:48:21	False	False	0	0	0
2023-12-15 17:48:27	False	False	0	0	0
2023-12-15 17:48:33	False	False	0	0	0
2023-12-15 17:48:40	False	False	0	0	0
2023-12-15 17:48:46	False	False	0	0	0
2023-12-15 17:48:52	False	False	0	0	0
2023-12-15 17:48:59	False	False	0	0	0
2023-12-15 17:49:06	False	False	0	0	0
2023-12-15 17:49:12	False	False	0	0	0
2023-12-15 17:49:19	True	False	0	0	0
2023-12-15 17:49:25	True	False	1	0	0
2023-12-15 17:49:31	True	False	2	0	0
2023-12-15 17:49:37	True	False	3	0	0
2023-12-15 17:49:43	True	False	4	0	0
2023-12-15 17:49:50	True	False	5	0	1
2023-12-15 17:49:56	True	False	6	0	1
2023-12-15 17:50:02	True	False	7	0	1
2023-12-15 17:50:09	True	False	8	0	1
2023-12-15 17:50:15	True	False	9	0	1
2023-12-15 17:50:21	True	False	10	0	1
2023-12-15 17:50:27	True	False	11	0	1
2023-12-15 17:50:33	True	False	12	0	1
2023-12-15 17:50:40	True	False	13	0	1
2023-12-15 17:50:46	True	False	14	0	1
2023-12-15 17:50:53	True	False	15	0	1
2023-12-15 17:50:59	True	False	16	0	1
2023-12-15 17:51:05	True	False	17	0	1
2023-12-15 17:51:11	True	True	18	0	1
2023-12-15 17:51:18	True	True	20	0	1
2023-12-15 17:51:24	True	True	22	0	1
2023-12-15 17:51:30	True	True	24	1	0
2023-12-15 17:51:36	True	True	26	1	0
2023-12-15 17:51:42	True	True	28	1	0
2023-12-15 17:51:49	True	True	30	1	0
2023-12-15 17:51:55	True	True	32	1	0
2023-12-15 17:52:01	True	True	34	1	0
2023-12-15 17:52:07	True	True	36	1	0
2023-12-15 17:52:13	True	False	38	1	0
2023-12-15 17:52:20	True	False	37	1	0
2023-12-15 17:52:26	True	False	36	1	0
2023-12-15 17:52:32	True	False	35	1	0
2023-12-15 17:52:40	True	False	34	1	0
2023-12-15 17:52:46	True	False	33	0	1
2023-12-15 17:52:52	True	False	34	0	1
2023-12-15 17:52:59	True	False	35	0	1
2023-12-15 17:53:05	True	False	36	0	1
2023-12-15 17:53:11	True	True	37	0	1
2023-12-15 17:53:17	True	True	39	0	1
2023-12-15 17:53:24	True	True	41	0	1
2023-12-15 17:53:30	True	True	43	1	0
2023-12-15 17:53:36	True	True	45	1	0
2023-12-15 17:53:42	True	True	47	1	0
2023-12-15 17:53:49	True	True	49	1	0
2023-12-15 17:53:55	True	True	51	1	0
2023-12-15 17:54:01	True	True	53	1	0
2023-12-15 17:54:07	True	True	55	1	0
2023-12-15 17:54:13	True	False	57	1	0
2023-12-15 17:54:20	True	False	56	1	0
2023-12-15 17:54:26	True	False	55	1	0
2023-12-15 17:54:32	True	False	54	1	0
2023-12-15 17:54:38	True	False	53	1	0
2023-12-15 17:54:45	True	False	52	0	1
2023-12-15 17:54:51	True	False	53	0	1
2023-12-15 17:54:57	True	False	54	0	1

This is how the transients was configured and why:

The configurations define transient spikes based on the duration of the load testing run in seconds (transient_min_run_secs and transient_max_run_secs) and the corresponding surge in users (transient_surge).

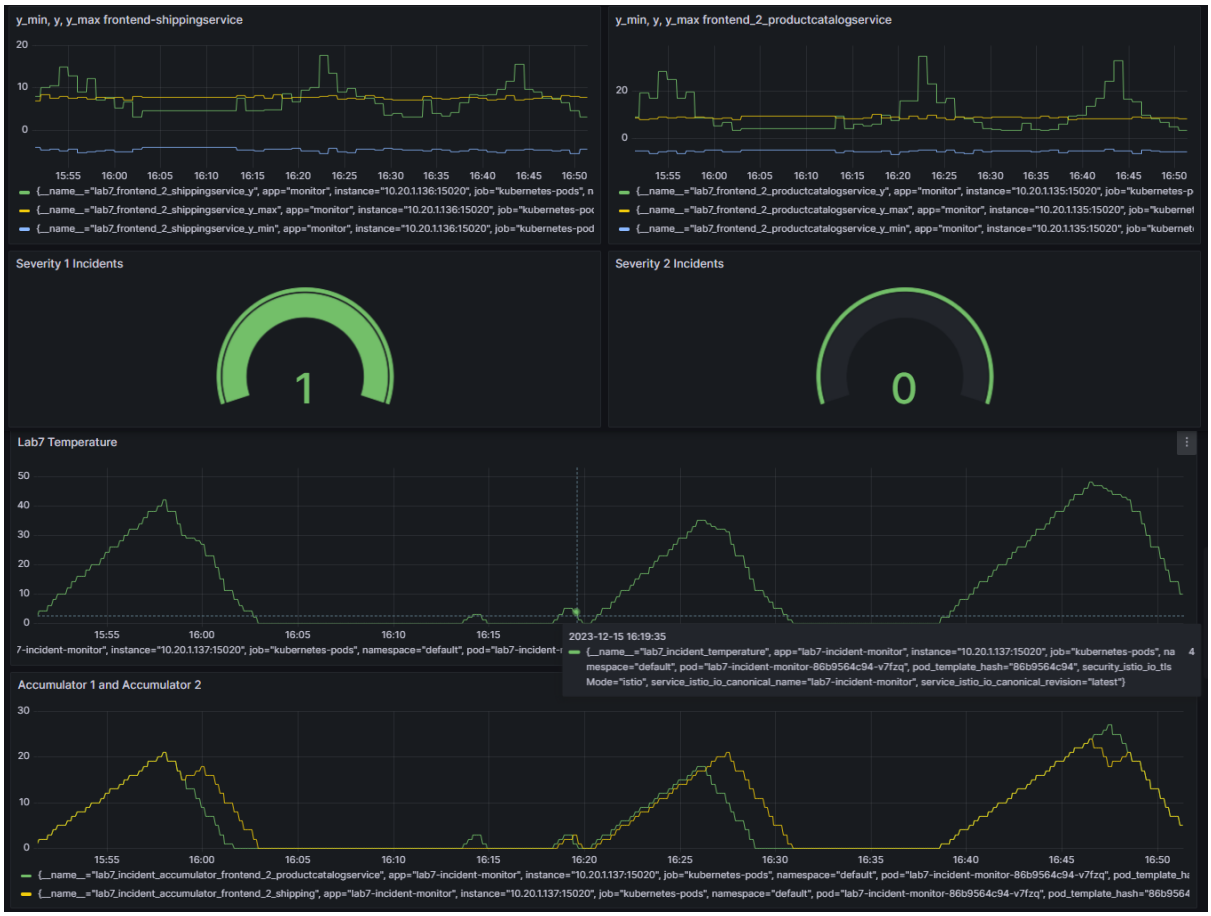
The original configuration had longer durations for transient spikes, ranging from 150 to 670 seconds, with associated user surges of 100 to 200 users.

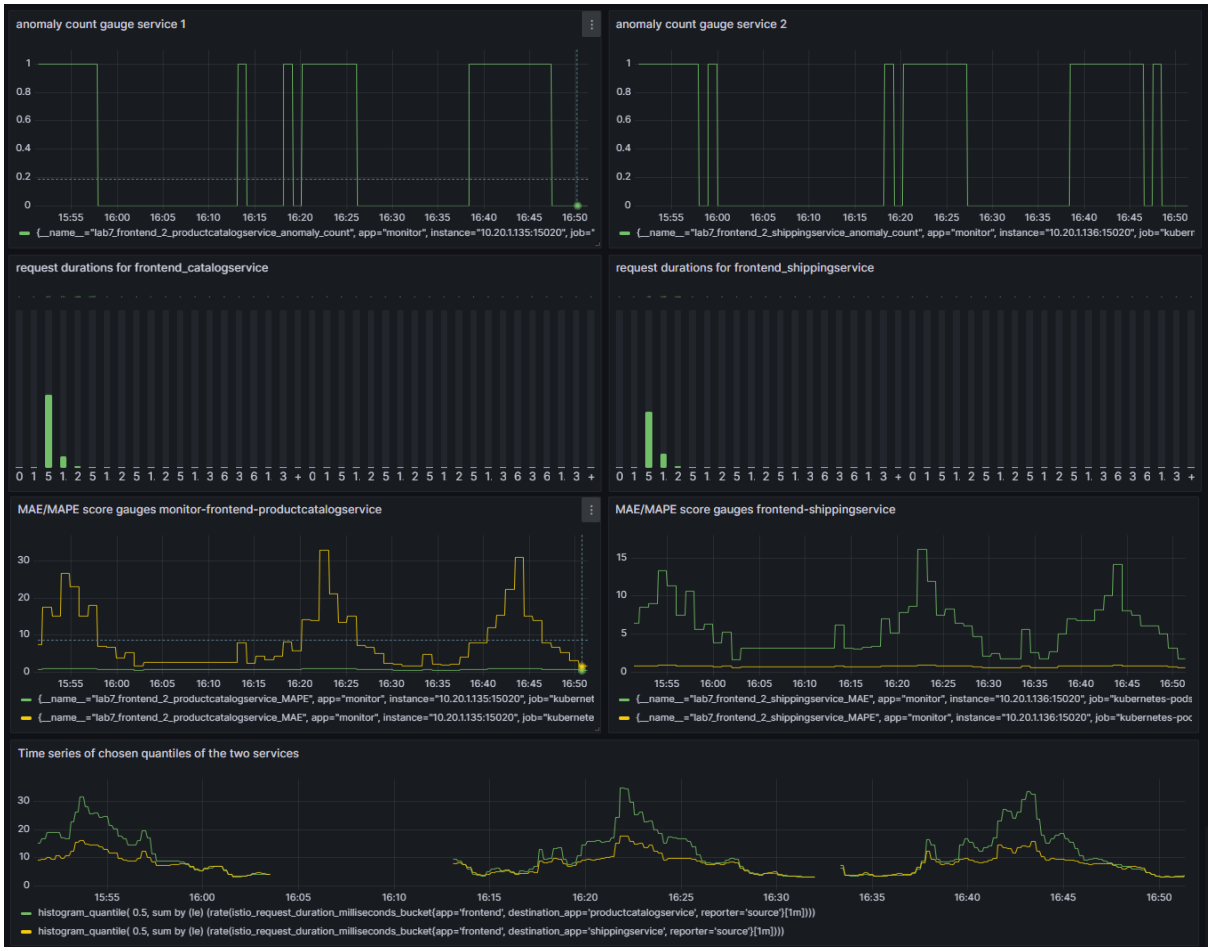
The modified configuration shortens the duration of transient spikes, ranging from 100 to 620 seconds, and reduces the associated user surges to 80 or 150 users.

The adjustments in the modified configuration were to create more dynamic and varied load patterns during testing, to simulate more realistic scenarios or to explore the system's behavior under different stress conditions.

Lab Task 6

Screen shot of your designed and implemented Grafana dashboard.





Lab Task 7

Screen shot of the successful removal of credit card 2399 from your account