

SCSB Digital Bank Project

Performance Test Report

Submission Unit: VNB

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1 Introduction

1.1 Purpose of Writing

This test report is a performance test report of the SCSB Digital Bank project, which aims to reflect the performance of the system under multiple concurrent conditions. This test analyzes the performance of the current system in terms of transaction response time, TPS, number of concurrent users, system resource usage and other aspects with professional performance testing tools, and compares the actual test data with the expected performance requirements to check whether the system meets the established performance indicators.

1.2 Testing Objectives

The findings of this performance test report enable us to define and establish the foundational sizing requirements necessary for our operational business environment, especially during the initial months of bank launch. This report serves as a baseline reference point for establishing initial performance expectations, with the implementation of monitoring to track cloud resources utilization and determining the necessary scaling strategies to accommodate growth beyond the initial setup.

1.3 Key Terms And Definitions

1. **Transaction Per Second(TPS):** It refers to the transaction volume that the system can process per second per concurrent number of user set, which is used to measure the transaction processing capacity of the system under test under different pressures under certain software and hardware conditions.
2. **Average Response Time(AvgRT):** It refers to the average time elapsed from the client initiating a transaction request to receiving the response from the server.
3. **Transaction Success Rate:** Refers to the ratio of the number of successful transactions to the total number of completed transactions during system transaction processing, which positively reflects the usability, reliability and stability of the tested system.

4. **The Maximum Number of Concurrent:** The maximum number of concurrent users that the system can handle when all hardware indicators of the system are running at full load.
5. **The Optimum Number of Concurrent:** When the CPU and memory utilization rate is no more than 80% and the transaction success rate is greater than 99.999%, the number of concurrency when the TPS reaches the maximum is the optimum concurrent number.
6. **Think Time:** Used to simulate the time that the actual user waits between different operations.
7. **Resource Usage:** It refers to the occupation of CPU, memory, disk IO and other hardware resources of each server.

1.4 Test Plan

Test Round	Start Date	End Date	Test Environment
Performance Test Round 1	2023/10/30	2024/02/23	Production Environment

2 Test Environment

2.1 System Analysis

Application Deployment Setting

Core Banking System:

Server	Component Description	Number of nodes	Resource for Each Node
Core Banking + DCP (Worker nodes)	ECS Worker Node	6	CPU: 16C MEMORY: 32G
Report (VM)	ECS for Report BIRT	1	CPU: 8C MEMORY: 32G
Kubernetes Cluster (Core Banking)	MSE Microservice Registry Registration Configuration Center	1	CPU: 2C MEMORY: 4G
MySQL		1	CPU: 16C

	ApsaraDB RDS for MySQL for core banking		MEMORY: 32G
	ApsaraDB RDS for MySQL for DCP, Report management, JGP	1	CPU: 16C MEMORY: 32G
	ApsaraDB RDS for MySQL for report	1	CPU: 16C MEMORY: 32G

Mobile Banking:

Server	Component Description	Number of nodes	Resource for Each Node
Kubernetes Cluster (YTL)	ECS Worker Nodes	3	CPU:16C MEMORY: 32G
Database	ApsaraDB RDS for PosgreSQL for YTL	13	CPU: 2C MEMORY: 4G
	ApsaraDB RDS for PosgreSQL for YTL (Payment for DuitNow Webhook Credit Transfer)	1	CPU: 8C MEMORY: 32G

2.1.1 Test Tools and Usage

Tool Type	Tool Name	Usage
Script Development	Jmeter 5.6	Develop test case script
Test Case Execution	Jmeter 5.6	Test environment configuration and test case execution
Monitoring Tools	Ali cloud monitoring platform	Monitor system resources, check CPU and memory usage

3 Test Scenarios

Each of the test scenarios listed in [Section 3](#) is inclusive of integration to PostgreSQL database in MBS, MySQL database in CBS, Apsara Messaging Queue for Apache Kafka, and Apsara Messaging Queue for RabbitMQ. The services for Apsara Messaging Queue for Apache Kafka, and Apsara Messaging Queue for RabbitMQ are configured with monitoring and health-check controls via Alibaba Cloud Monitor. Monitored metrics include diskspace, real-time statistics, observation on partition quota, topics skew, and others. Alerts will be sent out to the relevant teams based on threshold settings and scaling strategy for action to be taken.

3.1 Baseline Benchmark Scenarios

No.	Case Name	Concurrent User	Iterations	Think Time	Cycle Interval
1	Account Creation	1	20	no	no
2	DuitNow Webhook Credit Transfer	1	20	no	no
3	Account Information Retrieval	1	20	no	no
4	Account Insights	1	20	no	no
5	Account Transaction Listing	1	20	no	no
6	Account Transaction Detail Retrieval	1	20	no	no
7	Fund Option Retrieval	1	20	no	no
8	Transfer with Intrabank	1	20	no	no
9	Transfer with Interbank	1	20	no	no
10	Get Remaining transfer limit	1	20	no	no
11	Get Transfer details by transfer id	1	20	no	no
12	Transfer Limit Update	1	20	no	no
13	Account Resolution	1	20	no	no
14	Transferee Favourited	1	20	no	no
15	Account Statement Listing	1	20	no	no
16	Account Statement Retrieval	1	20	no	no
17	Fund Option Creation	1	20	no	no
18	Financial Institution Listing	1	20	no	no
19	Transferee Retrieval	1	20	no	no
20	Transferee UnFavourited	1	20	no	no

3.2 Single Scenario Cases

No.	Case Name	Interface URL
1	Account Creation	Customer-API/backdoor/customer (POST)
2	Account Information Retrieval	Deposit-API/demand-deposit-accounts
3	Account Insights	Deposit-API/demand-deposit-accounts/insights
4	Account Transaction Listing	Deposit-API/transactions (GET)
5	Account Transaction Detail Retrieval	Deposit-API/transactions/{transactionId} (GET)
6	Fund Option Retrieval	Payments-Platform-API/fund-options (GET)
7	Transfer with Intrabank	Payments-Platform-API/transfers (POST)
8	Transfer with Interbank	Payments-Platform-API/transfers (POST)
9	Get Remaining transfer limit	Payments-Platform-API/transfers/statistics (GET)
10	Get Transfer details by transfer id	Payments-Platform-API/transfers/{transferId} (GET)
11	Transfer Limit Update	Payments-Platform-API/transfer-limits/{transferLimitId} (PATCH)
12	Account Resolution	Payments-Platform-API/fund-options/transfer/resolution {GET}
13	Transferee Favourited	Payments-Platform-API/transferees/{transfereeId}/favourite (PATCH)
14	Account Statement Listing	Deposit-API/statements (GET)
15	Account Statement Retrieval	Deposit-API/statements/{statementId} (GET)
16	Fund Option Creation	Payments-Platform-API/fund-options (POST)
17	Financial Institution Listing	Payments-Platform-API/financial-institutions (GET)
18	Transferee Retrieval	Payments-Platform-API/transferees (GET)
19	Transferee UnFavourited	Payments-Platform-API/transferees/{transfereeId}/unfavourite (PATCH)
20	Customer Restriction Retrieval	Payments-Platform-API/customers/restrictions (GET)

3.3 Linked interface Scenarios

No.	Case Name	Interface URL
1	DuitNow Webhook Credit Transfer	1. /test/duitnow/business-message-id(GET)
		2. /test/duitnow/jws-token(POST)

		3. Payments-Platform-API/duitnow/webhook/v2/initiate (POST)
2	Onboarding Process	1. Whitelist phone number - /groups/igroupllamef /users (POST)
		2. /registration requests (POST)
		3. /phone-number-verifications/fid}/complete (PATCH)
		4. /customers (POST)
		5. /customers/{customerId}/applications/{applicationId}/zoloz/real-id (POST)
		6. /customers/{customerId}/applications/{applicationId}/zoloz/real-id/complete (POST)
		7. /customers/icustomerIdf/applications (POST)
		8. /customers/ icustomerId /applications/iappl i cationId/personal-details (PATCH)
		9. /customers/ fcustomerId/applications/lapplicationId) /additional-details (PATCH)

3.4 Mixed Scenario

Case Name	Business Name	Proportion of Business
Mixed Interface Scenario	Account Information Retrieval	30%
	Account Insights	15%
	Fund Option Retrieval	5%
	Account Transaction Listing	20%
	Account Transaction Detail Retrieval	15%
	Get Remaining transfer limit	10%
	Onboarding Process	5%

3.5 Batch Scenarios

No.	Case Name	Trading Volume	Note
1	Daily accounting batch	1 million 2 million	Process batch run with trading volume 1 million and 2 million.
2	Daily accounting batch		Process mixed scenario case while running daily batch.

3.6 Stability Scenario

Case Name	Instructions

Stability test	Stability testing is processed in the base of optimal system capacity, with all single scenario interfaces running continuously for 4 hours in proportion to their business.
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4 Key Performance Indicators

Index items	Target Description	Target value
CPU	CPU usage	CPU≤60%
MEN	MEM usage	MEM≤60%
Disk I/O	Disk IO usage	Disk IO≤40%
Average Response Time	Average response time of get interfaces	≤ 200 ms
	Average response time of post interface	≤ 600 ms
Transaction Success Rate	Transaction success rate	≥ 99.9999%
TPS	Get Interface	> = 200/s
	Post Interface	> = 50/s
	link test	> = 8/s
	Transaction Per Second (Average processing power for mixed scenarios)	>=200/s
Batch processing	Daily batch completion time	≤ 3h
Stability	All single-scenario interfaces running continuously for 4 hours	CPU≤40%; MEM≤60%; Disk IO≤40%; Transaction success rate≥ 99.999%; Average Response time of get interface ≤200ms; Average Response time of post interface ≤ 600 ms;

5 Test Results And Key Analysis

5.1 Benchmark Scenario Execution Results

The benchmark scenario results summary:

No.	Name		TPS	AvgRT		
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		Concurrent User		(ms)	Completion Times	Success Rate	Result
1	Account Creation	1	31.8	30	20	100%	Pass
2	DuitNow Webhook Credit Transfer	1	32.4	614	20	100%	Fail
3	Account Information Retrieval	1	7.4	133	20	100%	Fail
4	Account Insights	1	9.8	98	20	100%	Pass
5	Account Transaction Listing	1	11.6	84	20	100%	Pass
6	Account Transaciton Detail Retrieval	1	4.7	20	20	100%	Fail
7	Fund Option Retrieval	1	26.7	36	20	100%	Pass
8	Transfer with Intrabank	1	13.5	72	20	100%	Pass
9	Transfer with Interbank	1	11.4	86	20	100%	Fail
10	Get Remaining transfer limit	1	11.7	77	20	100%	Pass
12	Get Transfer details by transfer id	1	11.2	88	20	100%	Fail
13	Transfer Limit Update	1	33.3	28	20	100%	Pass
14	Account Resolution	1	14.2	69	20	100%	Pass
15	Transferee Favourited	1	415.8	23	20	100%	Fail
16	Account Statement Listing	1	14.4	69	20	100%	Pass
17	Account Statement Retrieval	1	10.5	94	20	100%	Fail
18	Fund Option Creation	1	12	81	20	100%	Pass
19	Financial Institution Listing	1	27.9	35	20	100%	Fail
20	Transferee Retrieval	1	21.3	45	20	100%	Pass
21	Transferee UnFavourited	1	904.9	20	20	100%	Fail
22	Customer Restriction Retrieval	1	19.6	49	20	100%	Pass

5.2 Single Load Scenario Execution Results

5.2.1 Account Creation

5.2.1.1 Execution Results

Case Name	Concurrent Number	TPS	AvgRT(ms)	Success Rate	Application Service		Database	
					CPU Usage	Memory Usage	CPU Usage	Memory Usage
Account Creation	50	227	81	100%	<4%	<50%	<20%	<96%
	100	484.8	200	100%	<4%	<50%	<20%	<96%
	120	489	238	100%	<4%	<50%	<24%	<96%
	150	482.7	303	100%	<4%	<50%	<20%	<96%

5.2.1.2 Application Service Resources Trend Chart

CPU and memory resource trends:

50 concurrent



100 concurrent



120 concurrent

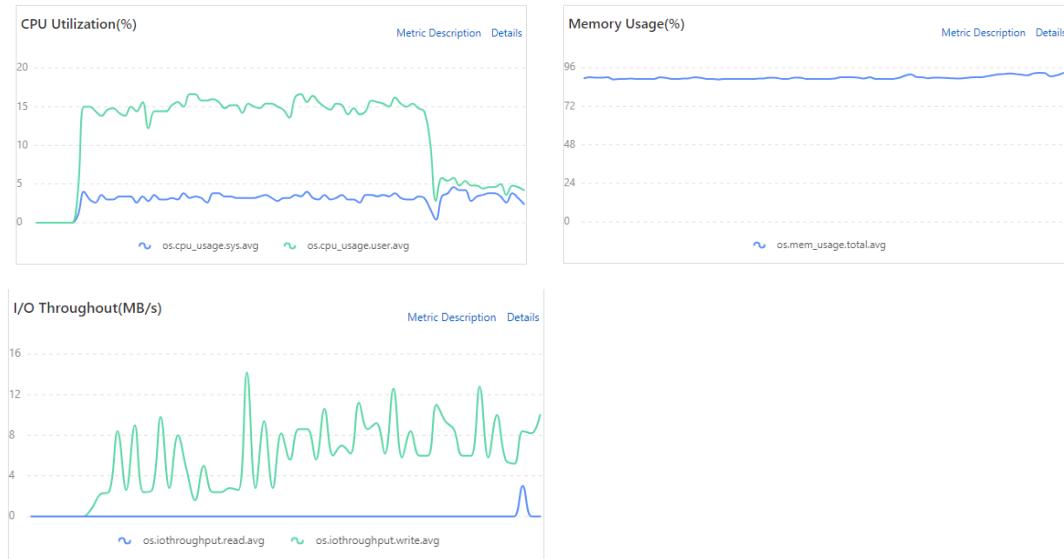


150 concurrent

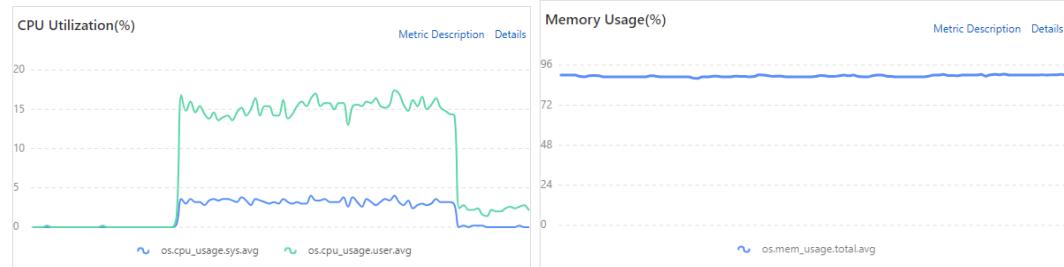


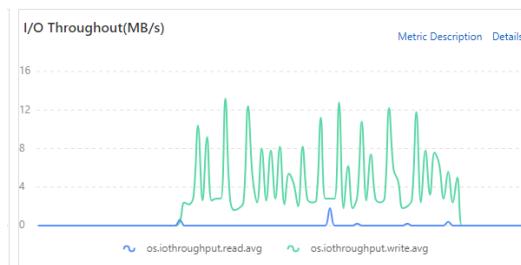
5.2.1.3 Database Resource Chart

Customer-CPU and memory resource Trends:
50 concurrent

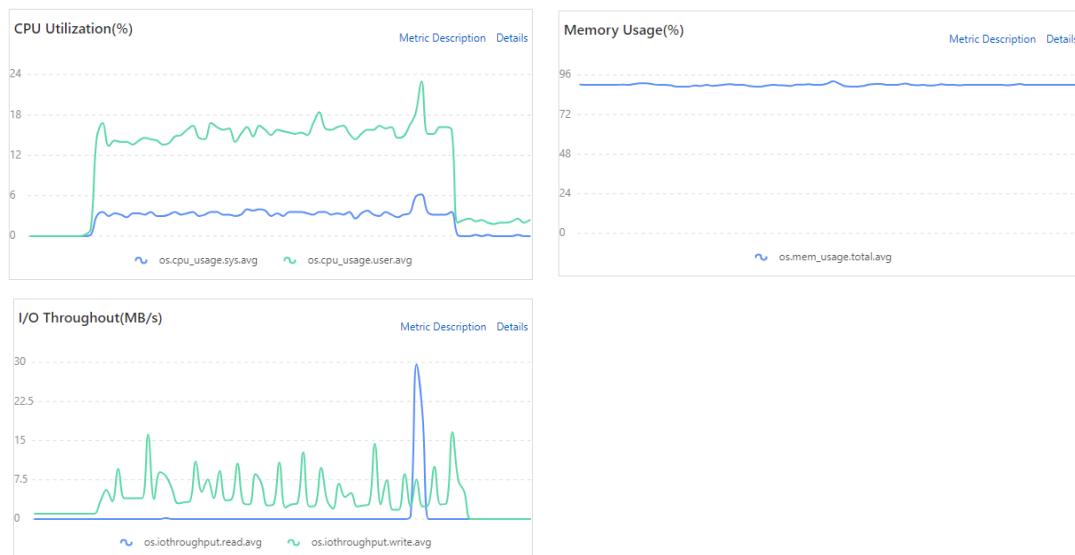


100 concurrent

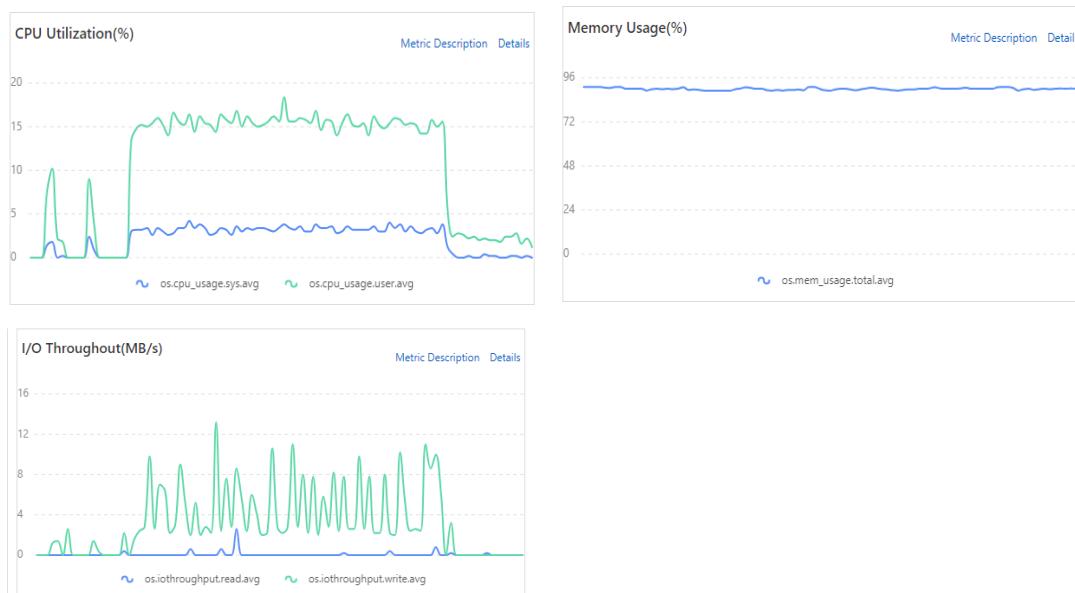




120 concurrent



150 concurrent



5.2.1.4 Analyze Test Result

Account Creation: The Transaction request is initiated using a stepwise number of concurrent

users (50,100,120,150), and each gradient continues to run for 5 minutes, with a success rate of 100%.

TPS: TPS is relatively stable, with the increase of the number of concurrent users, TPS remains around 480+.

AvgRT: The average response time trend is normal, with an average response time of 303ms for 150 concurrent users.

Application Service resources: The CPU and Memory resource usage is normal and does not exceed the preset resource limit.

Database resources: The CPU utilization of customer - service under 24%, meet expected target, but the memory usage is around 96%, which is above the target value, this is due to the database configuration is low for test environment, confirmed with client infra team will update the database configuration when product goes live.

Overall Observation: While the current observation does not presently affect overall performance based on the concurrent user sets, it is advisable to enhance the database specifications as the memory utilization is exceeding 60% as defined in the performance indicators. This measure aims to prevent any unexpected behavior resulting from reaching 100% utilization.

5.2.2 DuitNow Webhook Credit Transfer

5.2.2.1. Execution Results

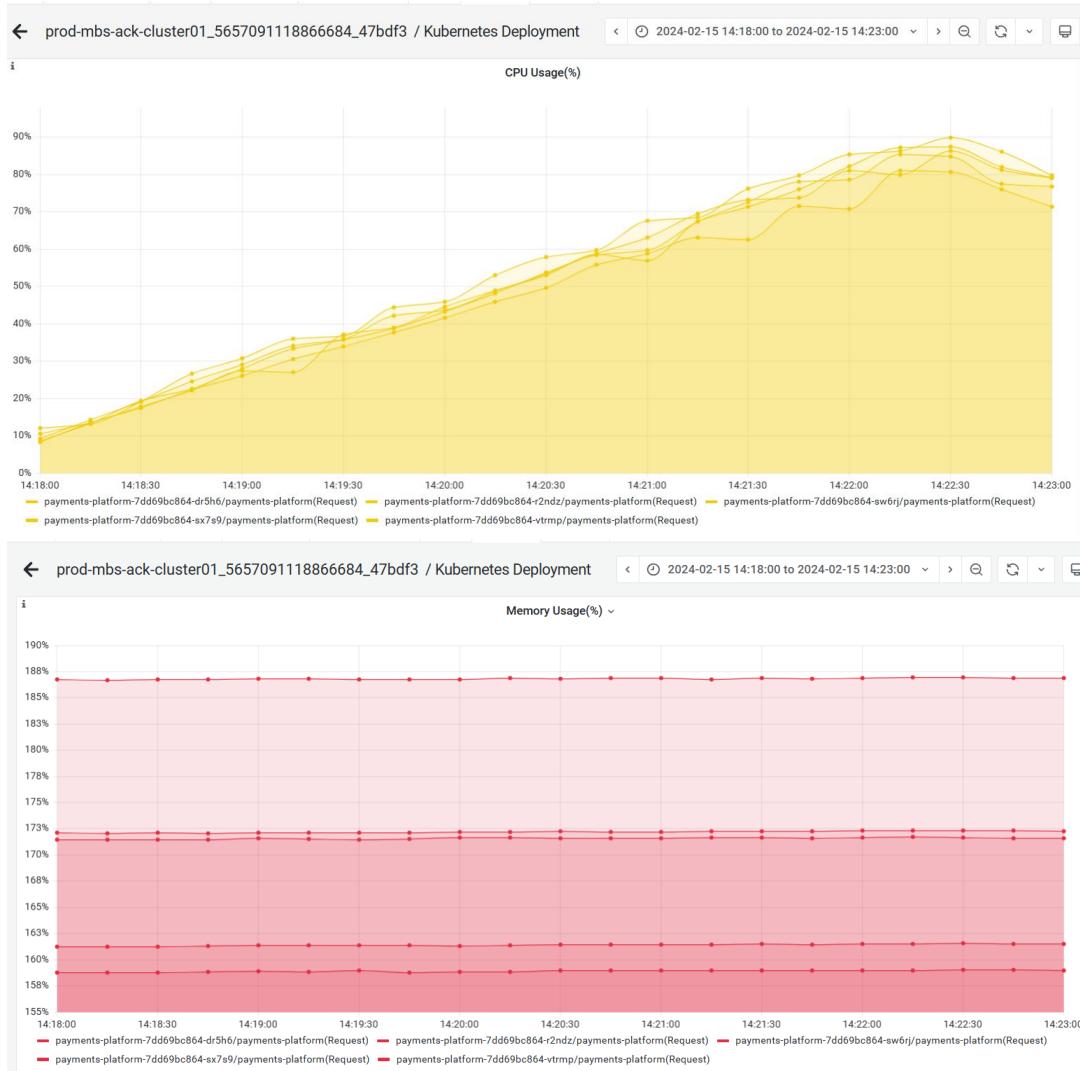
Case Name	Concurrent Number	TPS	AvgRT(ms)	Success rate	Application Service		Database	
					CPU Usage	Memory Usage	CPU Usage	Memory Usage
DuitNow Webhook Credit Transfer	20	32.4	614	100%	<90%	<188%	<8%	<60%
	40	61.8	643	100%	<90%	<188%	<8%	<60%
	60	88.3	674	100%	<120%	<190%	<16%	<60%
	80	95.3	834	100%	<150%	<190%	<16%	<60%

5.2.2.2. Application Service Resources Trend Chart

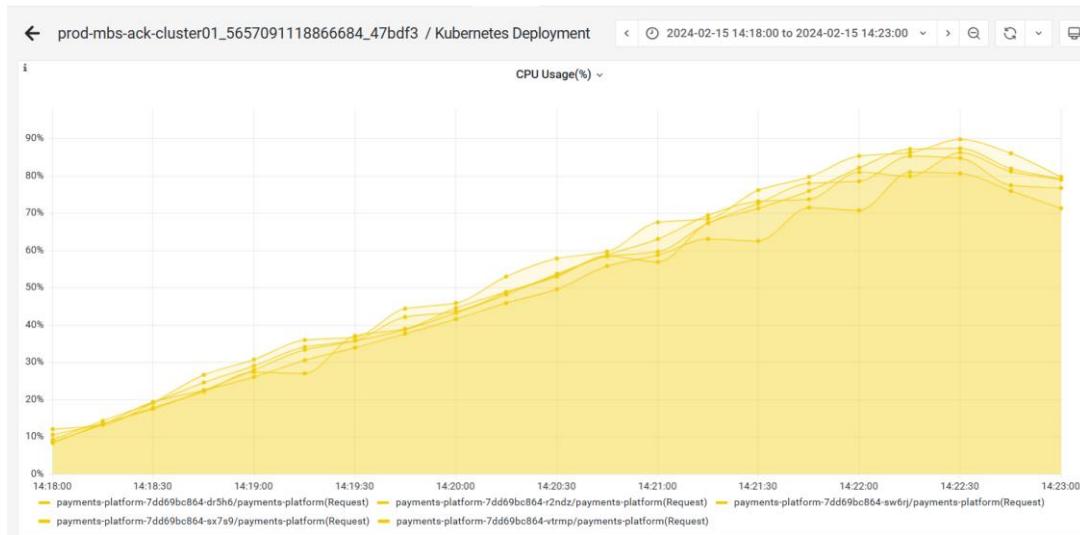
CPU and memory resource trends:

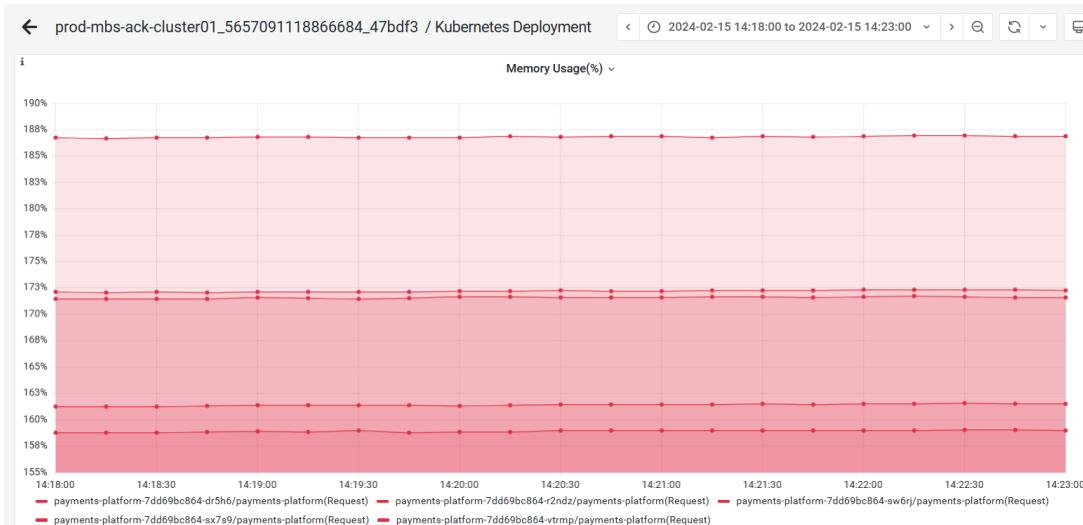
20 concurrent:

Performance Test Result

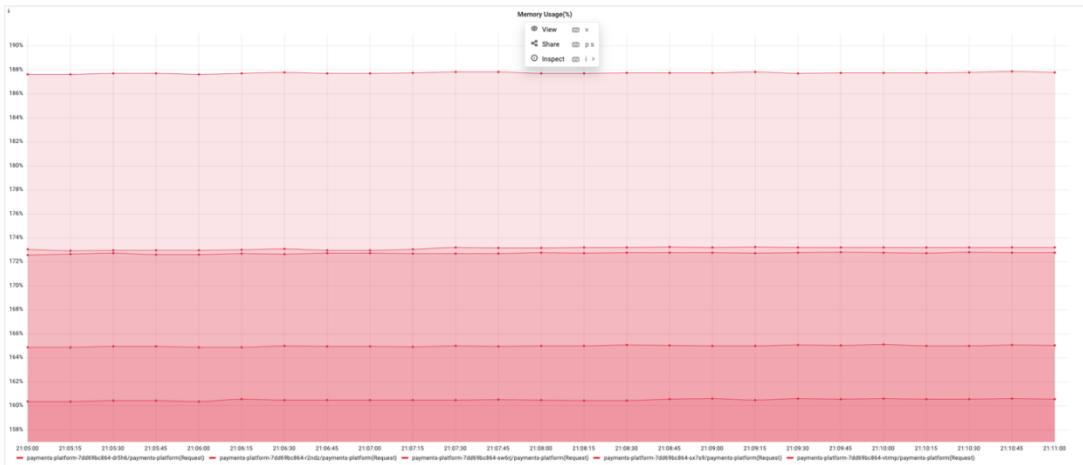
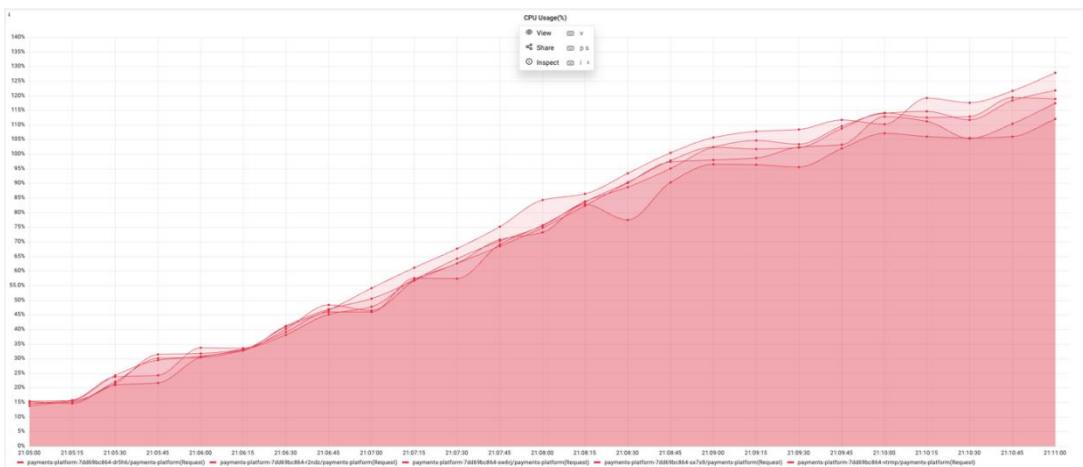


40 concurrent:

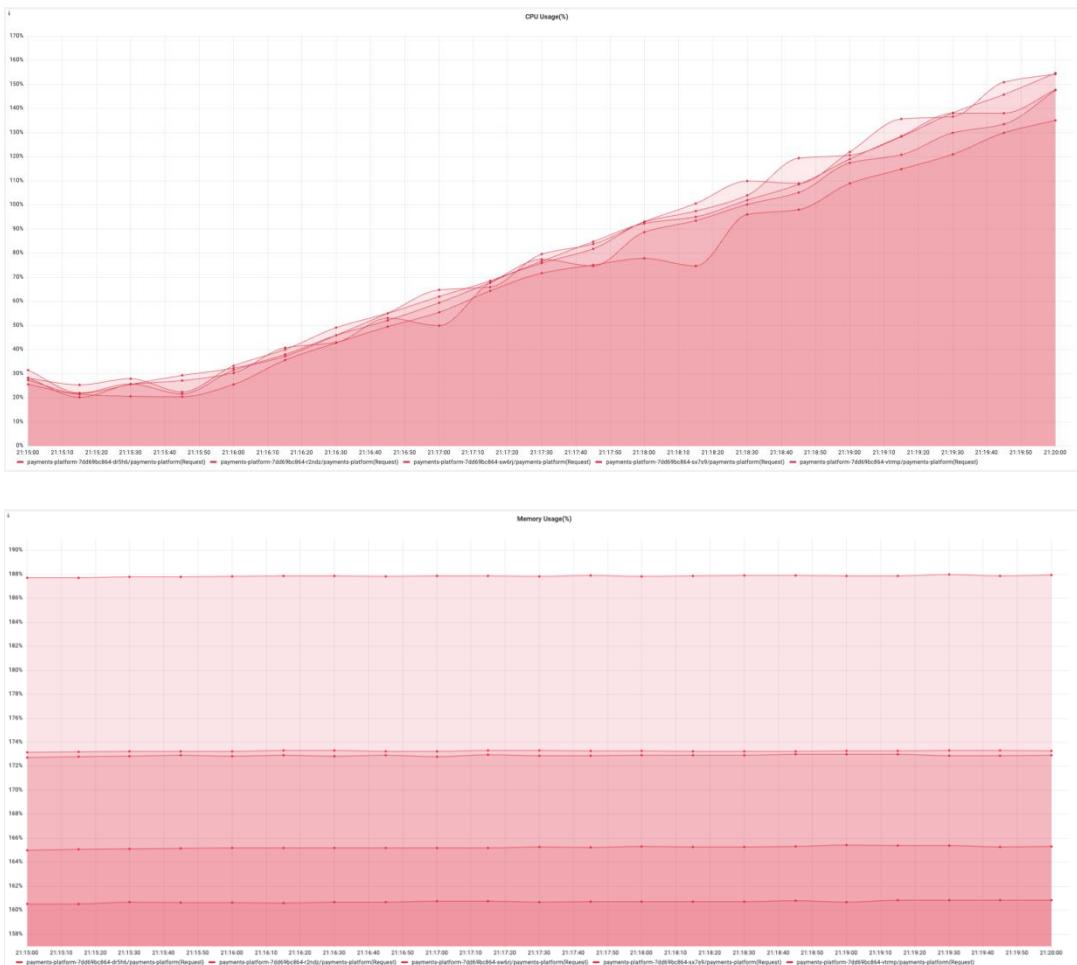




60 concurrent:



80 concurrent:

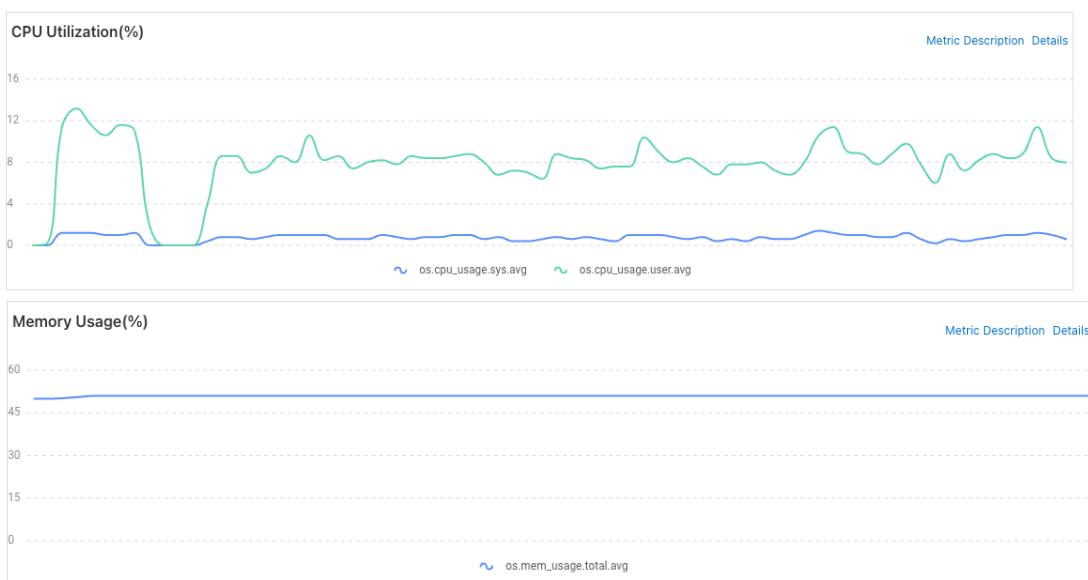
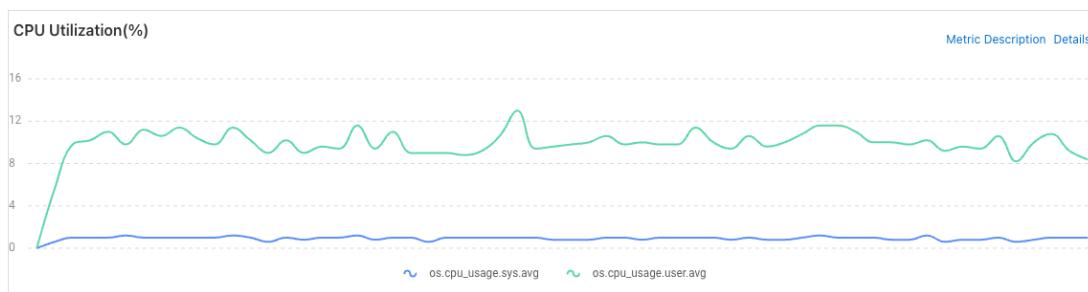


5.2.2.3. Database Resources Trend Chart

Payment-CPU and memory resource Trends:

20 concurrent:



40 concurrent:**60 concurrent****80 concurrent**



5.2.2.4. Analyze Statistics

DuitNow Webhook Credit Transfer: The Transaction request is initiated using a stepwise number of concurrent users (20,40,60,80), and each gradient continues to run for 5 minutes, with a success rate of 100%.

TPS: Given Interbank Transfer is a 2 steps transfer that involves Deposit and DuitNow, DuitNow time taken has been excluded in this test result calculation as it is out of the bank control. So as confirmed with bannk, the TPS is as expected.

AvgRT: The average response time trend is normal, with an average response time of 834ms for 80 concurrent, since most of the time caused by duitnow, and out of the bank control, so consider this as expected.

Application Service resources: The CPU and Memory resource usage is around 188% which is above the target indicator, but this is due to there are 5 copies of application services, so need take average value which is under 40%, so this is as expected.

Database resources: The CPU and memory usage is normal and below the target value.

Overall Observation: A linked steps test script (3 instead of 1 step, is not required in actual production) for simulating this test case may have contributed to the average response time which is expected, the CPU and Memory usage have exceeded the baseline defined in the performance indicators too. It is advisable to have pod scaling in place with target % of CPU and Memory utilization defined to ensure the appropriate number of application pods are spun up to manage spike in incoming traffics effectively while maintaining the healthiness of pod's CPU and Memory usage.

5.2.3 Account Information Retrieval

5.2.3.1. Execution Results

Case Name	Concurrent Number	TPS	AvgRT(ms)	Success rate	Application Service		Database	
					CPU Usage	Memory Usage	CPU Usage	Memory Usage

Account Information Retrieval	50	389.5	105	100%	<0.8%	<60%	<16%	<96%
	100	482.2	184	100%	<0.8%	<60%	<24%	<96%
	150	429.6	325	100%	<0.8%	<60%	<24%	<96%
	200	500.5	371	100%	<0.8%	<60%	<20%	<96%

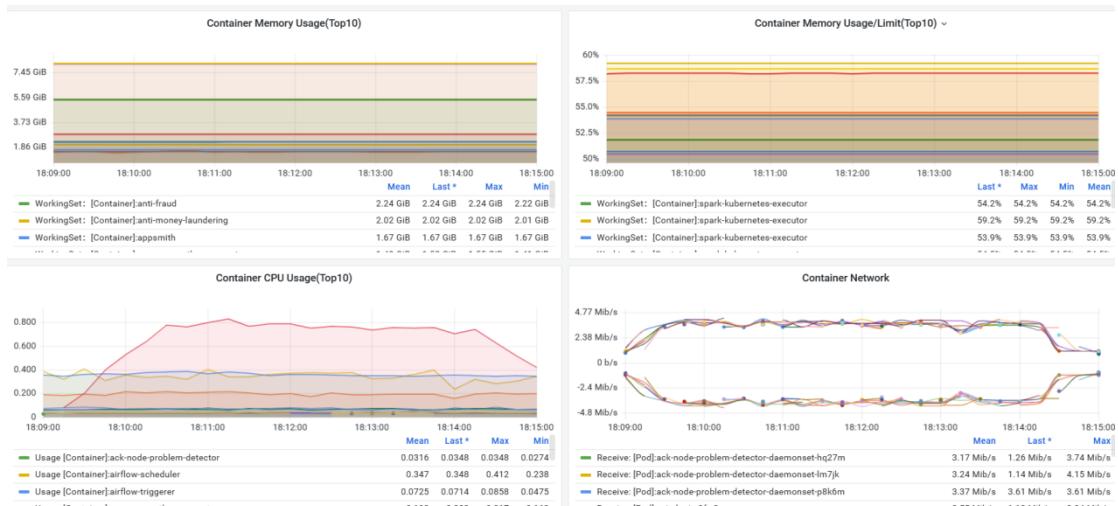
5.2.3.2. Application Service Resources Trend Chart

CPU and memory resource trends:

50 concurrent



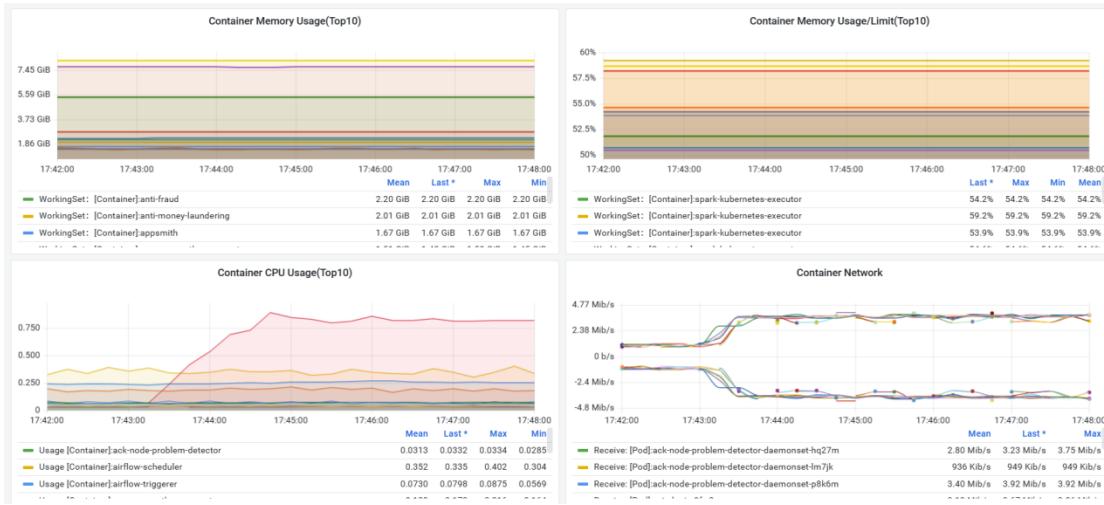
100 concurrent



150 concurrent



200 concurrent

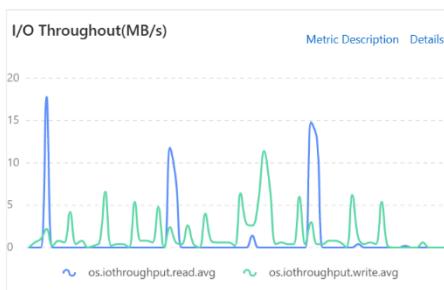
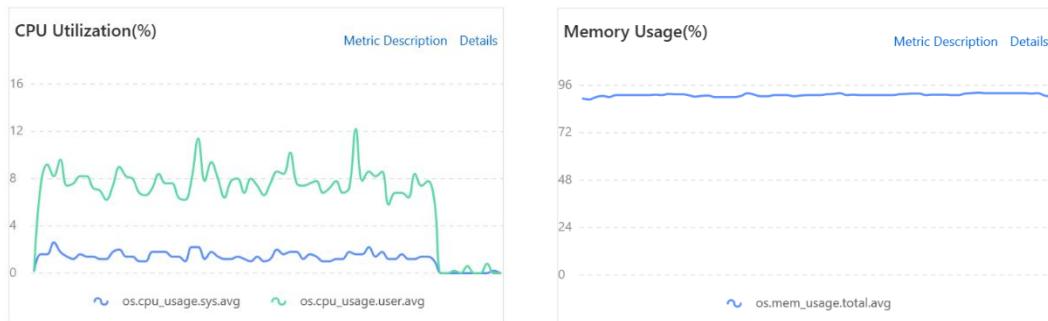


5.2.3.3.Database Resources Trend Chart

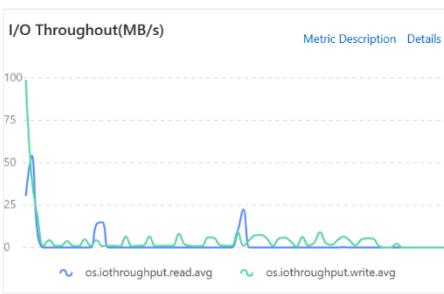
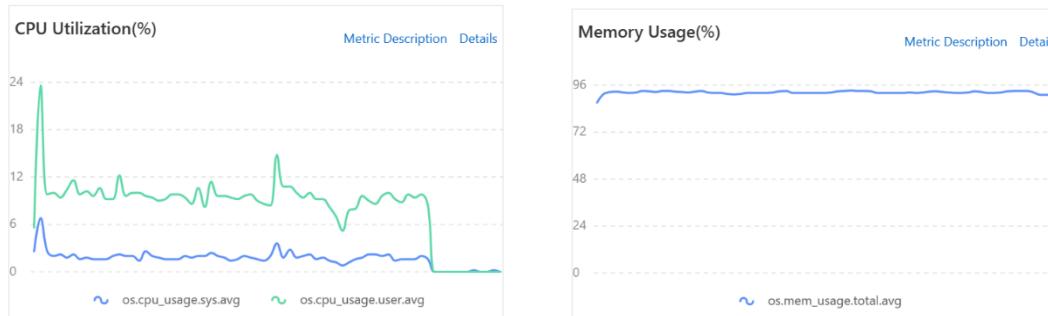
Deposit-CPU and memory resource Trends:

50 concurrent

Performance Test Result



100 concurrent



150 concurrent



200 concurrent



5.2.3.4. Analyze Statistics

Account Information Retrieval: The Transaction request is initiated using a stepwise number of concurrent users (50,100,150,200), and each gradient continues to run for 5 minutes, with a success rate of 100%.

TPS: TPS is relatively stable, with the increase of the number of concurrent users, TPS remains around 480+.

AvgRT: The average response time trend is normal, with an average response time of 371ms for 200 concurrent.

Application Service resources: The CPU and Memory resource usage is normal and does not exceed the preset resource setting limit.

Database resources: The CPU usage is under 24%, meet expected target, but the memory usage is around 96%, which is above the target value, this is due to the database configuration is low for test environment, confirmed with client infra team will update the database configuration when product goes live.

Overall Observation: While the database's memory utilization is constantly exceeding the baseline defined in performance indicator regardless of number of concurrent users, it is advisable to enhance the database specifications to handle requests more effectively.

5.2.4 Account Insights

5.2.4.1.Execution Results

Case Name	Concurrent Number	TPS	AvgRT(ms)	Success rate	Application Service		Database	
					CPU Usage	Memory Usage	CPU Usage	Memory Usage
Account Insights	50	1528.6	21	100%	<6%	<60%	<12%	<88%
	100	1726.9	41	100%	<6%	<60%	<12%	<88%
	150	2323.1	58	100%	<6%	<60%	<40%	<88%
	200	1651.8	80	100%	<4%	<60%	<12%	<88%

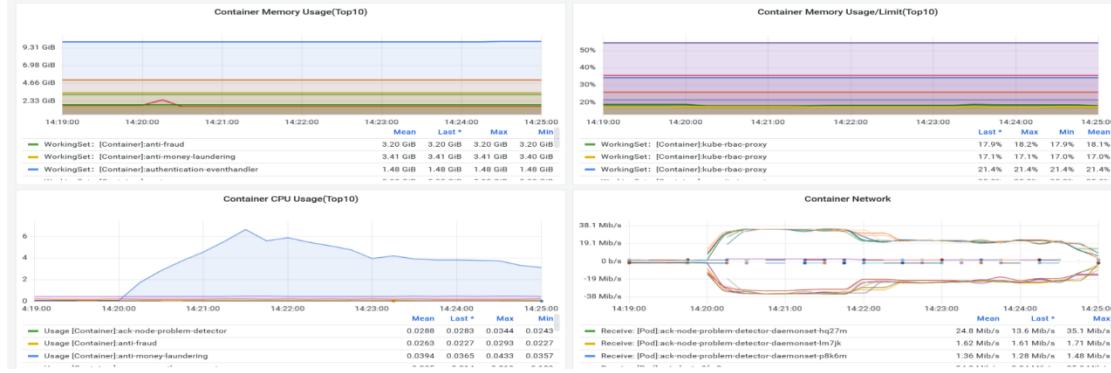
5.2.4.2.Application Service Resources Trend Chart

CPU and memory resource trends:

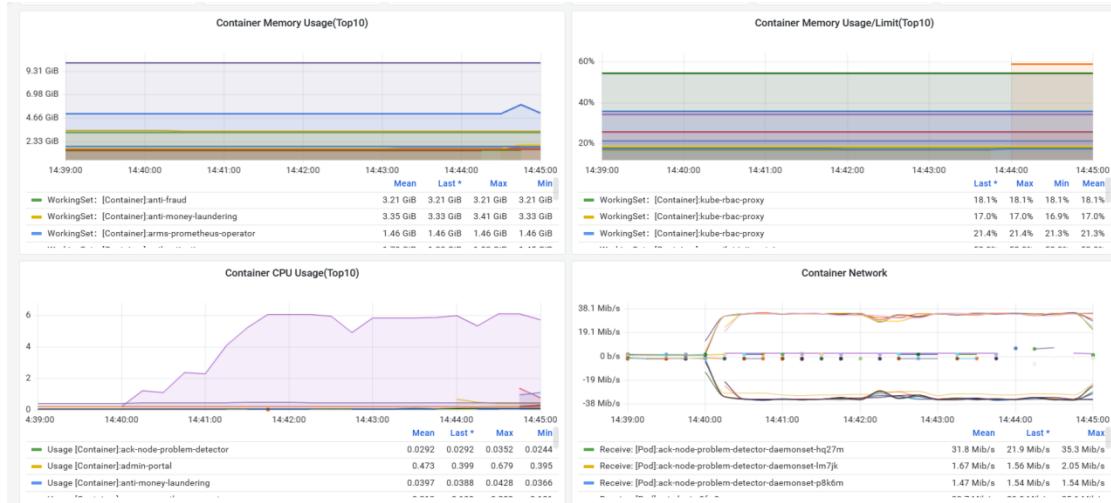
50 concurrent



100 concurrent



150 concurrent



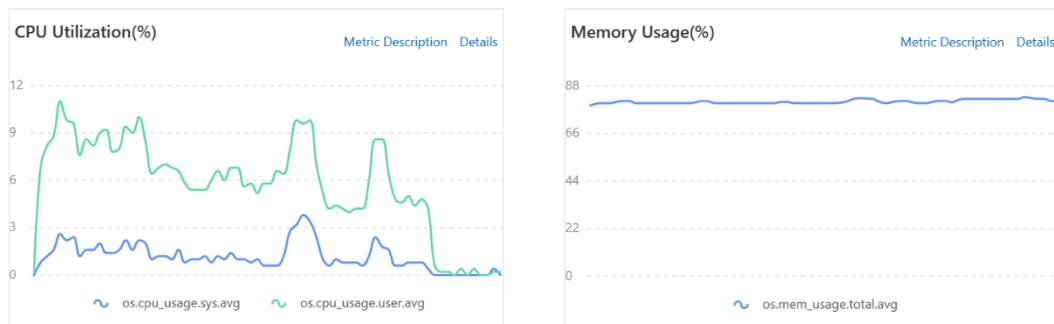
200 concurrent



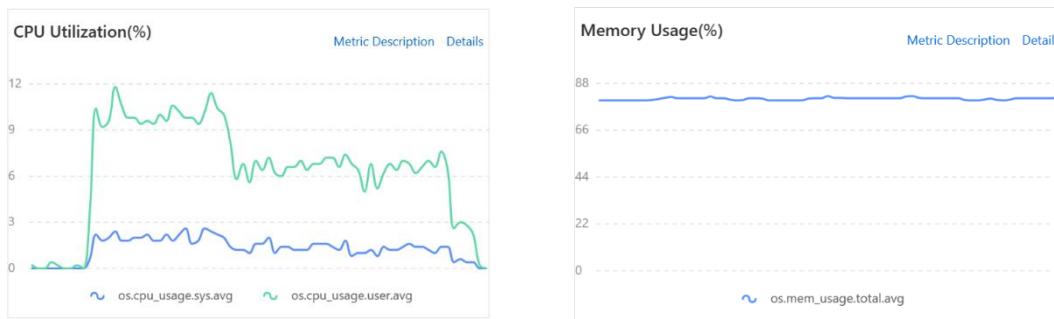
5.2.4.3.Database Resources Trend Chart

Deposit-CPU and memory resource Trends:

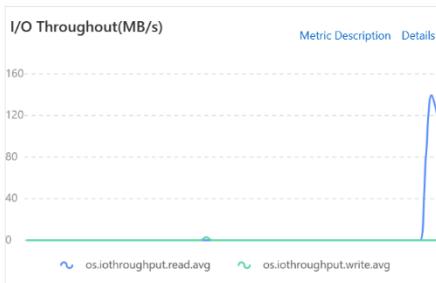
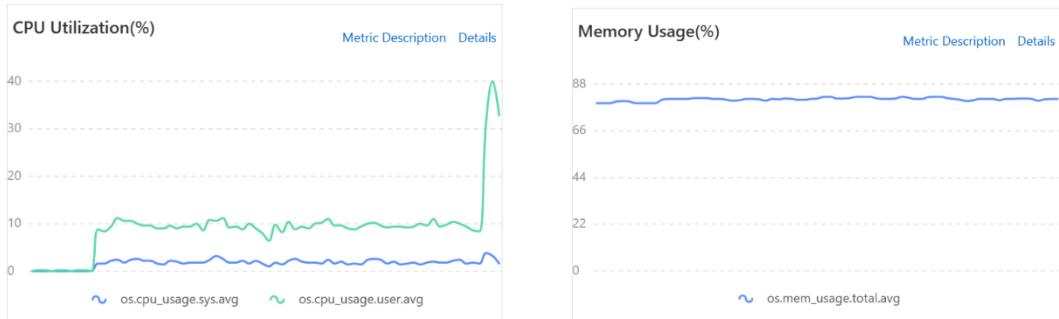
50 concurrent



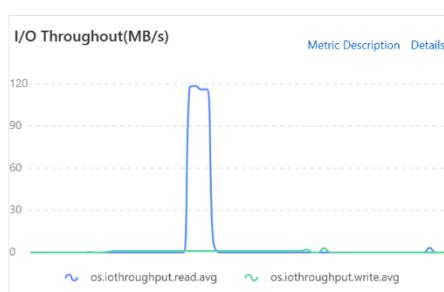
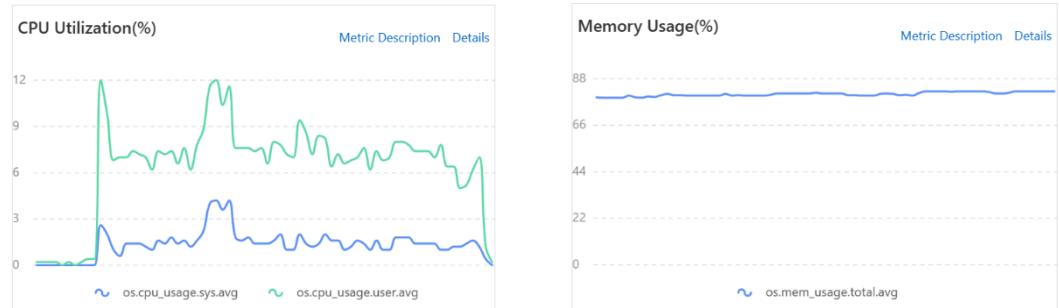
100 concurrent



150 concurrent



200 concurrent



5.2.4.4. Analyze Statistics

Account Insights: The Transaction request is initiated using a stepwise number of concurrent users (50,100,150,200), and each gradient continues to run for 5 minutes, with a success rate of 100%. **TPS:** TPS is relatively stable, with the increase of the number of concurrent users, TPS remains around 1700+.

AvgRT: The average response time trend is normal, with an average response time of 80ms for

200 concurrent.

Application Service resources: The CPU and Memory resource usage is normal and does not exceed the preset resource setting limit.

Database resources: The CPU usage is under 40%, meet expected target, but the memory usage is around 88%, which is above the target value, this is due to the database configuration is low for test environment, confirmed with client infra team will update the database configuration when product goes live.

Overall Observation: While the current observation does not presently affect overall performance based on the concurrent user sets, it is advisable to enhance the database specifications as the memory utilization is exceeding 60% as defined in the performance indicators. This measure aims to prevent any unexpected behavior resulting from reaching 100% utilization.

5.2.5 Fund Option Retrieval

5.2.5.1.Execution Results

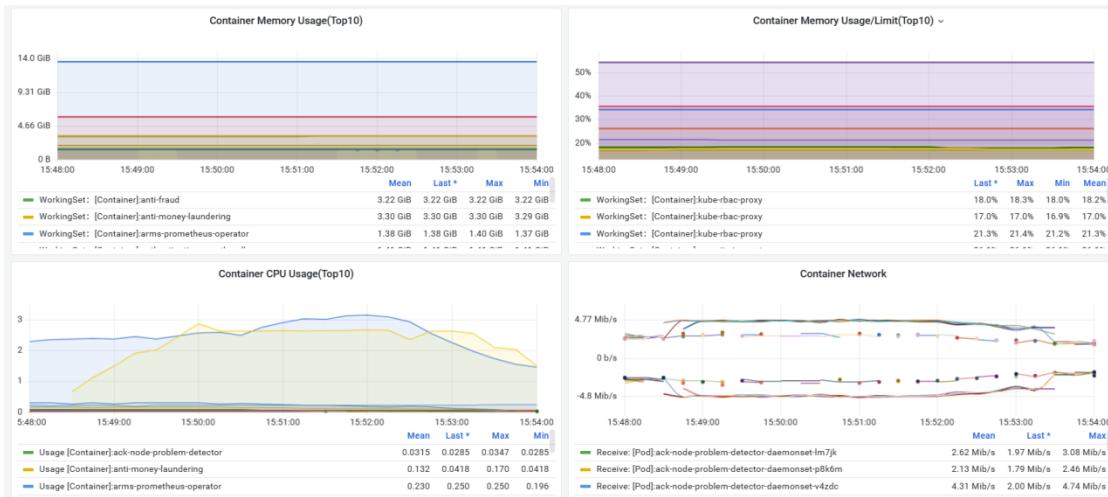
Case Name	Concurrent Number	TPS	AvgRT(ms)	Success rate	Application Service		Database	
					CPU Usage	Memory Usage	CPU Usage	Memory Usage
Fund Option Retrieval	50	1653.7	22	100%	<3%	<50%	<8%	<96%
	80	1730.3	38	100%	<3%	<50%	<7%	<96%
	100	1539.2	45	100%	<3%	<50%	<6%	<96%
	120	1728.8	58	100%	<3%	<50%	<6%	<96%

5.2.5.2.Application Service Resources Trend Chart

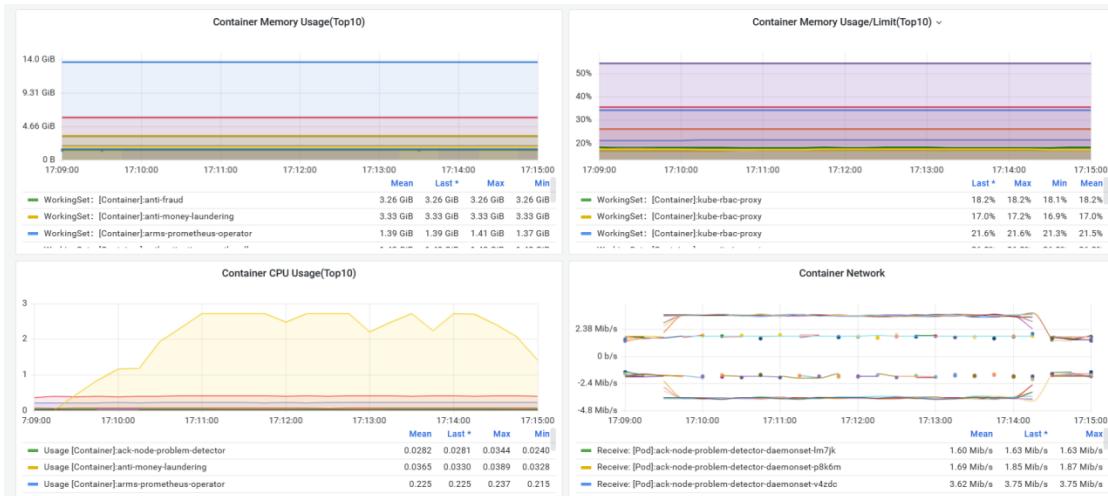
CPU and memory resource trends:

50 concurrent

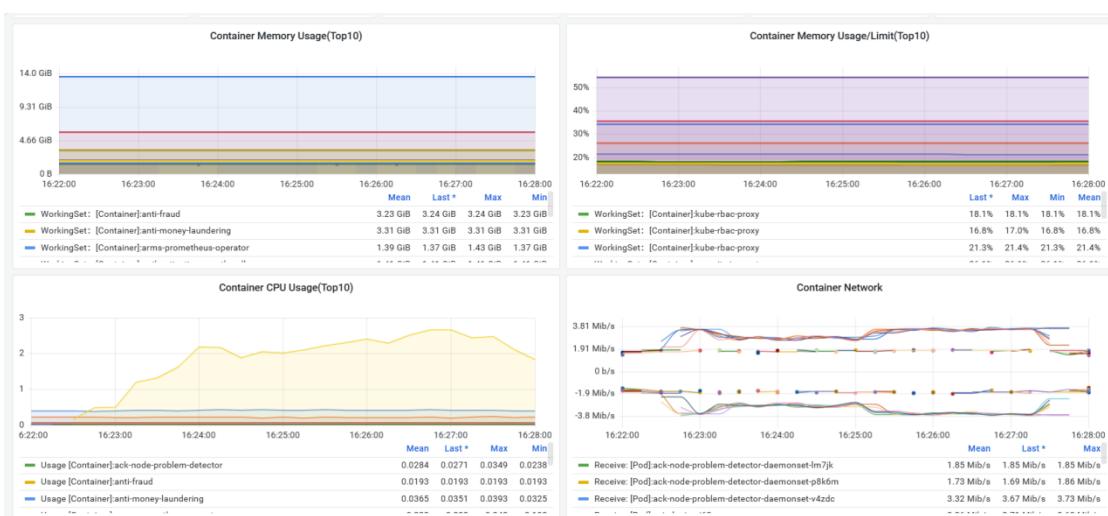
Performance Test Result



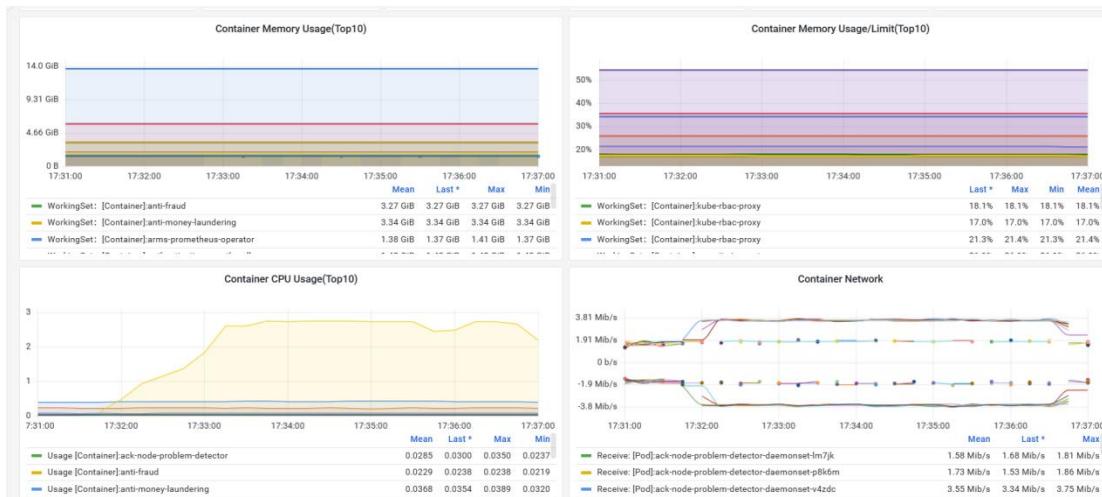
80 concurrent



100 concurrent



120 concurrent

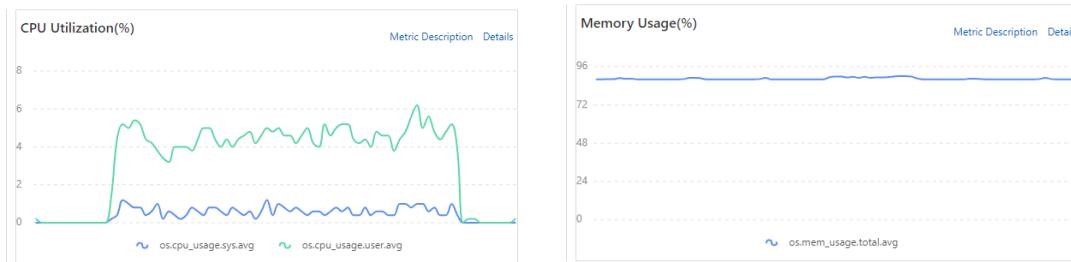


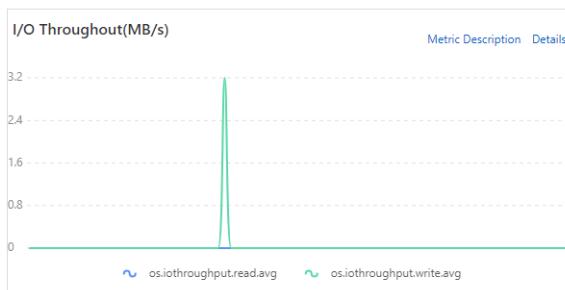
5.2.5.3.Database Resources Trend Chart

Payment-CPU and memory resource Trends:
50 concurrent

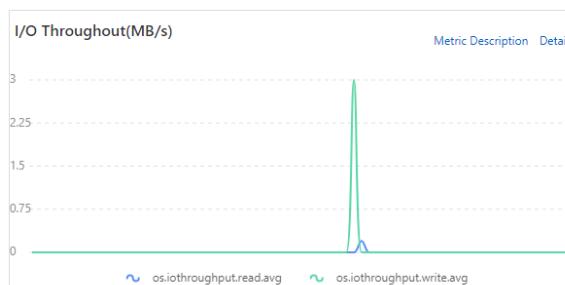
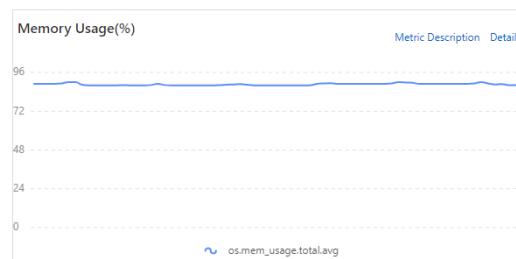
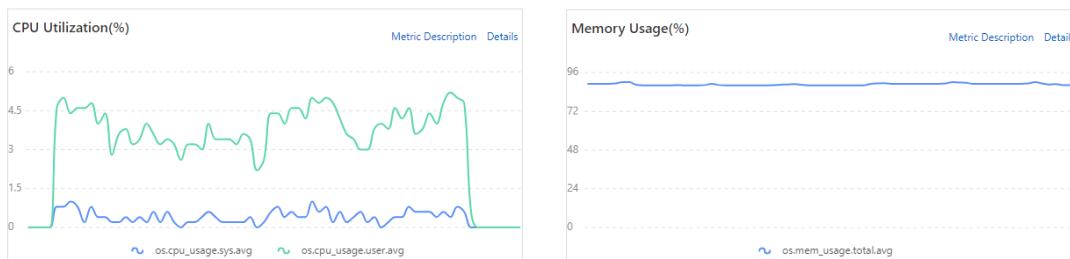


80 concurrent

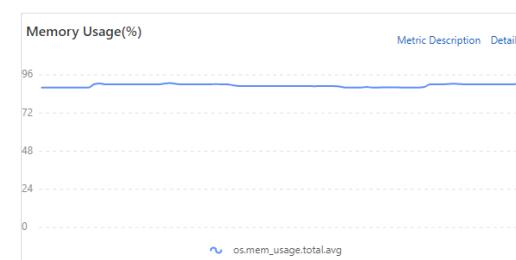
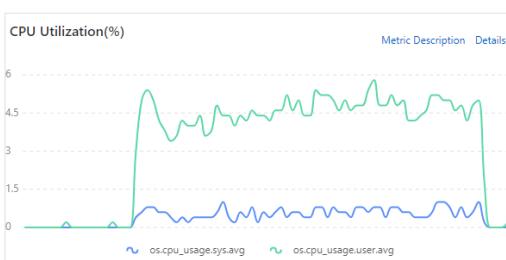


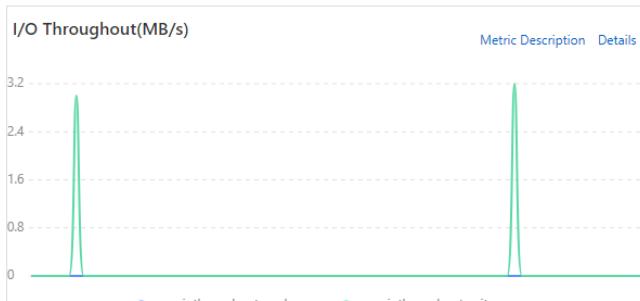


100 concurrent



120 concurrent





5.2.5.4. Analyze Statistics

Fund Option Retrieval: The Transaction request is initiated using a stepwise number of concurrent users (50,80,100,120), and each gradient continues to run for 5 minutes, with a success rate of 100%.

TPS: TPS is relatively stable, with the increase of the number of concurrent users, TPS remains around 1700+.

AvgRT: The average response time trend is normal, with an average response time of 58ms for 120 concurrent.

Application Service resources: The CPU and Memory resource usage is normal and does not exceed the preset resource setting limit.

Database resources: The CPU usage is under 24%, meet expected target, but the memory usage is around 96%, which is above the target value, this is due to the database configuration is low for test environment, confirmed with client infra team will update the database configuration when product goes live.

Overall Observation: While the current observation does not presently affect overall performance based on the concurrent user sets, it is advisable to enhance the database specifications as the memory utilization is exceeding 60% as defined in the performance indicators. This measure aims to prevent any unexpected behavior resulting from reaching 100% utilization.

5.2.6 Transfer with Intrabank

5.2.6.1. Execution Results

Case Name	Concurrent Number	TPS	AvgRT(ms)	Success rate	Application Service		Database	
					CPU Usage	Memory Usage	CPU Usage	Memory Usage
Transfer with Intrabank	20	386.5	41	100%	<60%	<60%	<32%	<96%
	40	381.8	42	100%	<60%	<60%	<40%	<96%
	60	470.2	111	100%	<60%	<60%	<40%	<96%
	80	484.9	145	100%	<60%	<60%	<48%	<96%

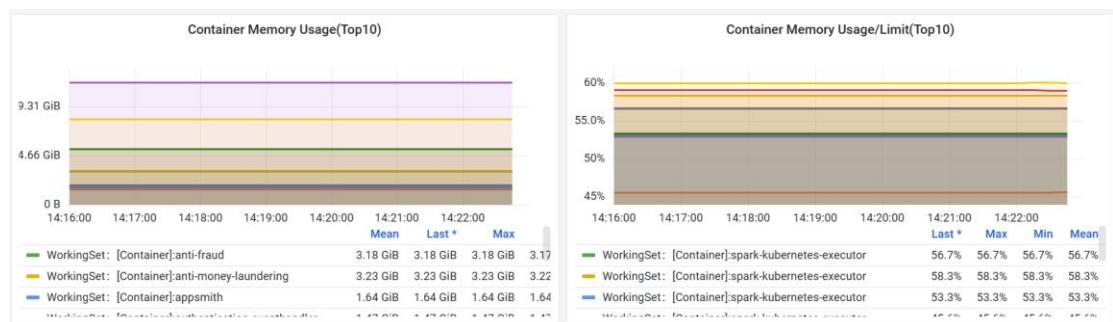
5.2.6.2. Application Service Resources Trend Chart

CPU and memory resource trends:

20 concurrent



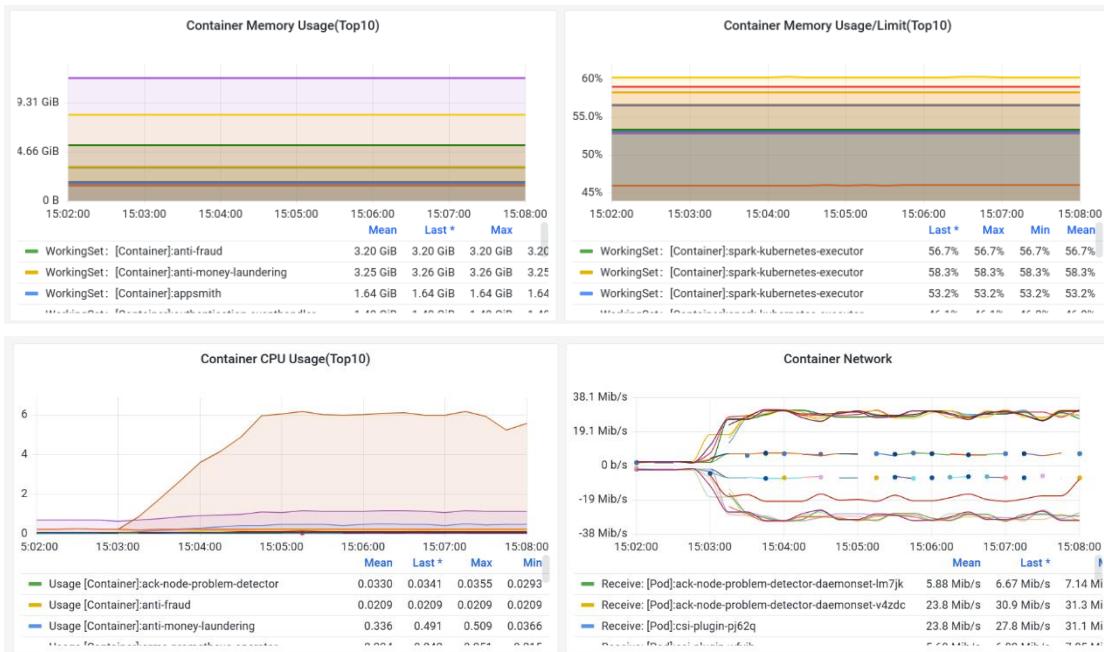
40 concurrent



Performance Test Result

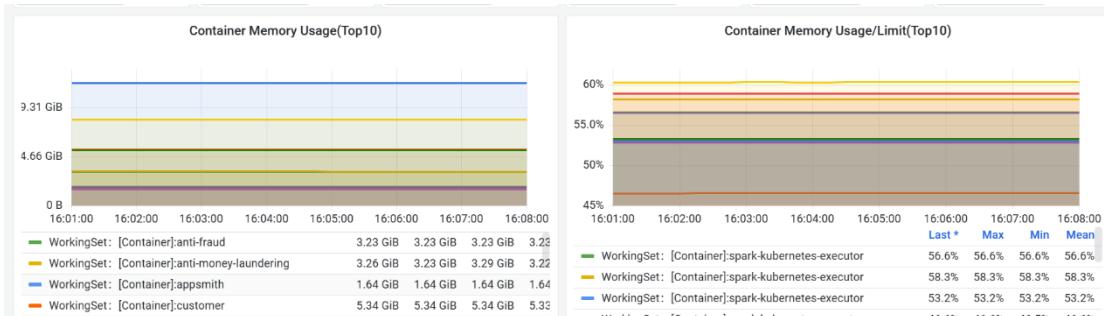
Container Memory Usage/Limit (Top 10)			Container CPU Usage (Top 10)			Container Socket Count(Top 10)		
Pod	Container	Memory Used	Pod	Container	CPU Usage (i)	Pod	Container	Socket Count
payment-transfer...	spark-kubernetes-...	60.0%	anti-money-launde...	anti-money-launde...	0.481	nginx-ingress-cont...	nginx-ingress-cont...	555
deposit-demande...	spark-kubernetes-...	59.1%	deposit-eventhand...	deposit-eventhand...	0.328	nginx-ingress-cont...	nginx-ingress-cont...	555
deposit-demande...	spark-kubernetes-...	58.3%	arms-prometheus-...	arms-prometheus-...	0.141	appsmith-6d79499...	appsmith	361
customer-custome...	spark-kubernetes-...	56.7%	arms-prometheus-...	arms-prometheus-...	0.114	deposit-eventhand...	deposit-eventhand...	96
deposit-providercu...	spark-kubernetes-...	56.6%	deposit-eventhand...	deposit-eventhand...	0.0448	deposit-eventhand...	deposit-eventhand...	95
deposit-unclaimed...	spark-kubernetes-...	53.4%	deposit-eventhand...	deposit-eventhand...	0.0425	deposit-eventhand...	deposit-eventhand...	93
deposit-demande...	spark-kubernetes-...	53.3%	payment-transfer...	spark-kubernetes-...	0.0394	deposit-eventhand...	deposit-eventhand...	93
deposit-demande...	spark-kubernetes-...	53.1%	deposit-eventhand...	deposit-eventhand...	0.0393	deposit-eventhand...	deposit-eventhand...	93

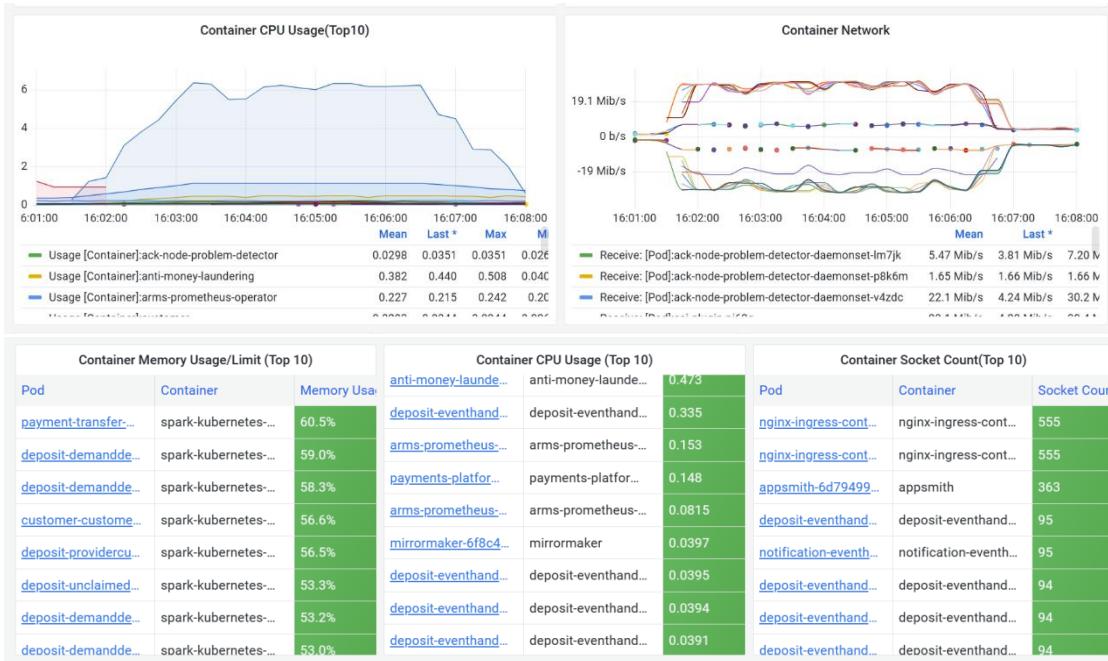
60 concurrent



Container Memory Usage/Limit (Top 10)			Container CPU Usage (Top 10)			Container Socket Count(Top 10)		
Pod	Container	Memory Used	Pod	Container	CPU Usage	Pod	Container	Socket Count
payment-transfer...	spark-kubernetes-...	60.3%	payments-platform...	payments-platform	2.48	nginx-ingress-cont...	nginx-ingress-cont...	555
deposit-demande...	spark-kubernetes-...	59.0%	anti-money-launde...	anti-money-launde...	0.499	nginx-ingress-cont...	nginx-ingress-cont...	555
deposit-demande...	spark-kubernetes-...	58.3%	deposit-eventhand...	deposit-eventhand...	0.415	appsmith-6d79499...	appsmith	361
customer-custome...	spark-kubernetes-...	56.7%	deposit-eventhand...	deposit-eventhand...	0.235	deposit-eventhand...	deposit-eventhand...	96
deposit-providercu...	spark-kubernetes-...	56.6%	deposit-eventhand...	deposit-eventhand...	0.185	notification-even...	notification-even...	95
deposit-unclaimed...	spark-kubernetes-...	53.4%	arms-prometheus-...	arms-prometheus-...	0.169	deposit-eventhand...	deposit-eventhand...	95
deposit-demande...	spark-kubernetes-...	53.2%	mirrormaker-c4d5...	mirrormaker	0.148	deposit-eventhand...	deposit-eventhand...	94
deposit-demande...	spark-kubernetes-...	53.1%	payments-platform...	payments-platform	0.127	deposit-eventhand...	deposit-eventhand...	94
			arms-prometheus-...	arms-prometheus-...	0.106	deposit-eventhand...	deposit-eventhand...	94

80 concurrent

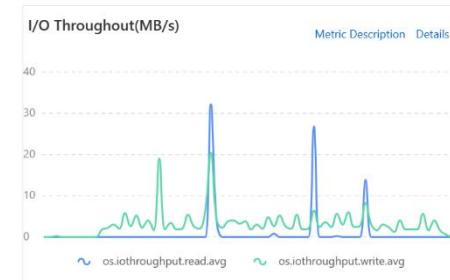
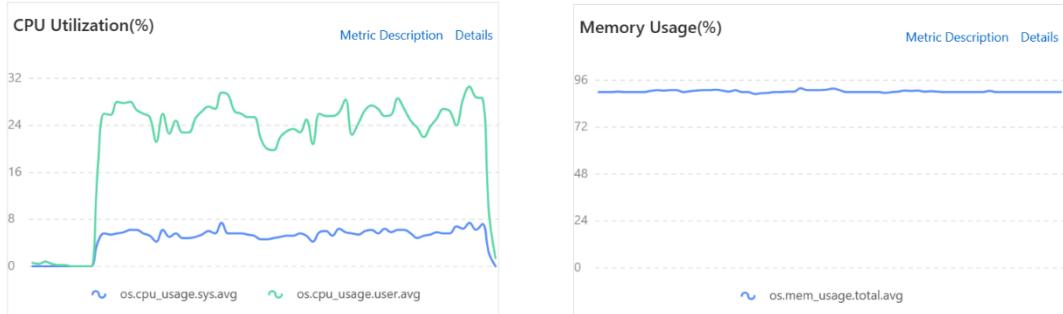




5.2.6.3.Database Resources Trend Chart

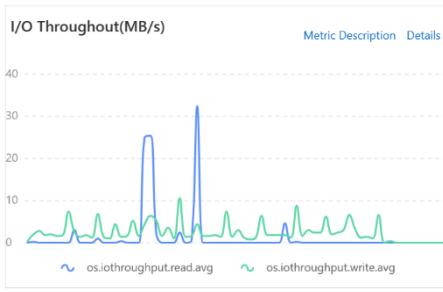
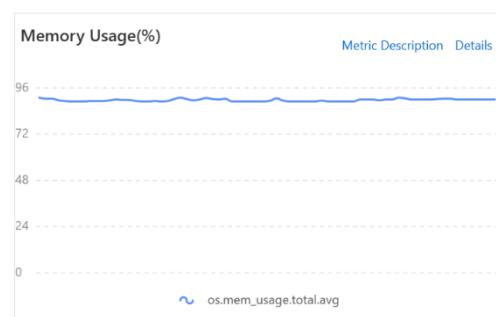
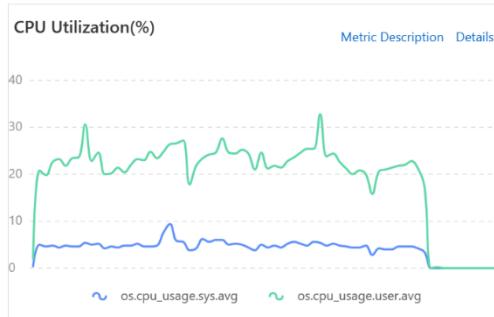
Payment-CPU and memory resource Trends:

20 concurrent

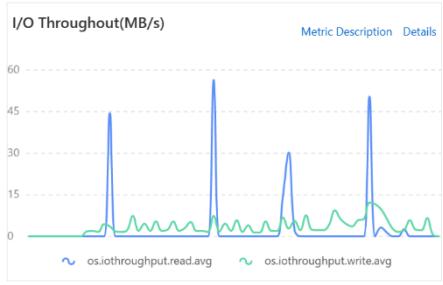
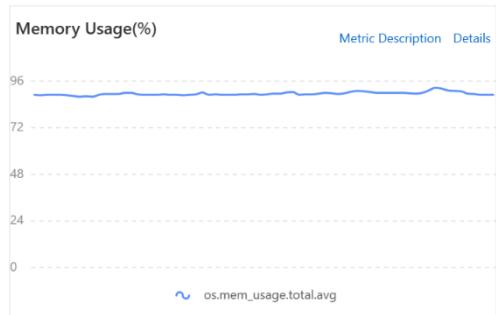
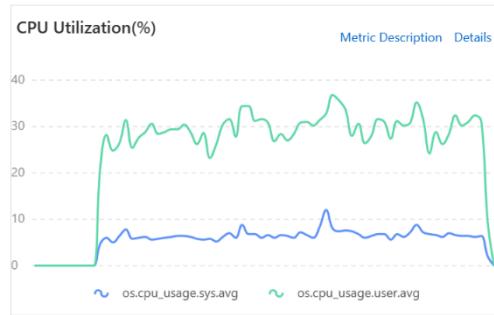


40 concurrent

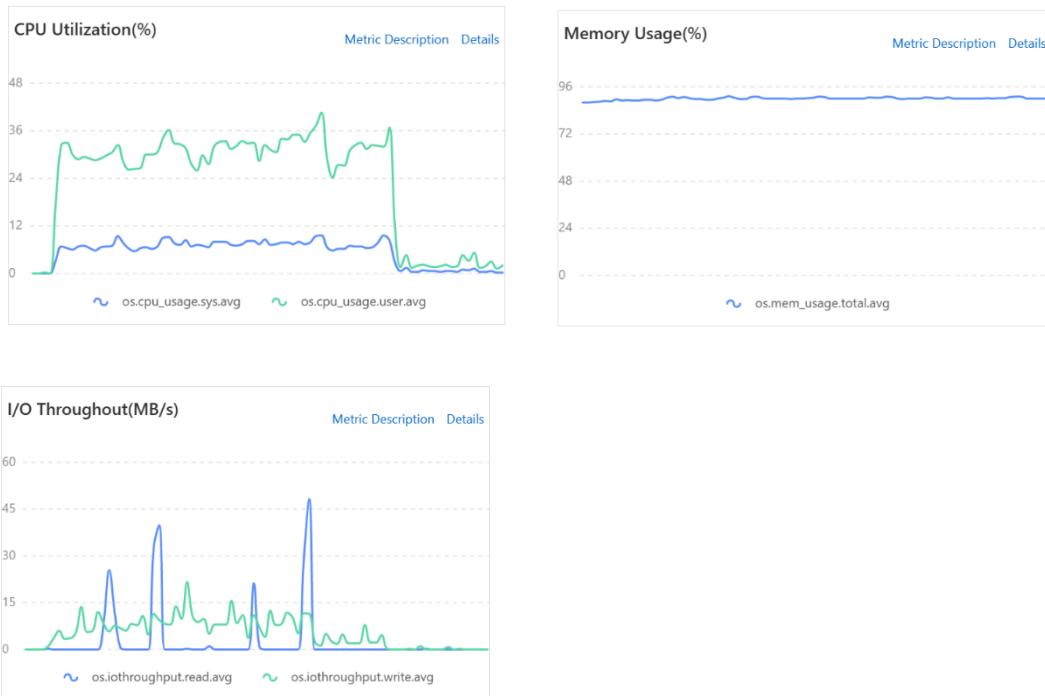
Performance Test Result



60 concurrent



80 concurrent



5.2.6.4. Analyze Statistics

Transfer with Intrabank: The Transaction request is initiated using a stepwise number of concurrent users (20,40,60,80), and each gradient continues to run for 5 minutes, with a success rate of 100%.

TPS: TPS is relatively stable, with the increase of the number of concurrent users, TPS remains around 450+.

AvgRT: The average response time trend is normal, with an average response time of 145ms for 80 concurrent.

Application Service resources: The CPU and Memory resource usage is normal and does not exceed the preset resource setting limit 60%.

Database resources: The CPU usage is under 48%, meet expected target, but the memory usage is around 96%, which is above the target value, this is due to the database configuration is low for test environment, confirmed with client infra team will update the database configuration when product goes live.

Overall Utilization: While the current observation does not presently affect overall performance based on the concurrent user sets, it is advisable to enhance the database specifications as the memory utilization is exceeding 60% as defined in the performance indicators. This measure aims to prevent any unexpected behavior resulting from reaching 100% utilization.

5.2.7 Transfer with Interbank

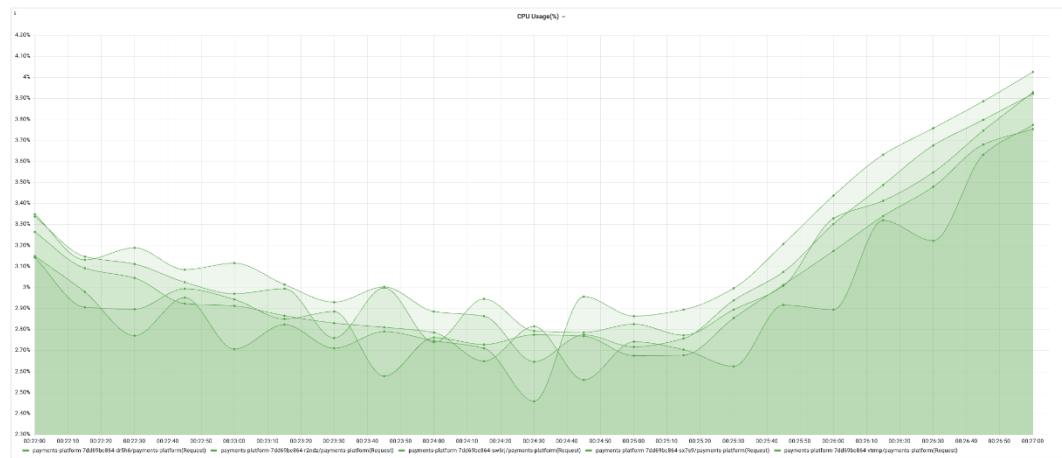
5.2.7.1. Execution Results

Case Name	Concurrent Number	TPS	AvgRT(ms)	Success rate	Application Service		Database	
					CPU Usage	Memory Usage	CPU Usage	Memory Usage
Transfer with Interbank	20	14.1	167	100%	<4.2%	<190%	<2.4%	<60%
	40	27.2	167	100%	<7%	<190%	<6%	<60%
	60	39.3	170	100%	<10%	<190%	<8.8%	<60%
	80	50.9	169	100%	<12.5%	<190%	<8.8%	<60%

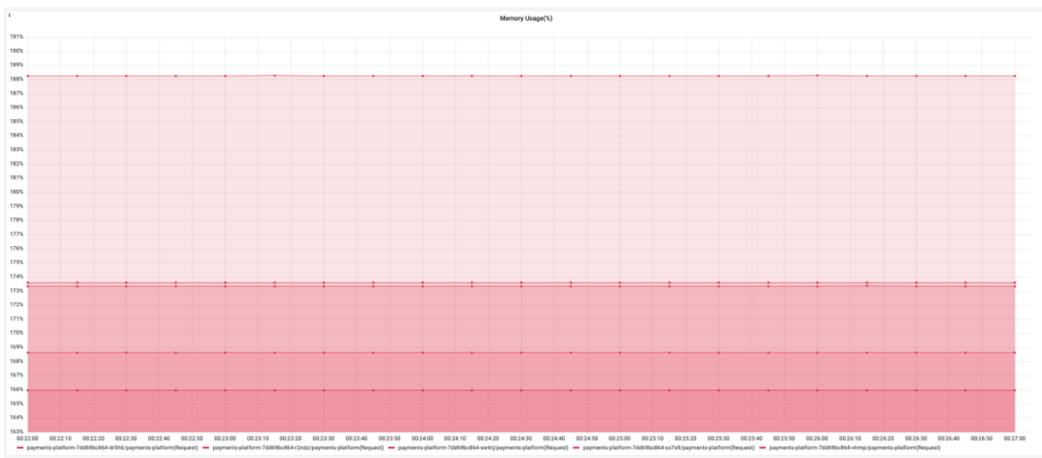
5.2.7.2. Application Service Resources Trend Chart

CPU and memory resource trends:

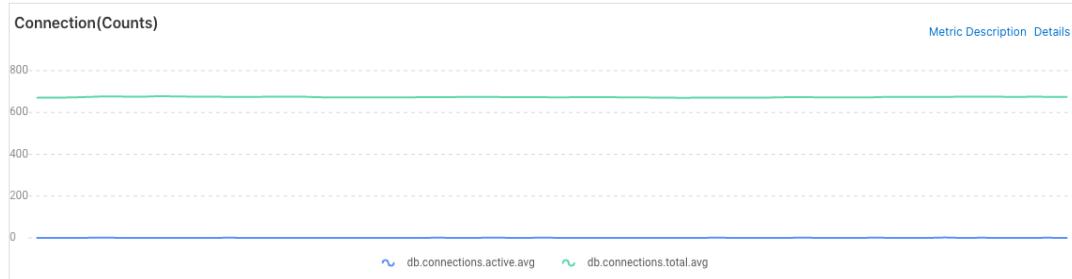
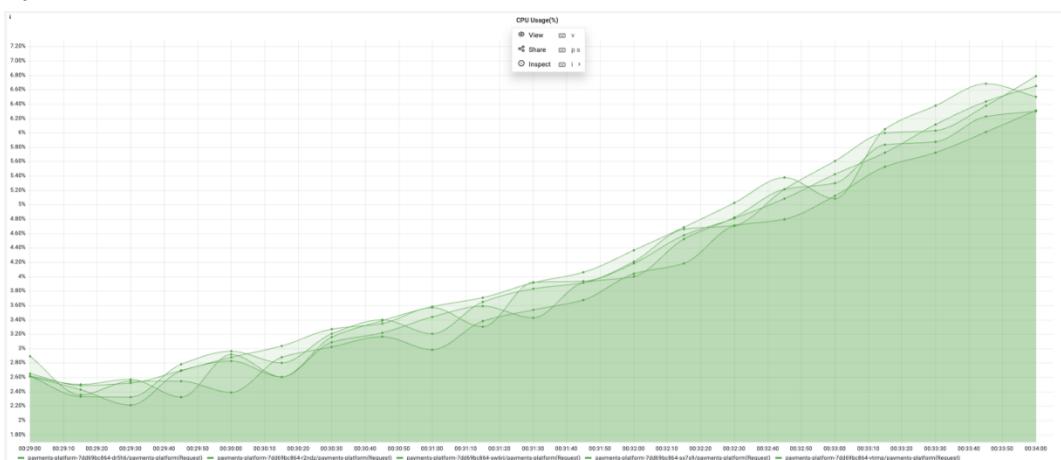
20 concurrent



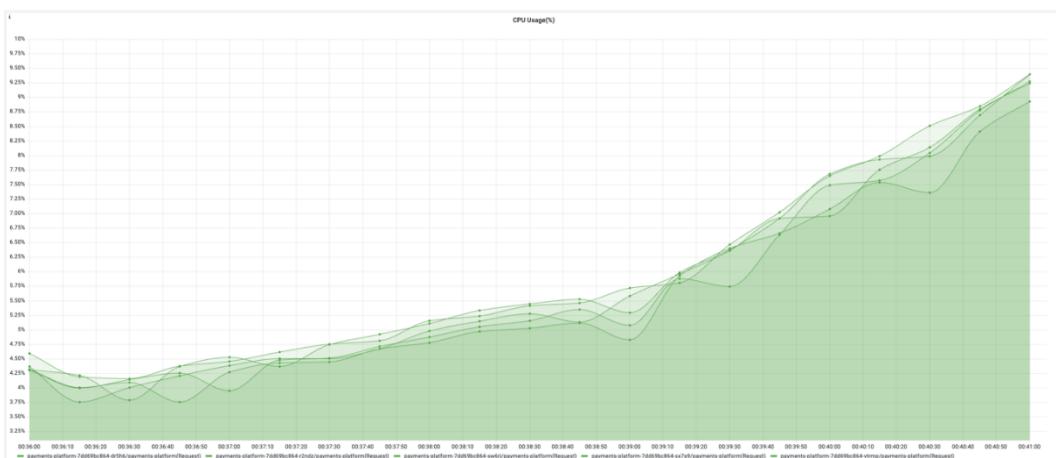
Performance Test Result



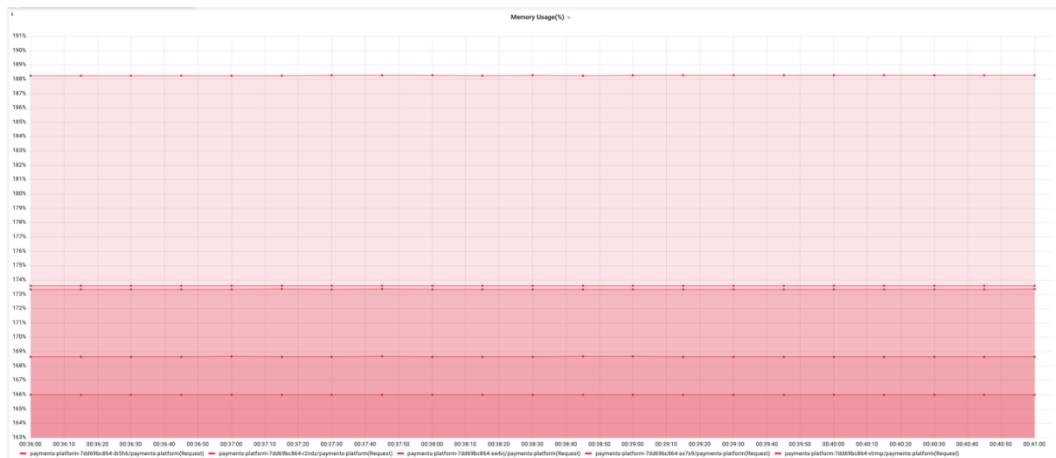
40 concurrent



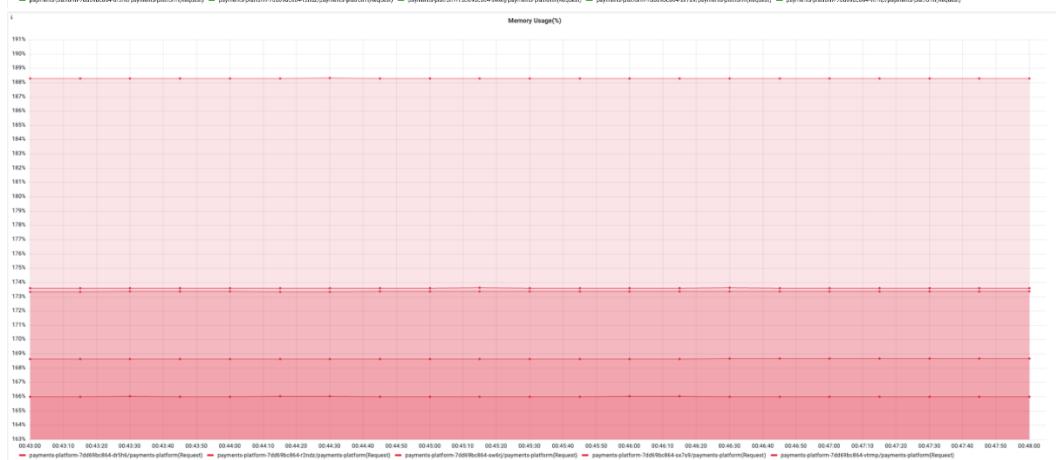
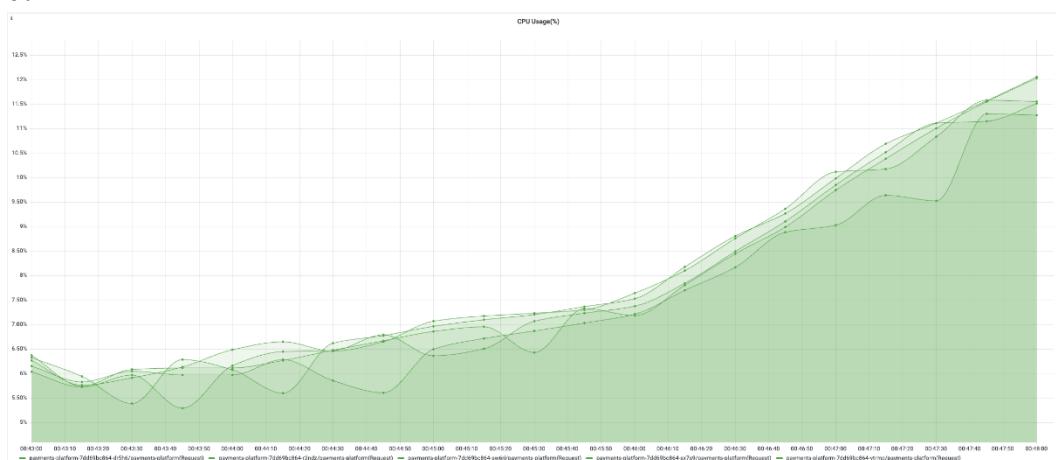
60 concurrent



Performance Test Result



80 concurrent



5.2.7.3.Database Resources Trend Chart

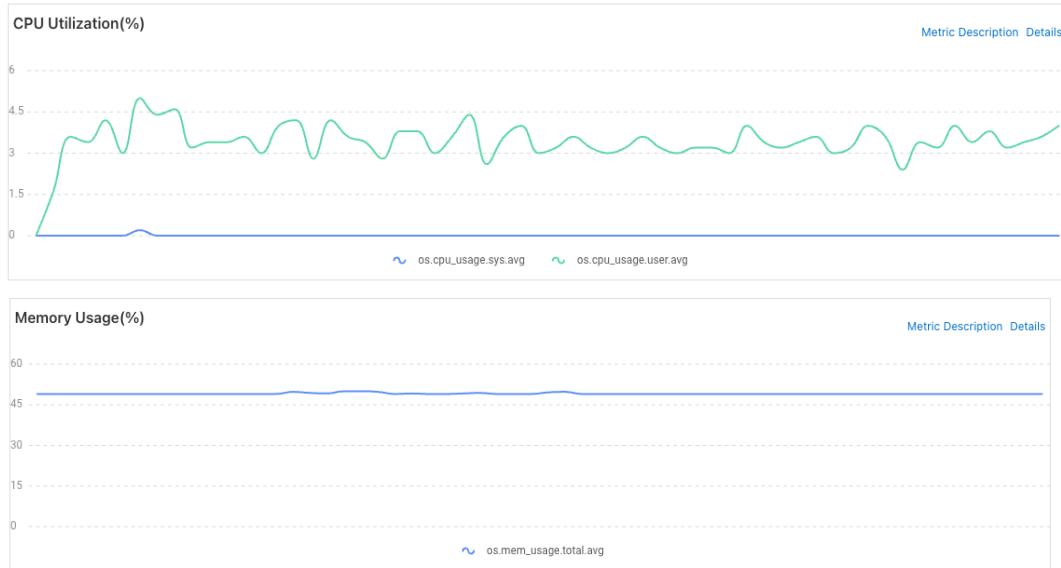
Payment-CPU and memory resource Trends:

20 concurrent

Performance Test Result



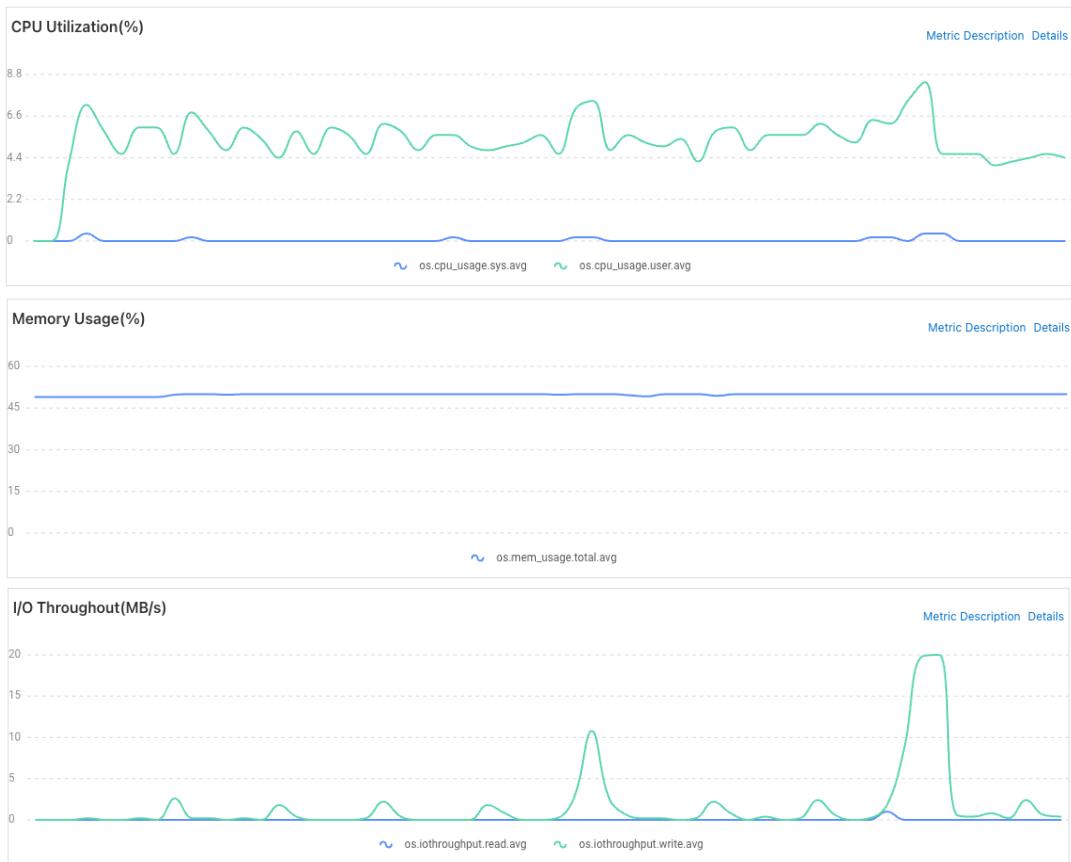
40 concurrent



Performance Test Result

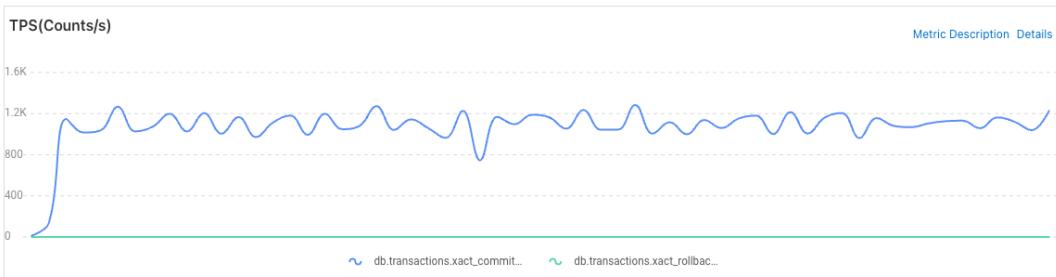
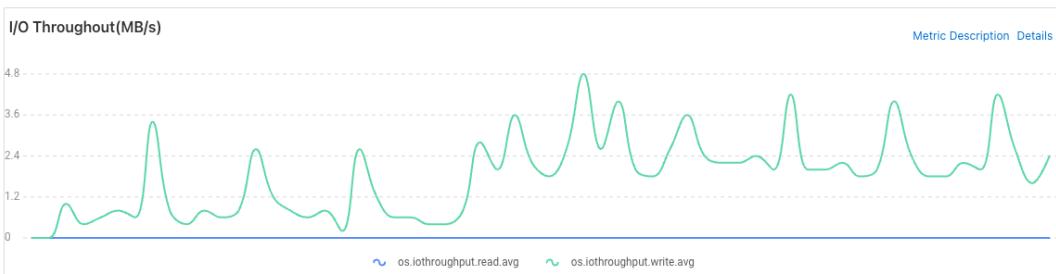
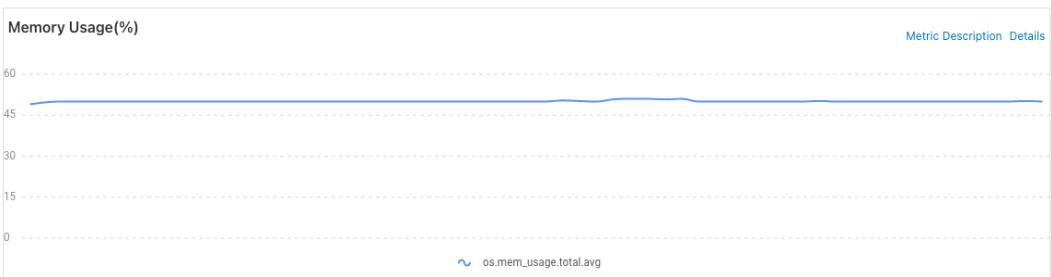
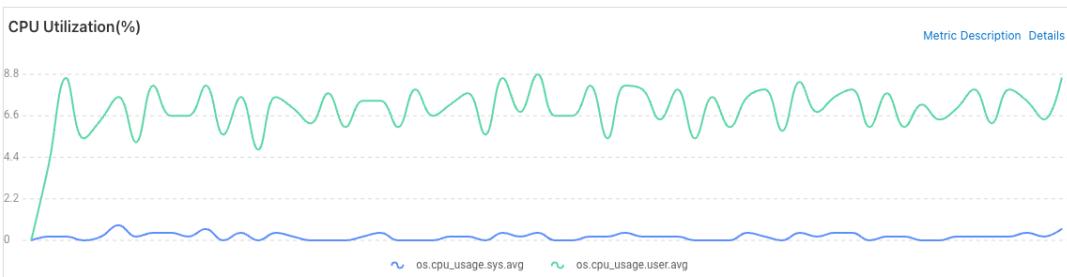


60 concurrent





80 concurrent



5.2.7.4. Analyze Statistics

Transfer with Interbank: The Transaction request is initiated using a stepwise number of concurrent users (20,40,60,80), and each gradient continues to run for 5 minutes, with a success rate of 100%.

TPS: TPS is relatively stable, with the increase of the number of concurrent users, TPS remains

around 40+.

AvgRT: The average response time trend is normal, with an average response time of 169ms for 80 concurrent.

Application Service resources: The CPU usage is normal, but the memory usage is 190%, this is due to there are 5 copies of application services, we need use the average value which is below 35% and meet the target value.

Database resources: The CPU and memory usage is normal and below the setting target value.

Overall Observation: While the current observation does not presently affect overall performance based on concurrent user sets, the CPU and Memory usage have exceeded the baseline defined in the performance indicators too. It is advisable to have pod scaling in place with target % of CPU and Memory utilization defined to ensure the appropriate number of application pods are spun up to manage spikes in incoming traffics effectively while maintaining the healthiness of pod's CPU and Memory usage.

5.2.8 Account Transaction Listing

5.2.8.1.Execution Results

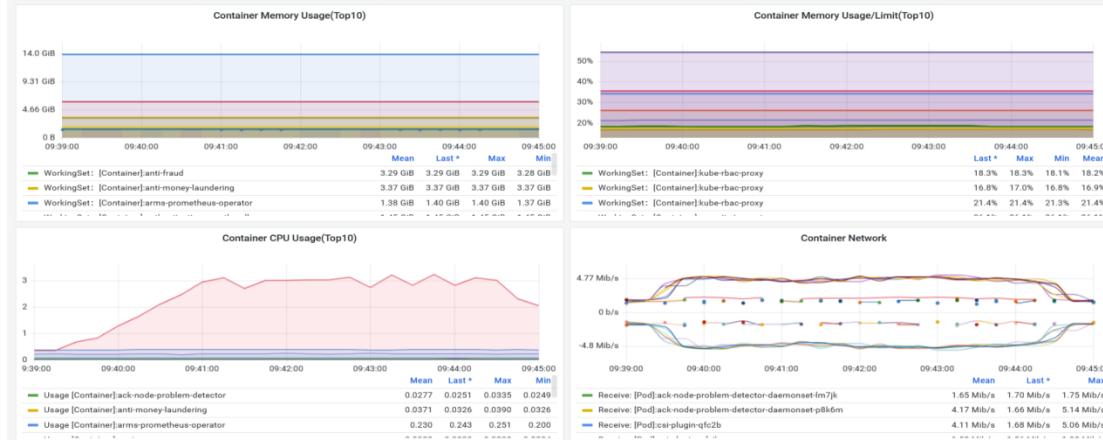
Case Name	Concurrent Number	TPS	AvgRT(ms)	Success rate	Application Service		Database	
					CPU Usage	Memory Usage	CPU Usage	Memory Usage
Account Transaction Listing	50	1280.9	31	100%	<3%	<50%	<8.8	<80%
	100	1772.3	44	100%	<4%	<50%	<12	<88%
	120	1559	67	100%	<4%	<50%	<16	<88%
	150	1773.7	75	100%	<4%	<50%	<12	<88%

5.2.8.2.Application Service Resources Trend Chart

CPU and memory resource trends:

50 concurrent

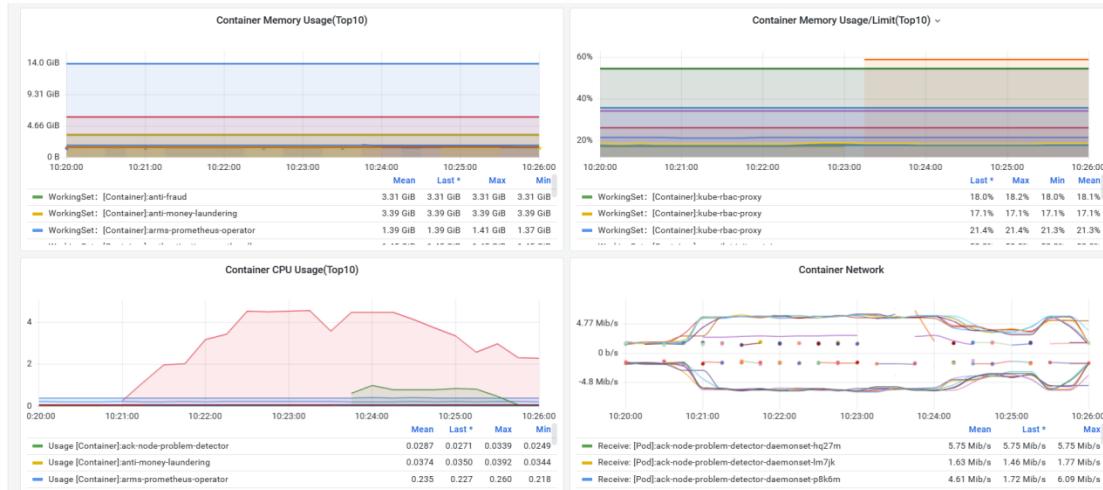
Performance Test Result



100 concurrent



120 concurrent



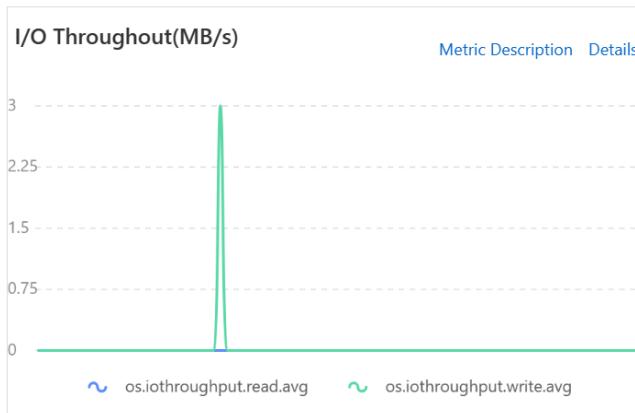
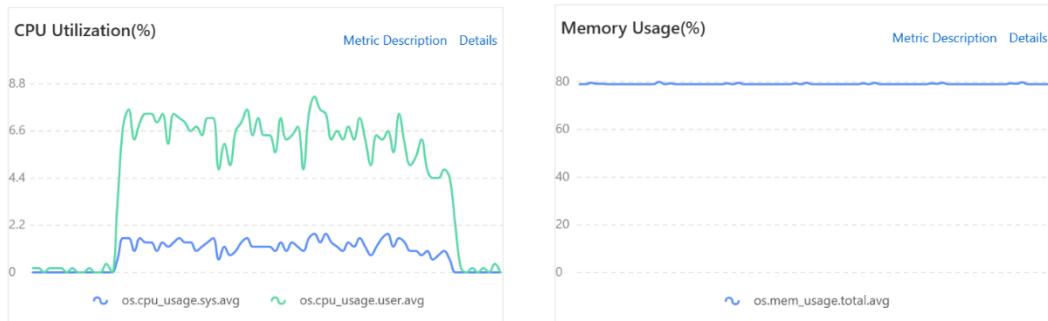
150 concurrent



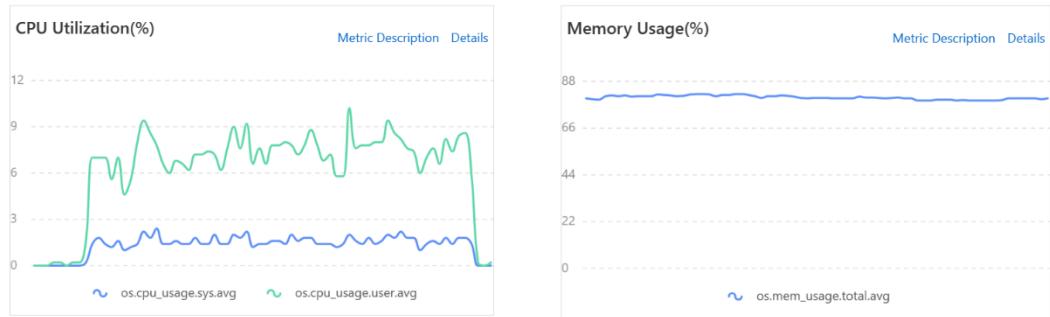
5.2.8.3.Database Resources Trend Chart

Deposit-CPU and memory resource Trends:

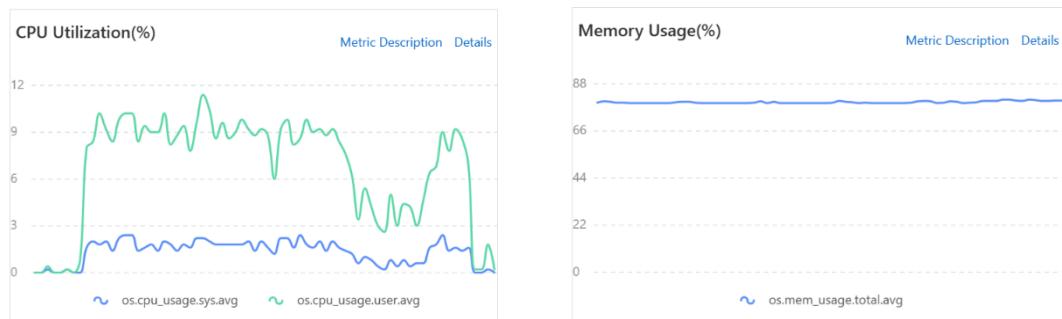
50 concurrent



100 concurrent



120 concurrent



150 concurrent



5.2.8.4. Analyze Statistics

Account Transaction Listing: The Transaction request is initiated using a stepwise number of concurrent users (50,100,120,150), and each gradient continues to run for 5 minutes, with a success rate of 100%.

TPS: TPS is relatively stable, with the increase of the number of concurrent users, TPS remains around 1600+.

AvgRT: The average response time trend is normal, with an average response time of 75ms for 150 concurrent.

Application Service resources: The CPU and Memory resource usage is normal and does not exceed the preset resource setting limit.

Database resources: The CPU usage is under 16%, meet expected target, but the memory usage is around 96%, which is above the target value, this is due to the database configuration is low for test environment, confirmed with client infra team will update the database configuration when product goes live.

Overall Observation: While the current observation does not presently affect overall performance based on concurrent user sets, it is advisable to enhance the database specifications as the database's memory utilization is exceeding 60% as compared to the performance indicators. This measure aims to prevent any unexpected behavior resulting from reaching 100% utilization.

5.2.9 Account Transaction Detail Retrieval

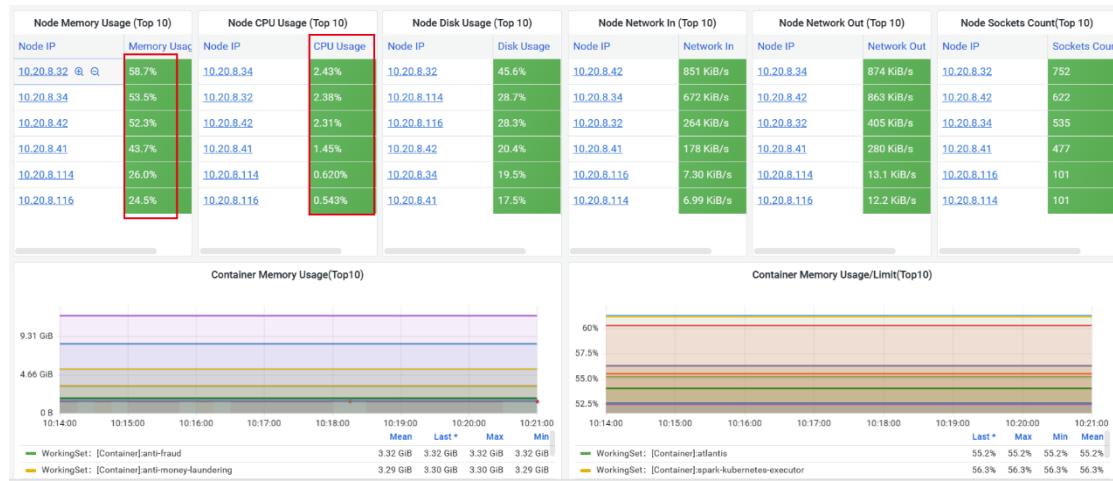
5.2.9.1.Execution Results

Case Name	Concurrent Number	TPS	AvgRT(ms)	Success rate	Application Service		Database	
					CPU Usage	Memory Usage	CPU Usage	Memory Usage
Account Transaction Detail Retrieval	50	851.7	40	100%	<2.5%	<60%	<8%	<88%
	100	841.4	80	100%	<2.5%	<60%	<8%	<88%
	150	857.6	98	100%	<4.3%	<60%	<8%	<88%
	200	875.6	208	100%	<2.4%	<60%	<9.6%	<88%

5.2.9.2.Application Service Resources Trend Chart

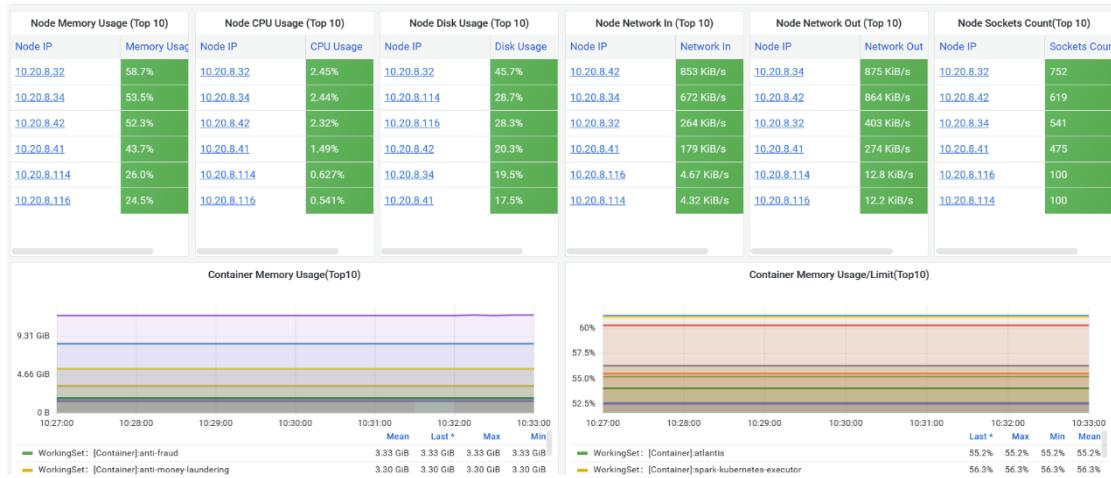
CPU and memory resource trends:

50 concurrent

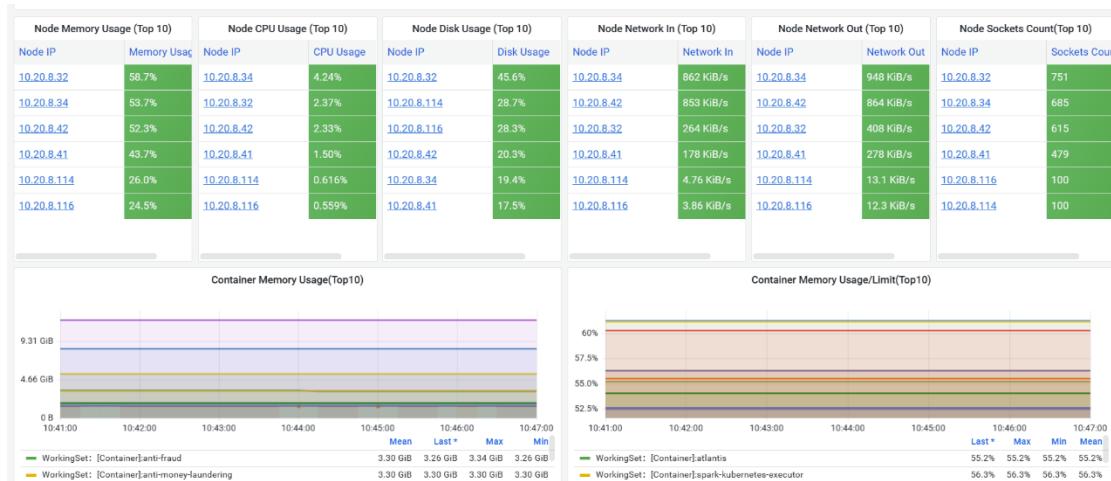


100 concurrent

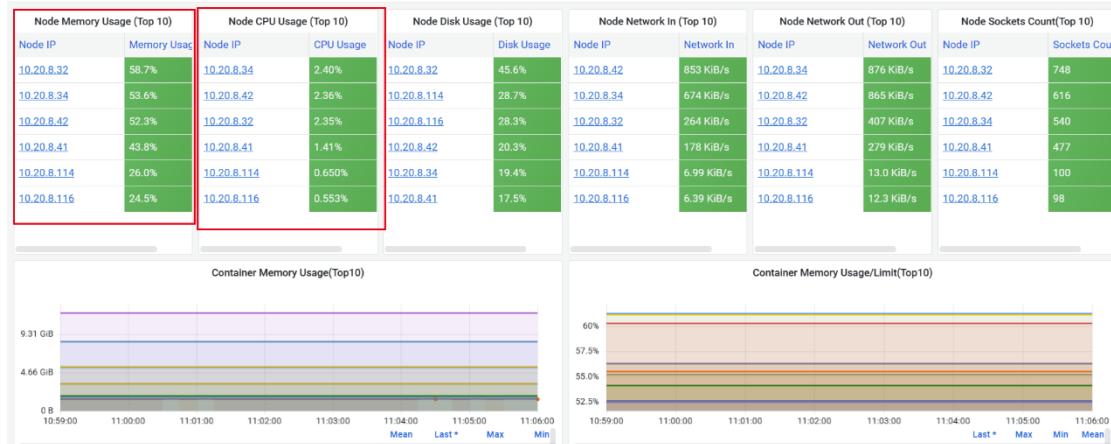
Performance Test Result



150 concurrent



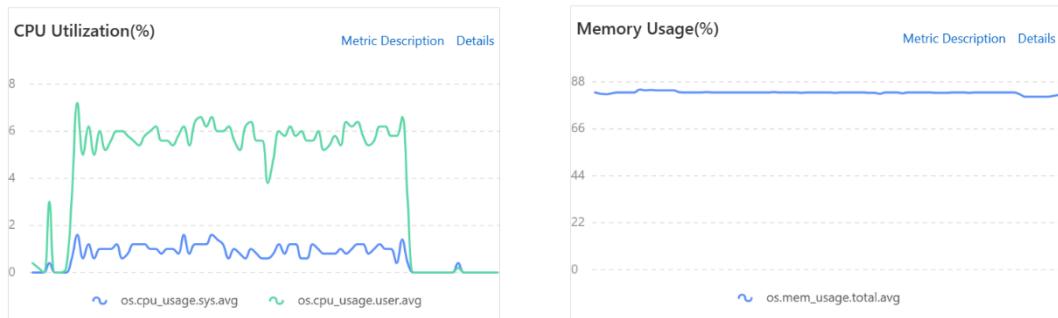
200 concurrent



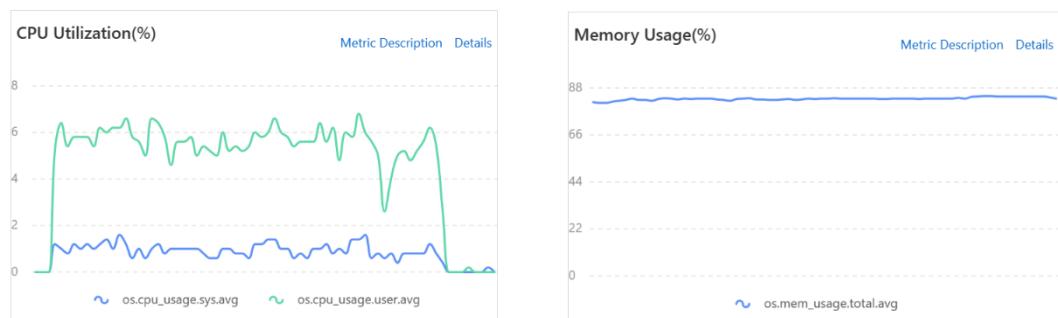
5.2.9.3.Database Resources Trend Chart

Deposit-CPU and memory resource Trends:

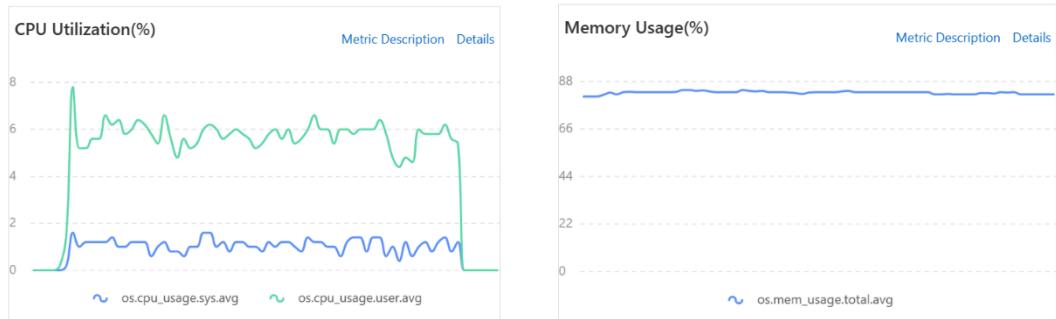
50 concurrent



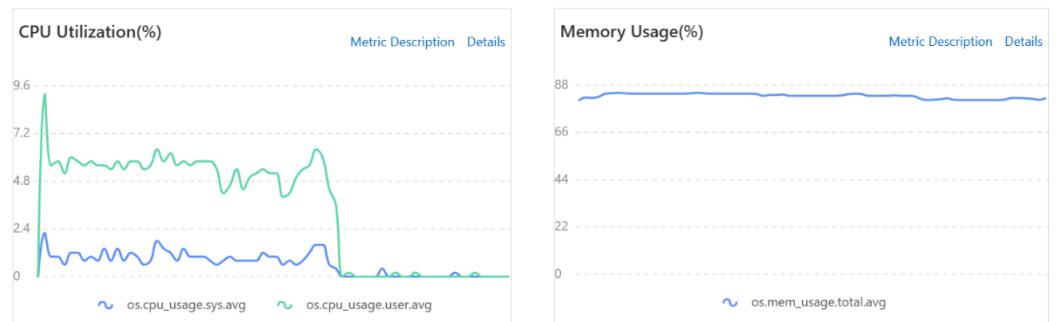
100 concurrent



150 concurrent



200 concurrent



5.2.9.4. Analyze Statistics

Account Transaction Detail Retrieval: The Transaction request is initiated using a stepwise

number of concurrent users (50,100,150,200), and each gradient continues to run for 5 minutes, with a success rate of 100%.

TPS: TPS is relatively stable, with the increase of the number of concurrent users, TPS remains around 850+.

AvgRT: The average response time trend is normal, with an average response time of 208ms for 200 concurrent.

Application Service resources: The CPU and Memory resource usage is normal and does not exceed the preset resource setting limit.

Database resources: The CPU usage is under 9.6%, meet expected target, but the memory usage is around 96%, which is above the target value, this is due to the database configuration is low for test environment, confirmed with client infra team will update the database configuration when product goes live.

Overall Observation: While the current observation does not presently affect overall performance until the max number of concurrent users set are used (exceed 8ms), it is advisable to enhance the database specifications as the database's memory utilization is exceeding 60% as compared to the performance indicators. This measure aims to prevent any unexpected behavior resulting from reaching 100% utilization.

5.2.10 Get Remaining transfer limit

5.2.10.1. Execution Results

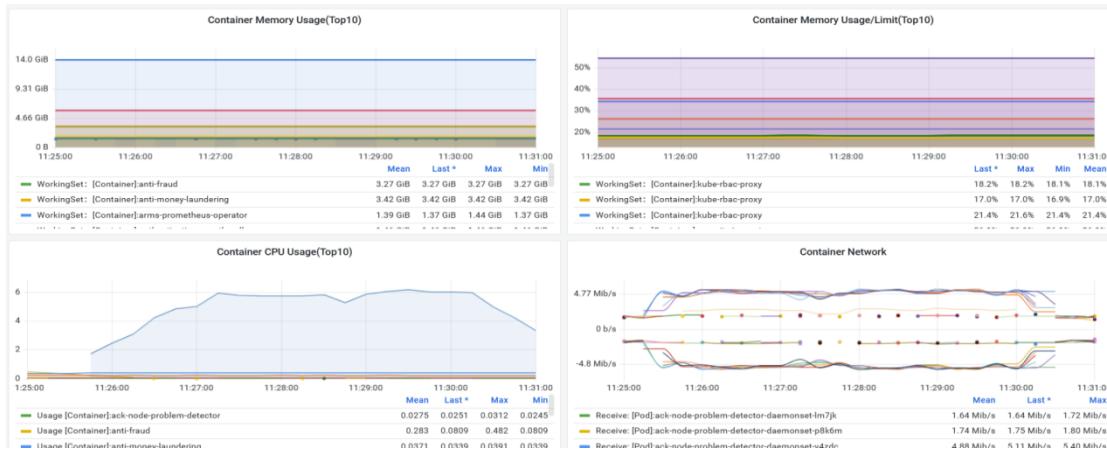
Case Name	Concurrent Number	TPS	AvgRT(ms)	Success rate	Application Service		Database	
					CPU Usage	Memory Usage	CPU Usage	Memory Usage
Get Remaining transfer limit	50	1104.8	35	100%	<6%	<50%	<24%	<96%
	100	1207.7	66	100%	<6%	<50%	<20%	<96%
	150	1143.6	96	100%	<6%	<50%	<24%	<96%
	120	1218.7	80	100%	<6%	<50%	<24%	<96%

5.2.10.2. Application Service Resources Trend Chart

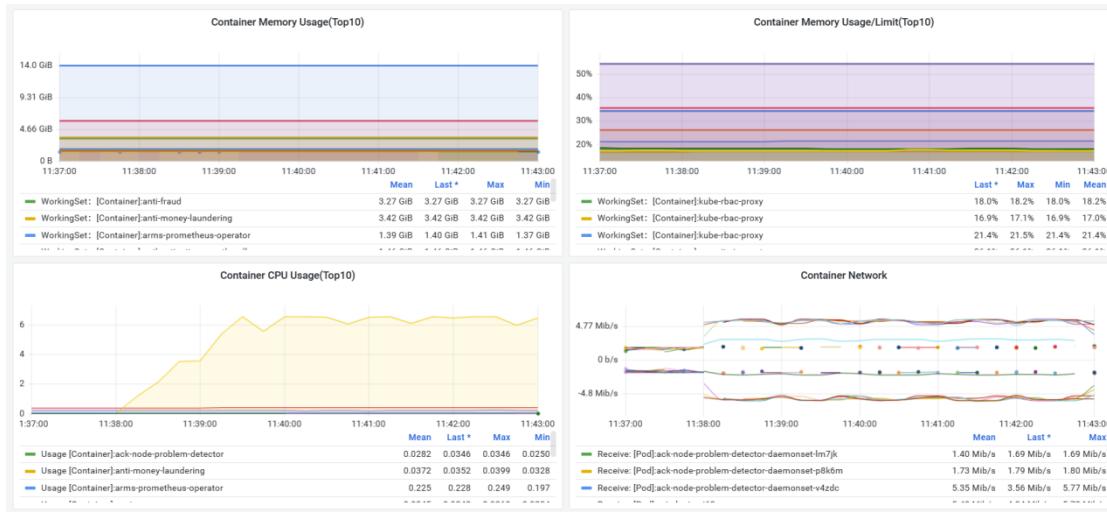
CPU and memory resource trends:

50 concurrent

Performance Test Result



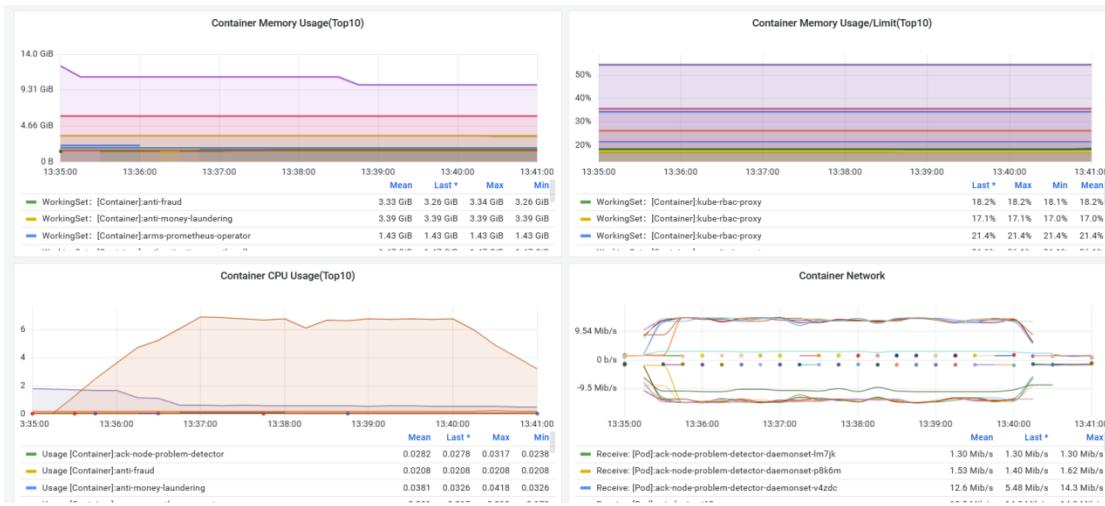
100 concurrent



120 concurrent



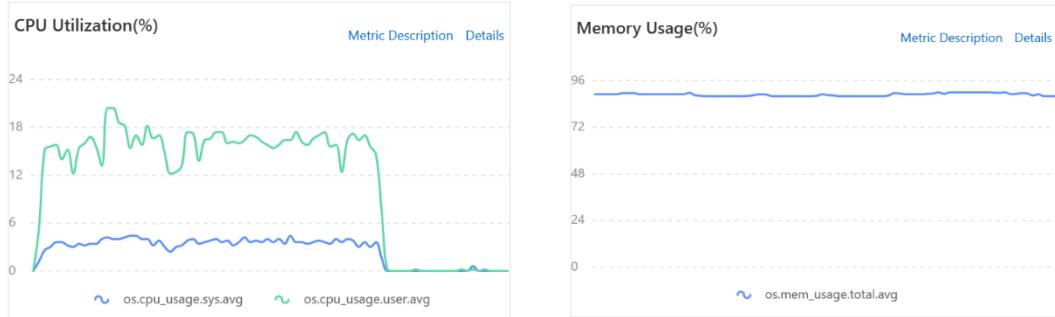
150 concurrent



5.2.10.3. Database Resources Trend Chart

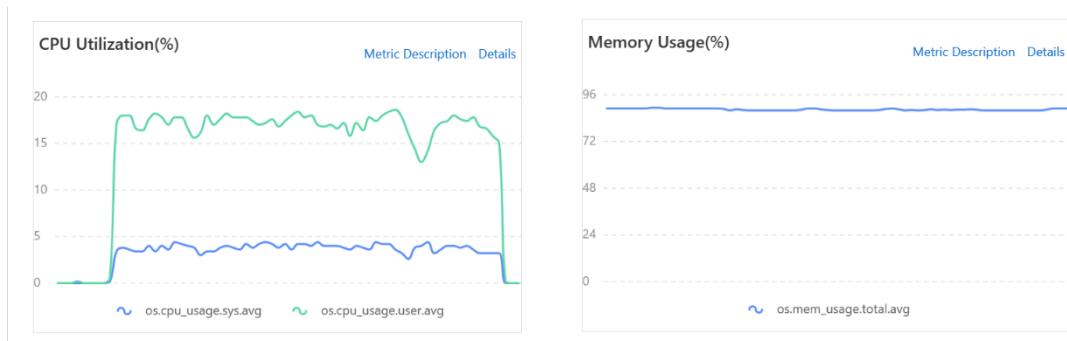
Payment-CPU and memory resource Trends:

50 concurrent

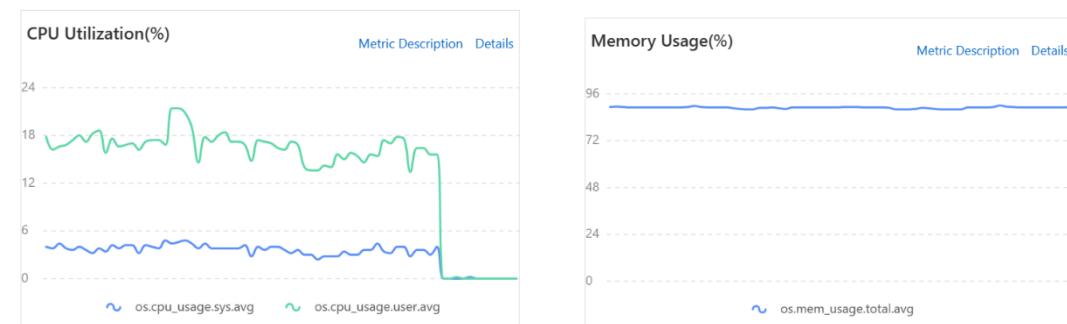


100 concurrent

Performance Test Result



120 concurrent



150 concurrent



5.2.10.4. Analyze Statistics

Get Remaining transfer limit: The Transaction request is initiated using a stepwise number of concurrent users(50, 100, 120, 150), and each gradient continues to run for 5 minutes, with a success rate of 100%.

TPS: TPS is relatively stable, with the increase of the number of concurrent users, TPS remains around 1200+.

AvgRT: The average response time trend is normal, with an average response time of 96ms for 150 concurrent.

Application Service resources: The CPU and Memory resource usage is normal and does not exceed the preset resource setting limit.

Database resources: The CPU usage is under 24%, meet expected target, but the memory usage is around 96%, which is above the target value, this is due to the database configuration is low for test environment, confirmed with client infra team will update the database configuration when product goes live.

Overall Observation: While the current observation does not presently affect overall performance based on concurrent user sets, it is advisable to enhance the database specifications as the database's memory utilization is exceeding 60% as compared to the performance indicators. This measure aims to prevent any unexpected behavior resulting from reaching 100% utilization.

5.2.11 Get Transfer details by transfer id

5.2.11.1. Execution Results

Case Name	Concurrent Number	TPS	AvgRT(ms)	Success rate	Application Service		Database	
					CPU Usage	Memory Usage	CPU Usage	Memory Usage
Get Transfer details by transfer id	50	280.5	159	100%	<7%	<60%	<88%	<96%
	100	285.7	321	100%	<7%	<60%	<88%	<96%
	150	288.1	444	100%	<7%	<60%	<88%	<96%
	120	278.8	347	100%	<7%	<60%	<88%	<96%

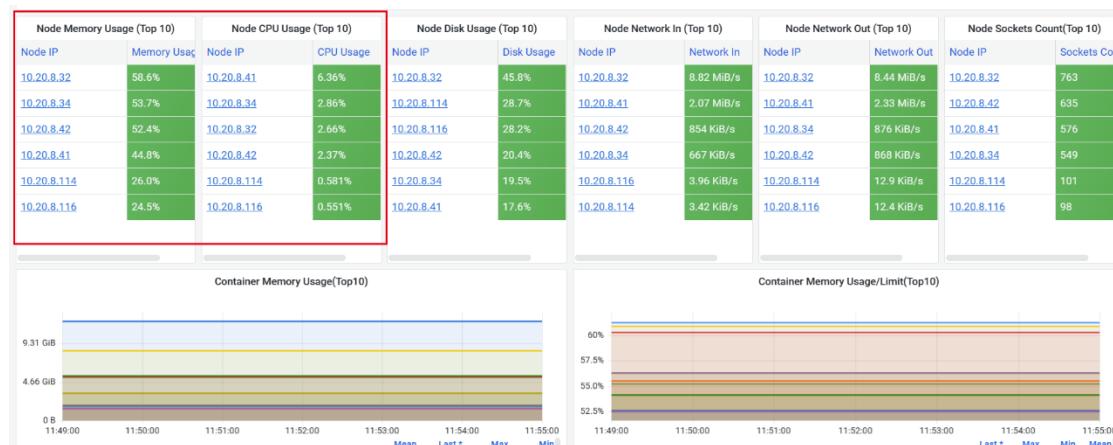
5.2.11.2. Application Service Resources Trend Chart

CPU and memory resource trends:

50 concurrent

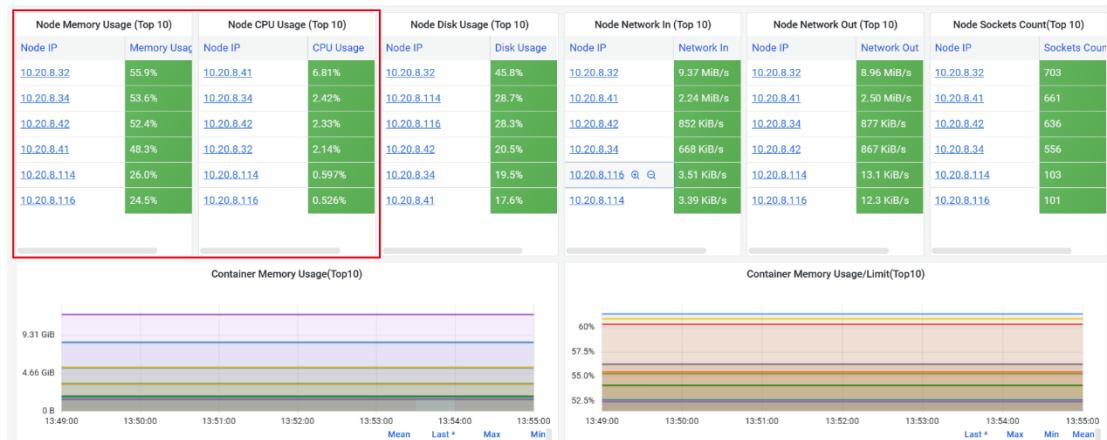


100 concurrent

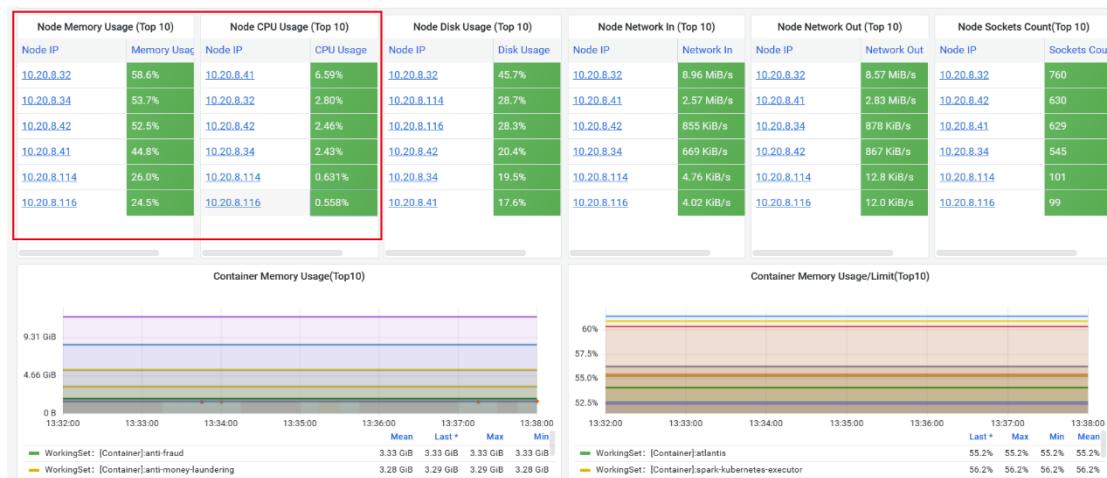


Performance Test Result

120 concurrent



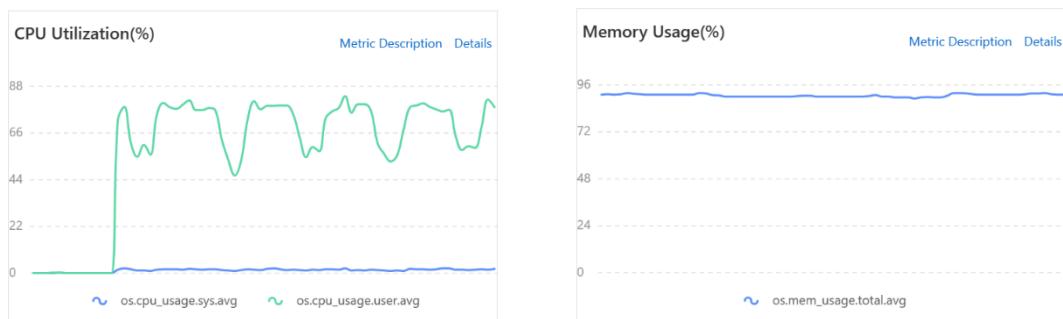
150 concurrent

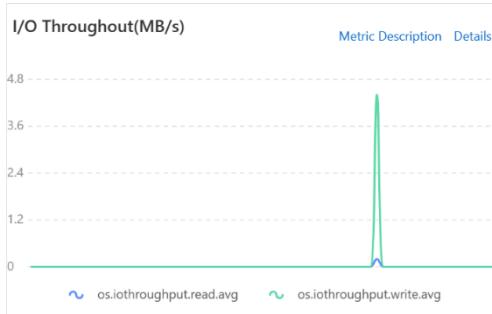


5.2.11.3. Database Resources Trend Chart

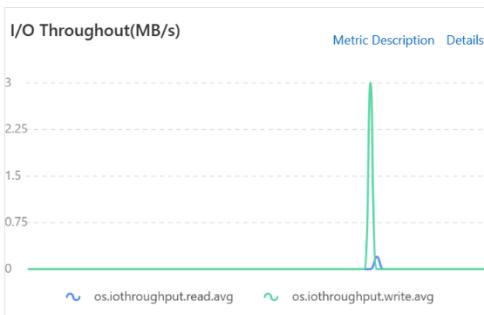
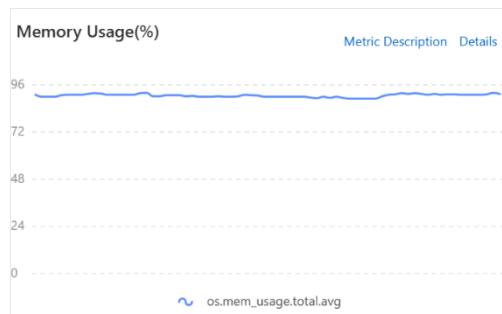
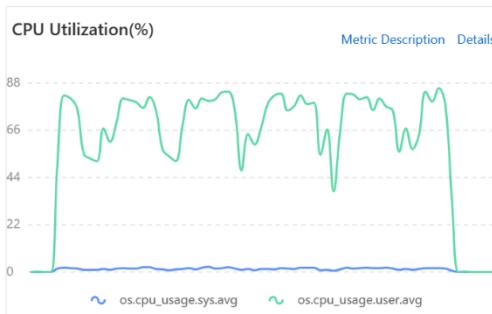
Payment-CPU and memory resource Trends:

50 concurrent

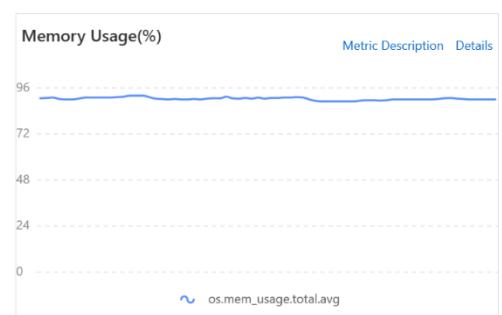
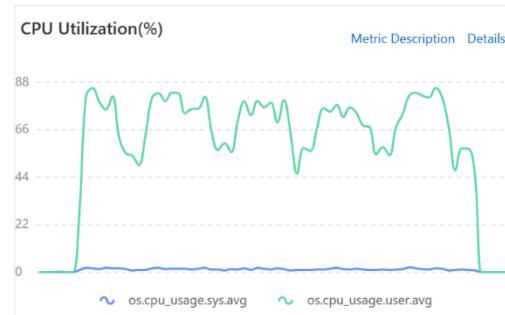


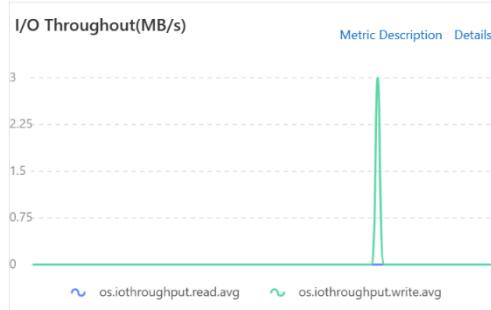


100 concurrent

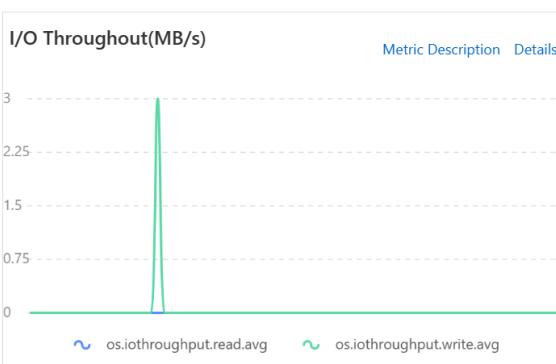
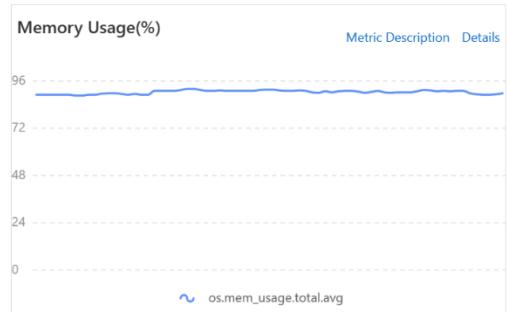
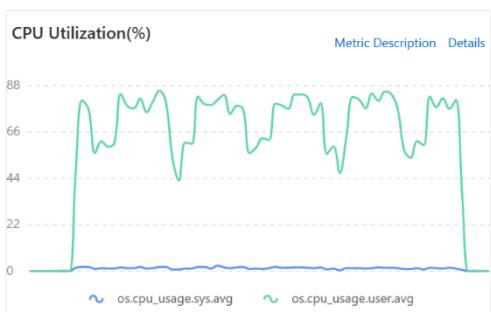


120 concurrent





150 concurrent



5.2.11.4. Analyze Statistics

Get Transfer details by transfer id: The Transaction request is initiated using a stepwise number of concurrent users (50,100,120,150), and each gradient continues to run for 5 minutes, with a success rate of 100%.

TPS: TPS is relatively stable, with the increase of the number of concurrent users, TPS remains around 280+.

AvgRT: The average response time trend is normal, with an average response time of 444ms for 150 concurrent.

Application Service resources: The CPU and Memory resource usage is normal and does not exceed the preset resource setting limit.

Database resources: The CPU usage is under 88% and CPU usage is around 96% which is above the target value, this is due to the payment database configuration is low for test environment when processing this case, and already been upgraded.

Overall Observation: While the database's CPU and memory utilization is constantly exceeding the 60% baseline regardless of number of concurrent users and impacting the average response time while increasing the number of concurrent users used, it is advisable to enhance the database specifications to handle the request more effectively.

5.2.12 Transfer Limit Update

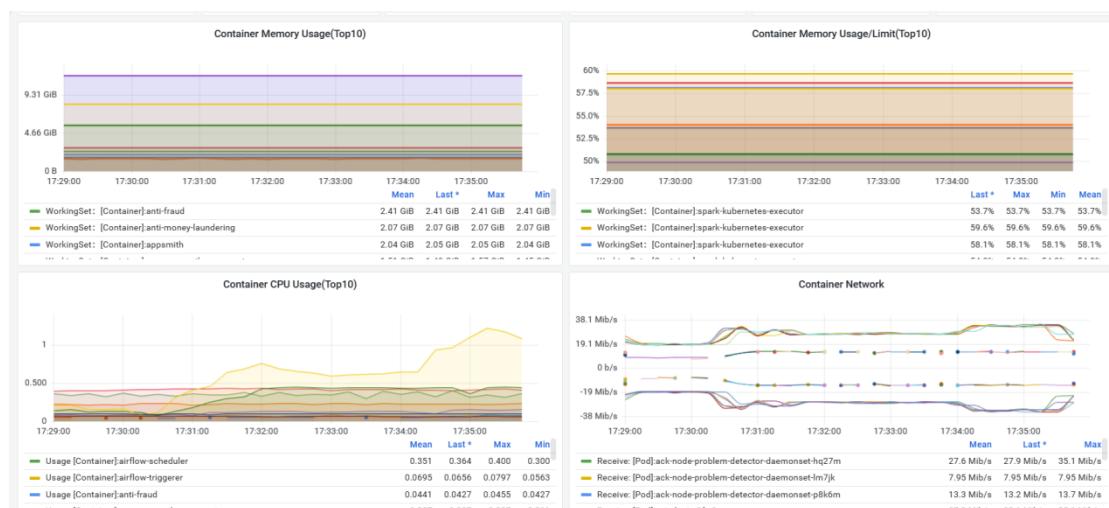
5.2.12.1. Execution Results

Case Name	Concurrent Number	TPS	AvgRT(ms)	Success rate	Application Service		Database	
					CPU Usage	Memory Usage	CPU Usage	Memory Usage
Transfer Limit Update	20	331.5	30	100%	<1%	<60%	<88%	<96%
	40	906	35	100%	<2%	<60%	<80%	<96%
	60	591.8	48	100%	<2%	<60%	<80%	<100%
	80	653.9	60	100%	<2%	<60%	<88%	<96%

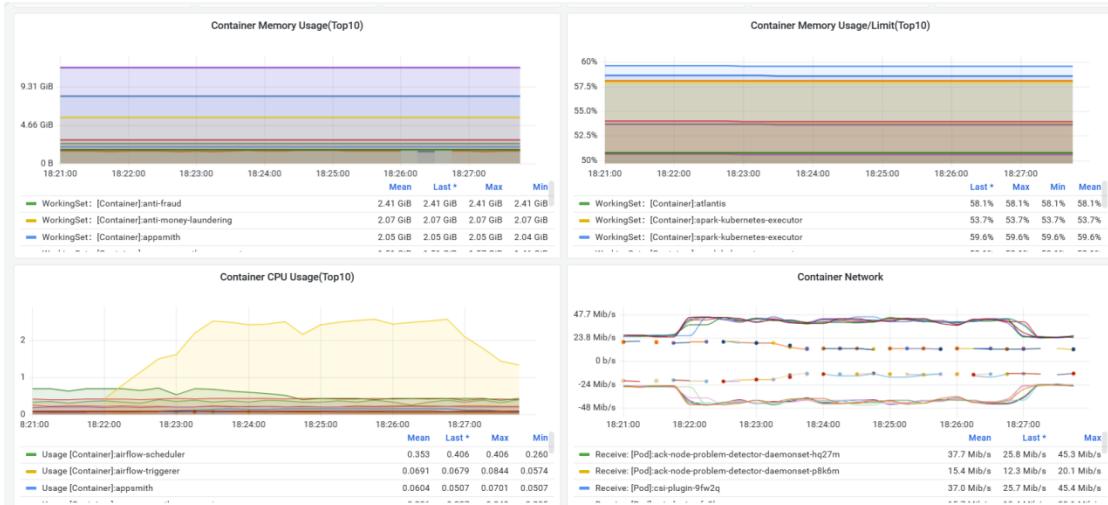
5.2.12.2. Application Service Resources Trend Chart

CPU and memory resource trends:

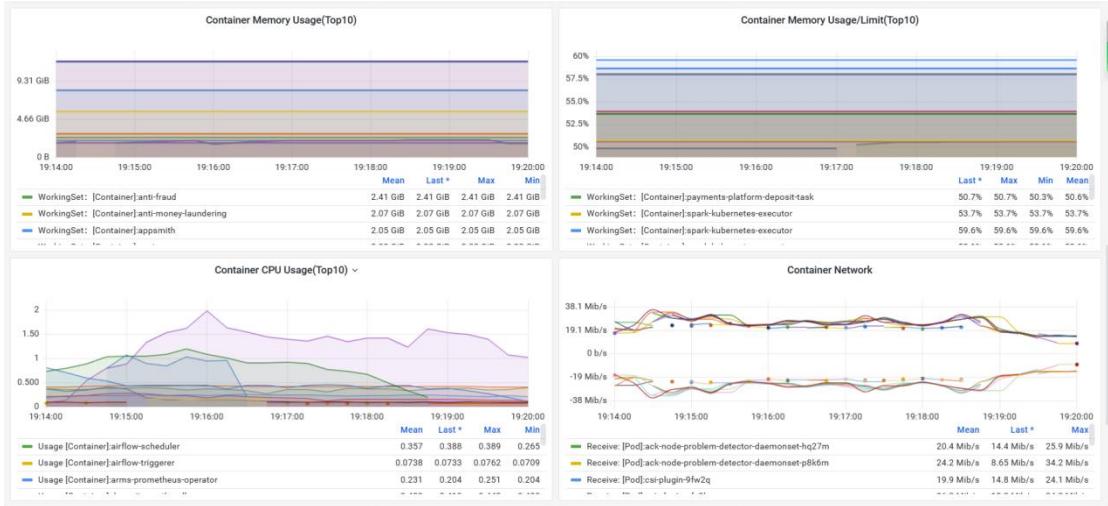
20 concurrent



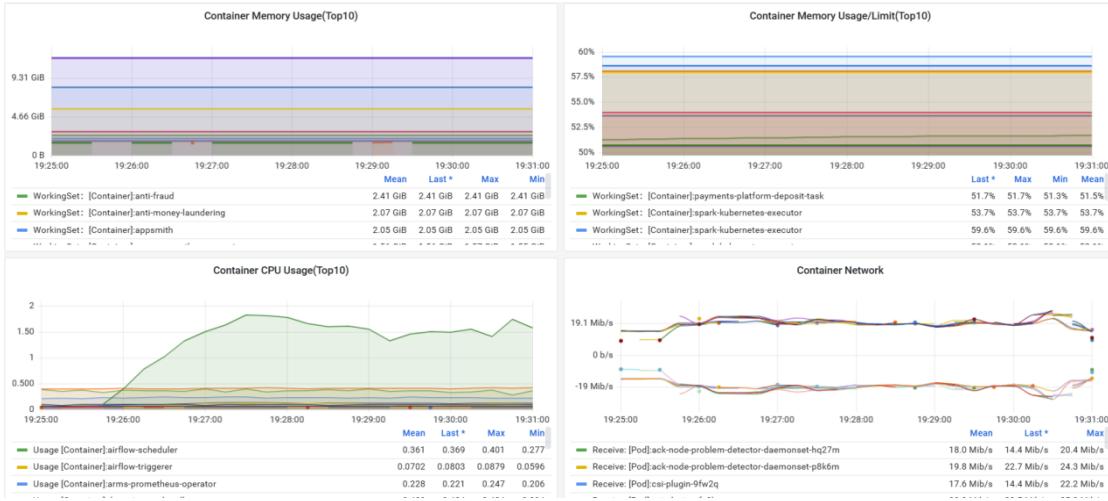
40 concurrent



60 concurrent

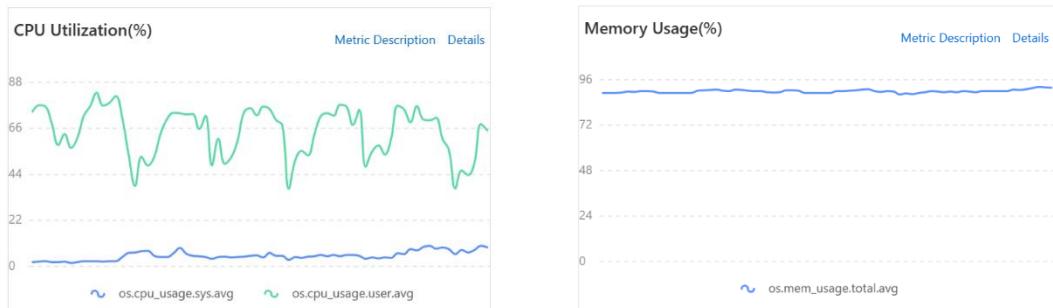


80 concurrent

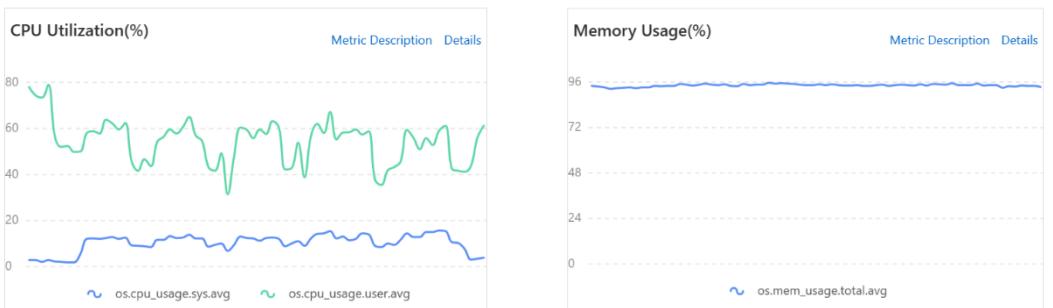


5.2.12.3. Database Resources Trend Chart

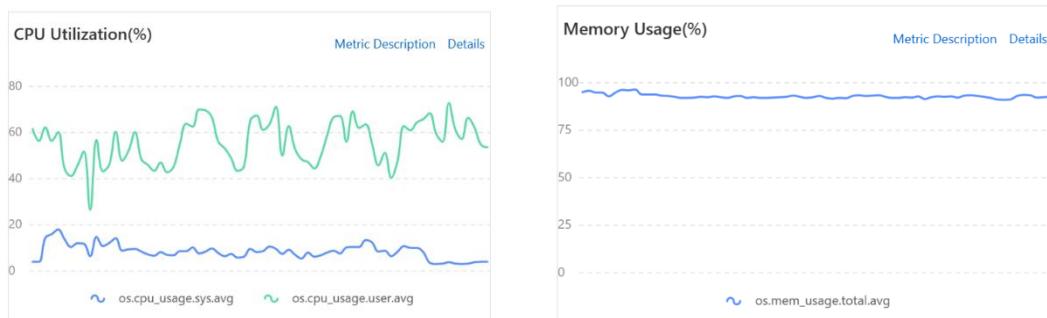
Payment-CPU and memory resource Trends:
20 concurrent



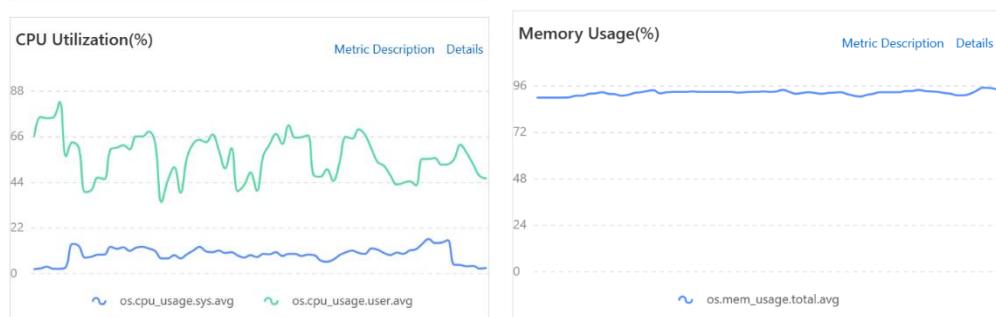
40 concurrent



60 concurrent



80 concurrent



5.2.12.4. Analyze Statistics

Transfer Limit Update: The Transaction request is initiated using a stepwise number of concurrent users (20,40,60,80), and each gradient continues to run for 5 minutes, with a success rate of 100%.

TPS: TPS is relatively stable, with the increase of the number of concurrent users, TPS remains

around 600+.

AvgRT: The average response time trend is normal, with an average response time of 60ms for 80 concurrent.

Application Service resources: The CPU and Memory resource usage is normal and does not exceed the preset resource setting limit.

Database resources: The CPU usage is under 88% and CPU usage is around 100% which is above the target value, this is due to the payment database configuration is low for test environment when processing this case, and already been upgraded.

Overall Observation: While the current observation does not presently affect overall performance based on concurrent user sets, it is advisable to enhance the database specifications as the database's CPU and Memory utilization is exceeding 60% as compared to the performance indicators. This measure aims to prevent any unexpected behavior resulting from reaching 100% utilization.

5.2.13 Account Resolution

5.2.13.1. Execution Results

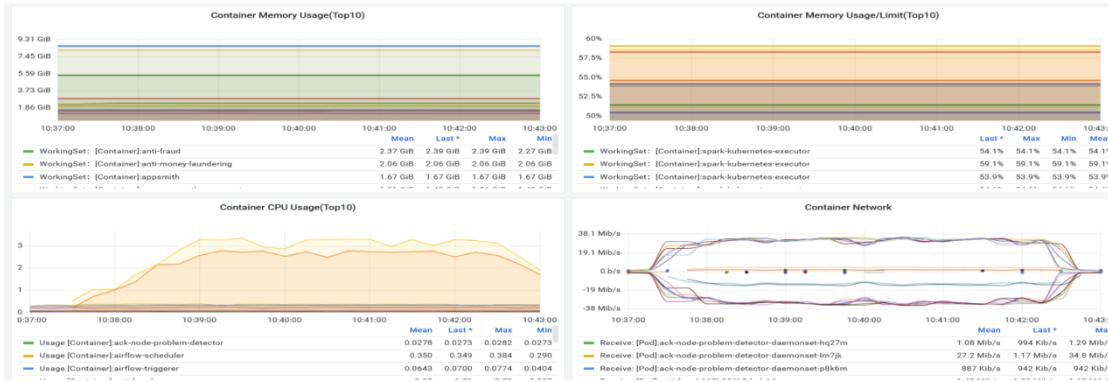
Case Name	Concurrent Number	TPS	AvgRT(ms)	Success rate	Application Service		Database	
					CPU Usage	Memory Usage	CPU Usage	Memory Usage
Account Resolution	50	957	43	100%	<3%	<60%	<32%	<96%
	100	1000.9	67	100%	<4%	<60%	<40%	<96%
	150	1164.8	114	100%	<4%	<60%	<40%	<96%
	200	1161.8	157	100%	<4%	<60%	<40%	<96%

5.2.13.2. Application Service Resources Trend Chart

CPU and memory resource trends:

50 concurrent

Performance Test Result



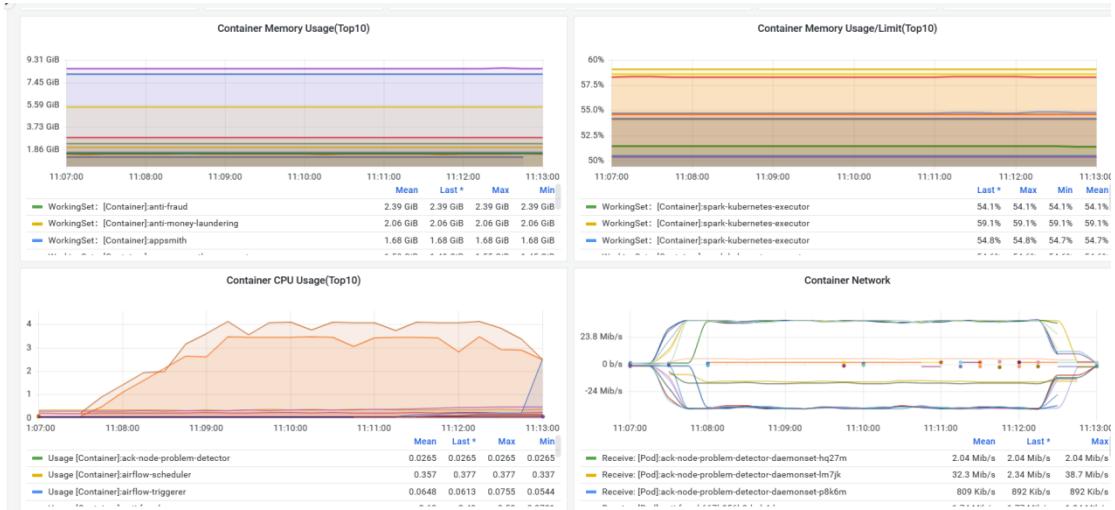
100 concurrent



150 concurrent



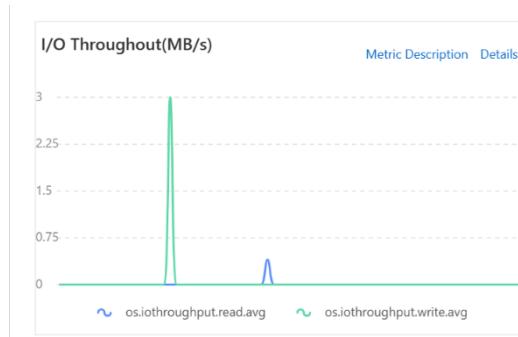
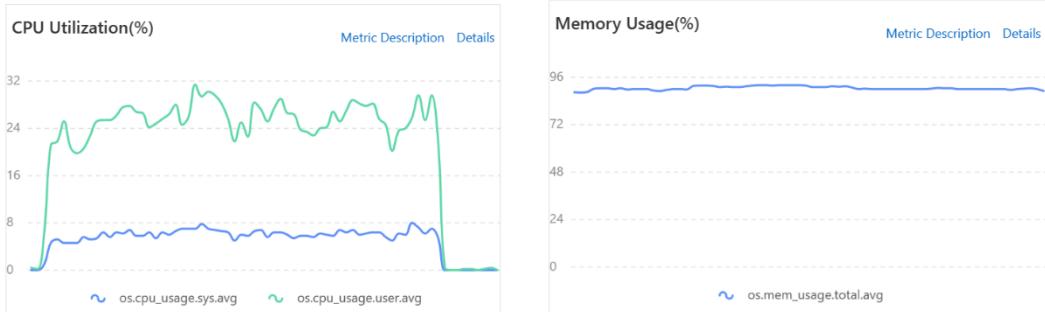
200 concurrent



5.2.13.3. Database Resources Trend Chart

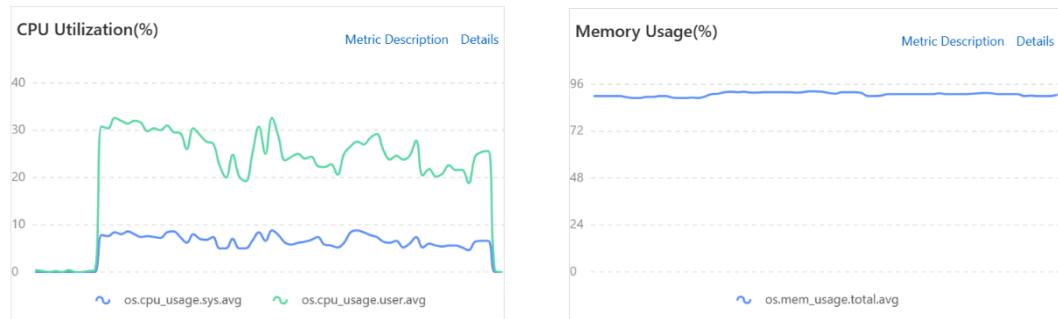
Payment-CPU and memory resource Trends:

50 concurrent

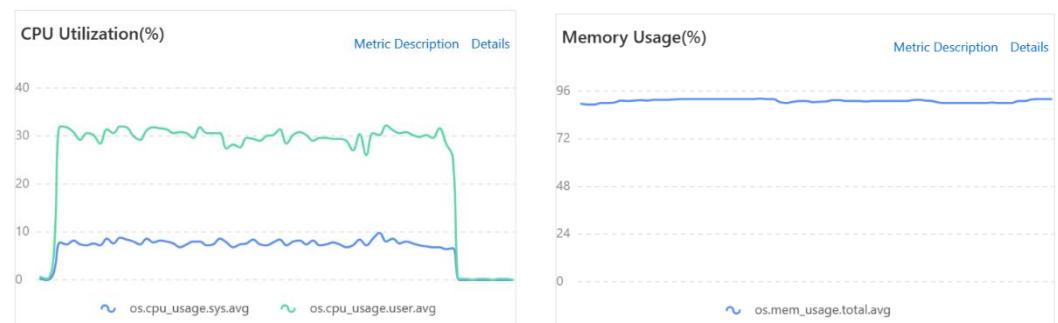


100 concurrent

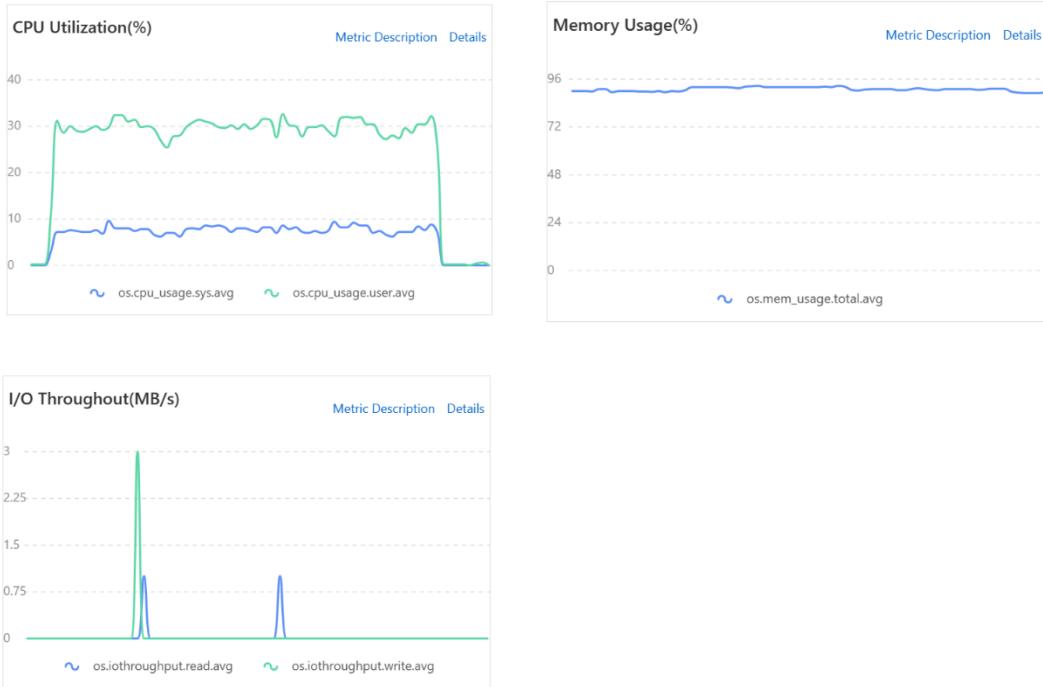
Performance Test Result



150 concurrent



200 concurrent



5.2.13.4. Analyze Statistics

Account Resolution: The Transaction request is initiated using a stepwise number of concurrent users (50,100,150,200), and each gradient continues to run for 5 minutes, with a success rate of 100%.

TPS: TPS is relatively stable, with the increase of the number of concurrent users, TPS remains around 1000+.

AvgRT: The average response time trend is normal, with an average response time of 157ms for 200 concurrent.

Application Service resources: The CPU and Memory resource usage is normal and does not exceed the preset resource setting limit.

Database resources: The CPU usage is under 40% which is normal, but CPU usage is around 96% which is above the target value, this is due to the database configuration is low for test environment when processing this case, and will be upgraded when product goes live.

Overall Observation: While the current observation does not presently affect overall performance based on concurrent user sets, it is advisable to enhance the database specifications as the database's memory utilization is exceeding 60% as compared to the performance indicators. This measure aims to prevent any unexpected behavior resulting from reaching 100% utilization.

5.2.14 Transferee Favourited

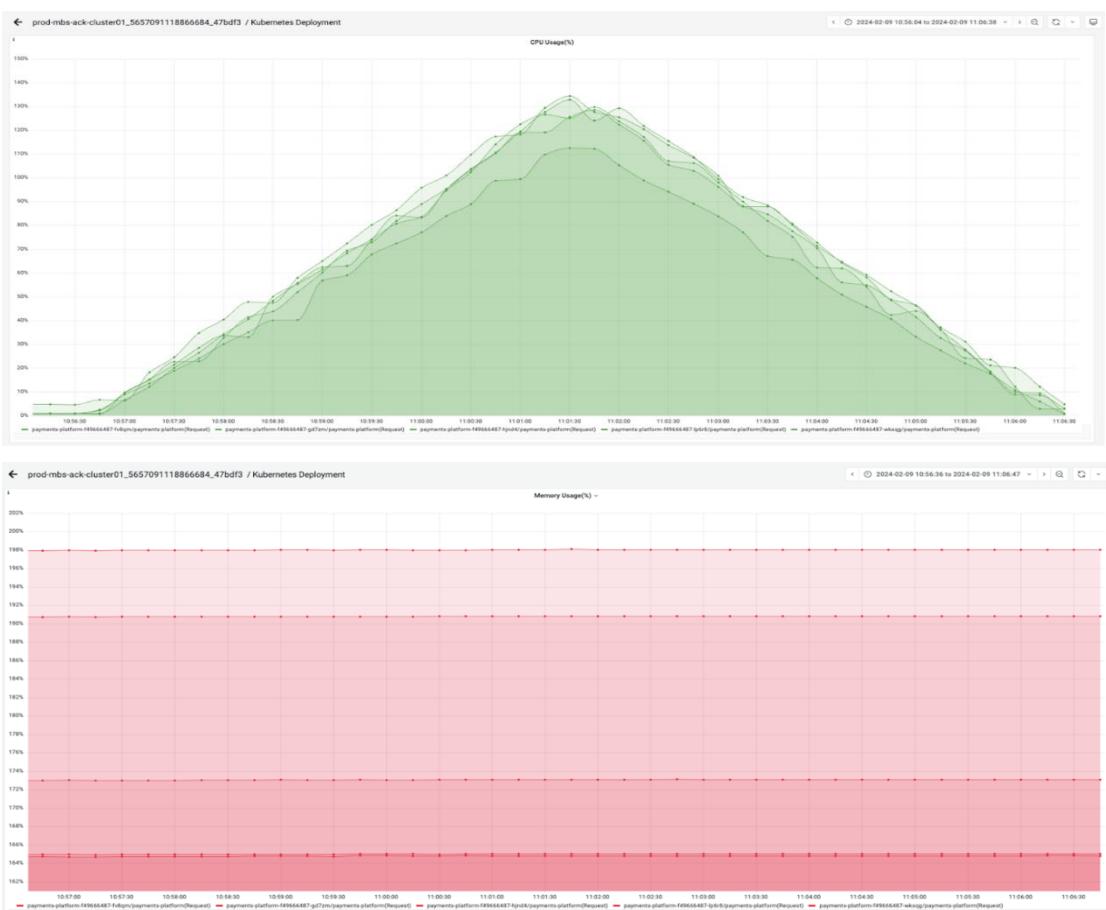
5.2.14.1. Execution Results

Case Name	Concurrent Number	TPS	AvgRT(ms)	Success rate	Application Service		Database	
					CPU Usage	Memory Usage	CPU Usage	Memory Usage
Transfer ee Favourited	20	415.8	23	100%	<140%	<200%	<8%	<48%
	40	1607.6	23	100%	<270%	<200%	<12%	<48%
	60	2046.8	27	100%	<340%	<200%	<20%	<48%
	80	2217.2	34	100%	<380%	<200%	<20%	<48%

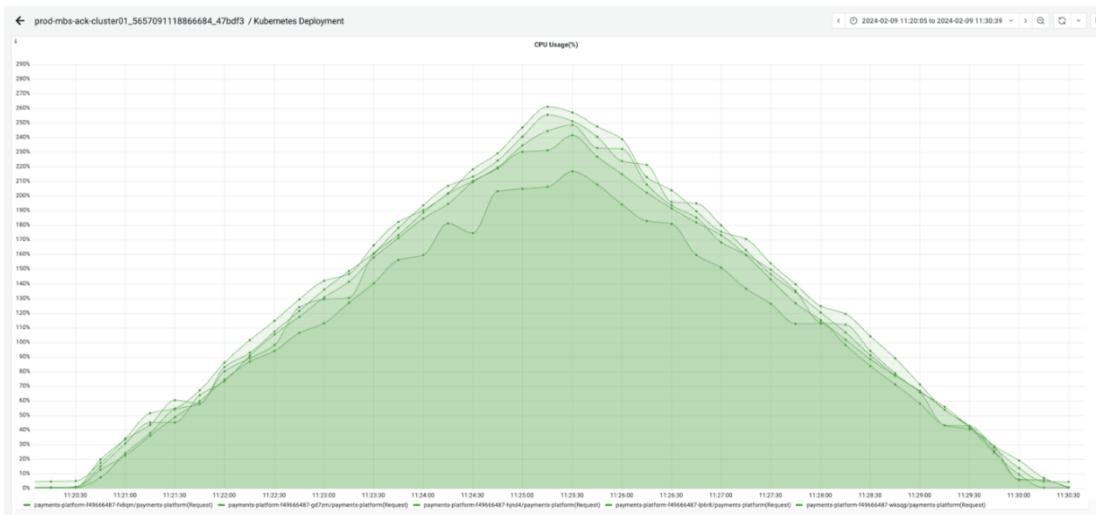
5.2.14.2. Application Service Resources Trend Chart

CPU and memory resource trends:

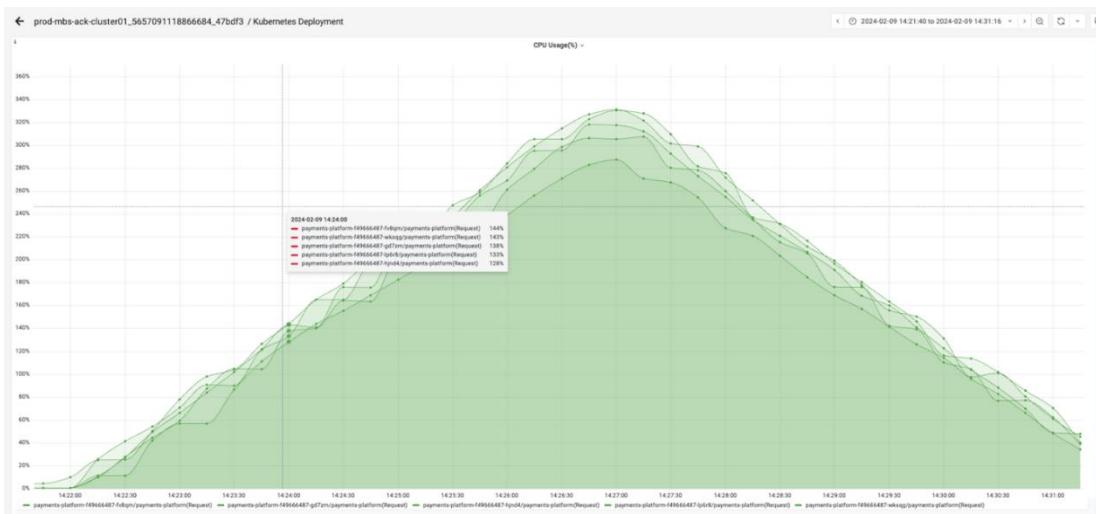
20 concurrent



40 concurrent



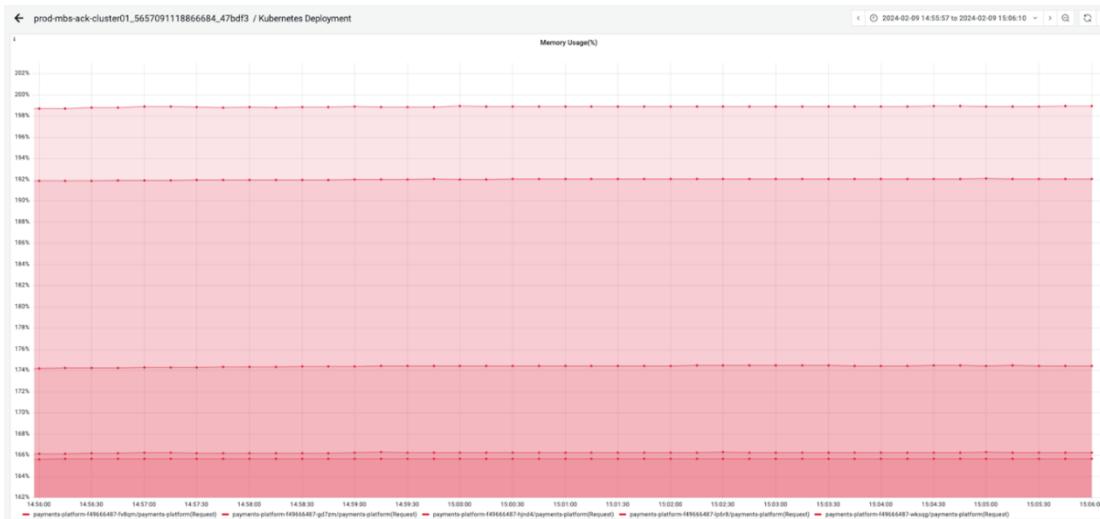
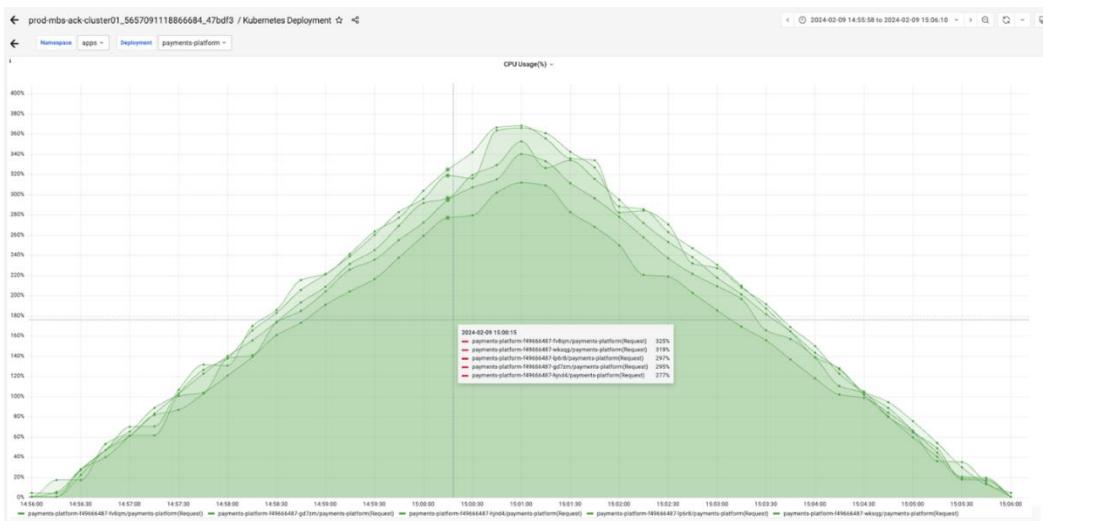
60 concurrent



Performance Test Result



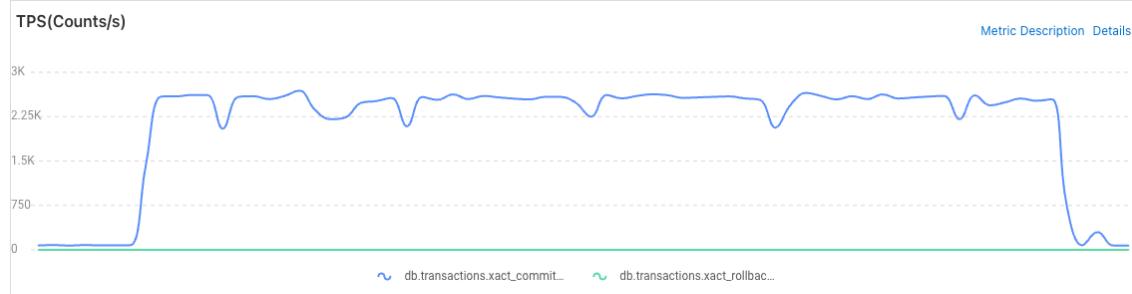
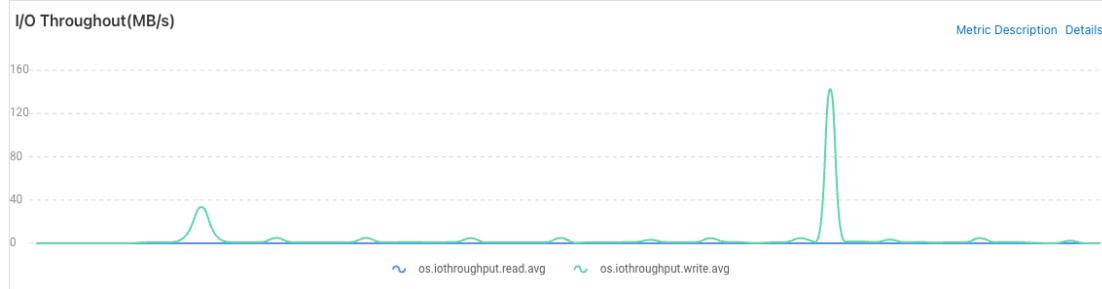
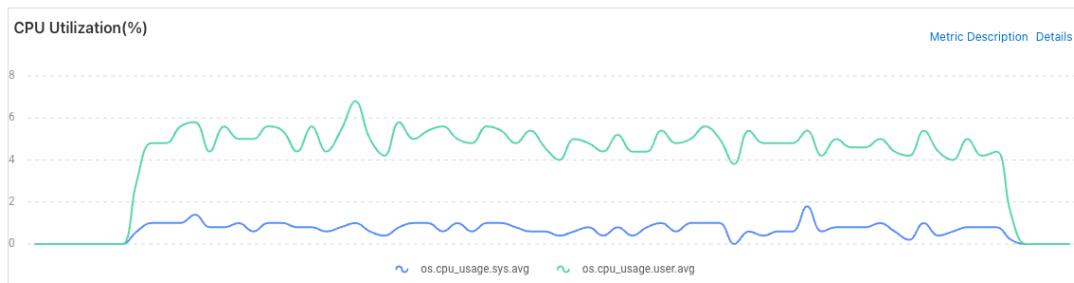
80 concurrent



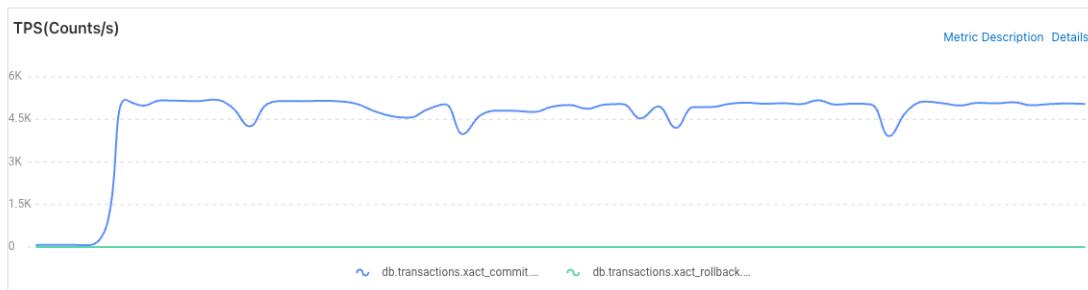
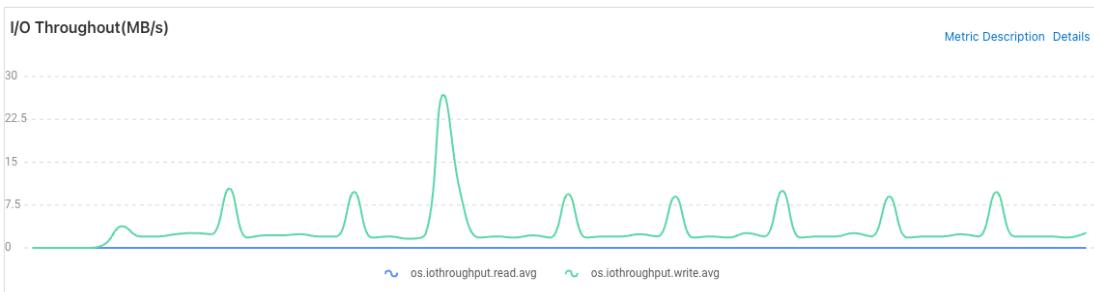
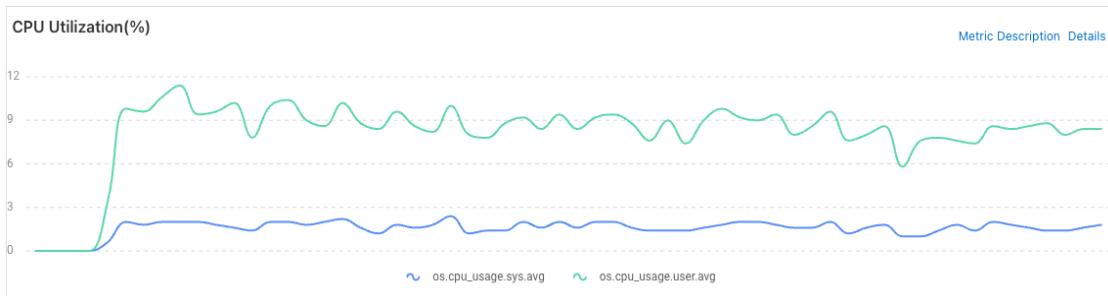
5.2.14.3. Database Resources Trend Chart

Payment-CPU and memory resource Trends:

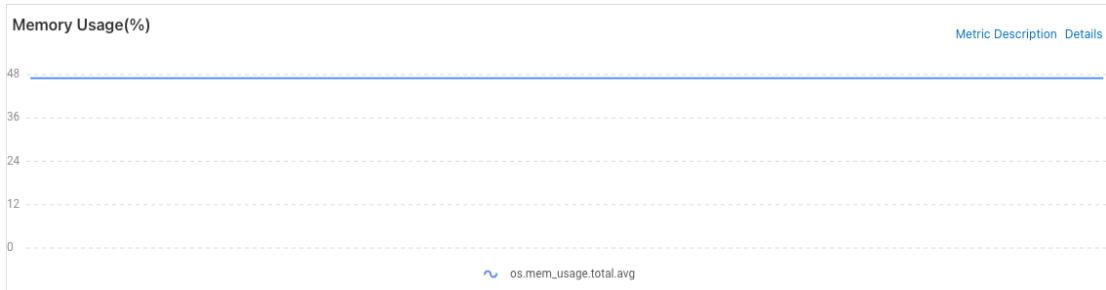
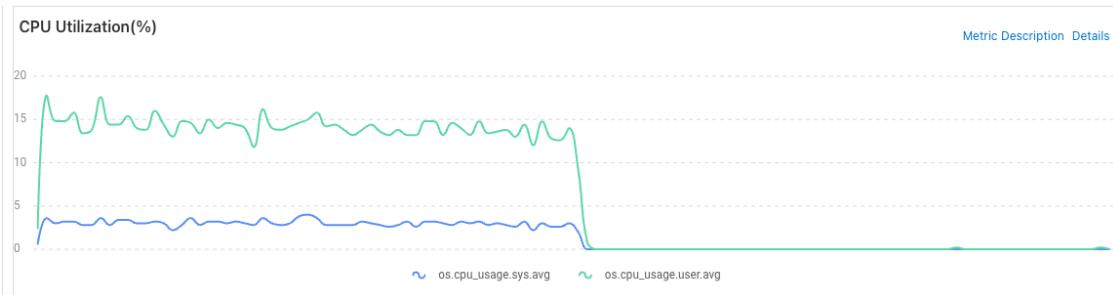
20 concurrent



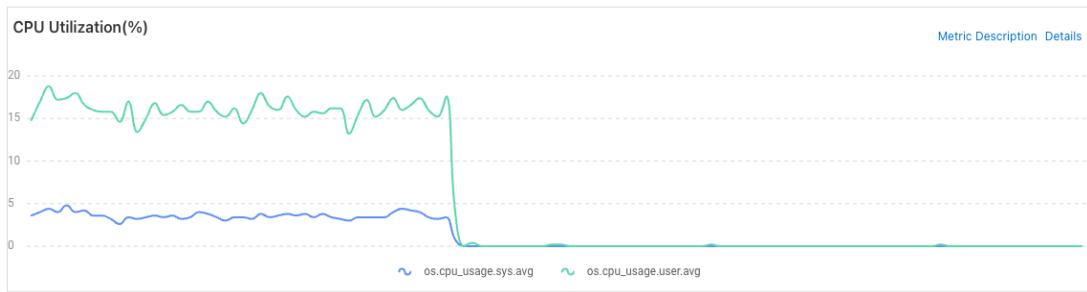
40 concurrent

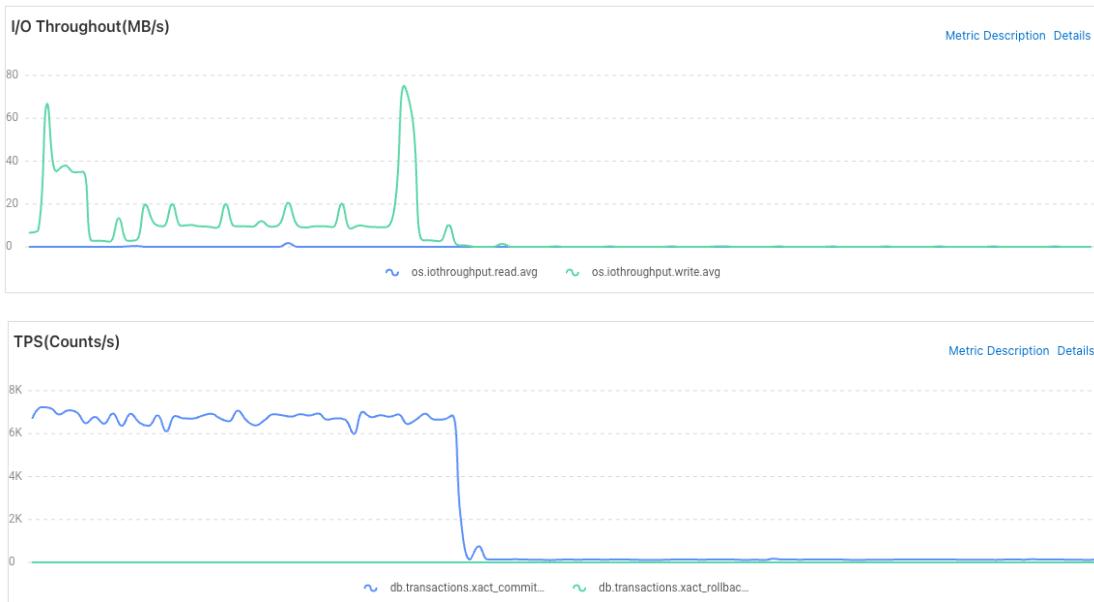


60 concurrent



80 concurrent





5.2.14.4. Analyze Statistics

Transferee Favourited: The Transaction request is initiated using a stepwise number of concurrent users (20,40,60,80), and each gradient continues to run for 5 minutes, with a success rate of 100%.
TPS: TPS is relatively stable, with the increase of the number of concurrent users, TPS remains around 2000+.

AvgRT: The average response time trend is normal, with an average response time of 34ms for 80 concurrent.

Application Server resources: The CPU usage is around 380%, even use the average value for 5 applications 76% still not over the target value, after checking with developer, the usage is increasing according to the pressure, and will back to normal when the case stopped, which is normal behavior. The memory is 40% if taking the average value for 5 application services and is normal.

Database resources: The CPU and Memory resource usage is normal and does not exceed the preset resource setting limit.

Overall Observation: While the current observation does not presently affect overall performance based on concurrent user sets, the CPU and Memory usage have exceeded the baseline defined in the performance indicators too. It is advisable to have pod scaling in place with target % of CPU and Memory utilization defined to ensure the appropriate number of application pods are spun up to manage spikes in incoming traffics effectively while maintaining the healthiness of pod's CPU and Memory usage.

5.2.15 Account Statement Listing

5.2.15.1. Execution Results

Case Name	Concurrent Number	TPS	AvgRT(ms)	Success rate	Application Service		Database	
					CPU Usage	Memory Usage	CPU Usage	Memory Usage
Account Statement Listing	50	415.8	22	100%	<3%	<60%	<16%	<96%
	100	1607.6	46	100%	<3%	<60%	<16%	<96%
	150	2046.8	69	100%	<3%	<60%	<20%	<96%
	200	2217.2	88	100%	<3%	<60%	<24%	<96%

5.2.15.2. Application Service Resources Trend Chart

CPU and memory resource trends:

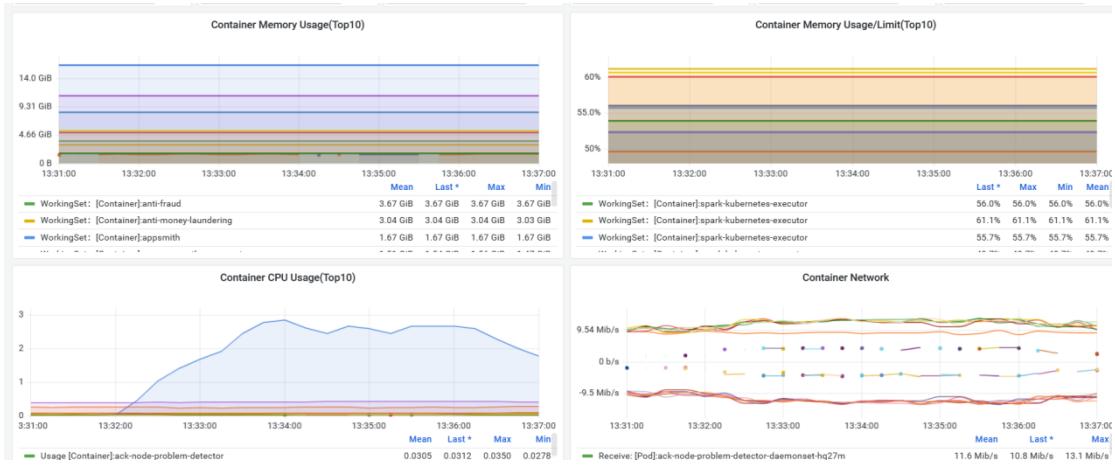
50 concurrent



100 concurrent



150 concurrent



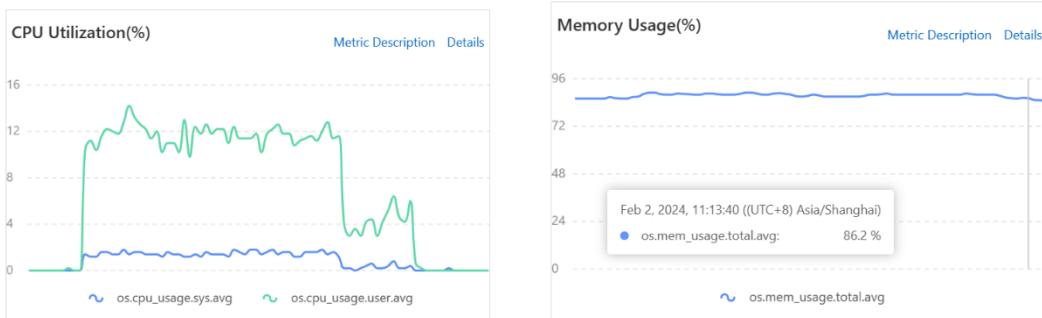
200 concurrent



5.2.15.3. Database Resources Trend Chart

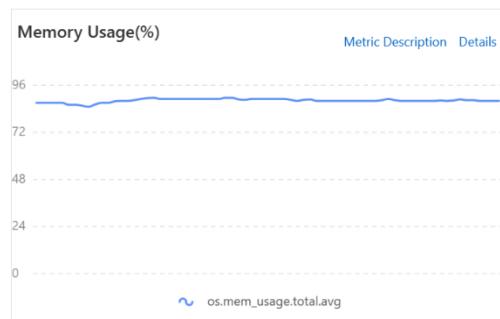
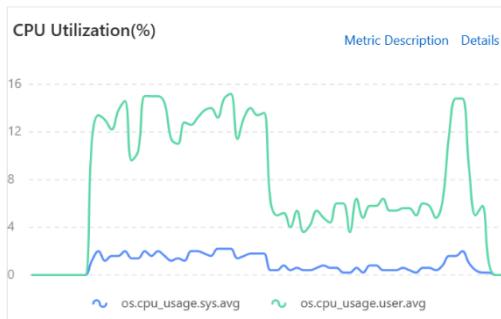
Deposit-CPU and memory resource Trends:

50 concurrent

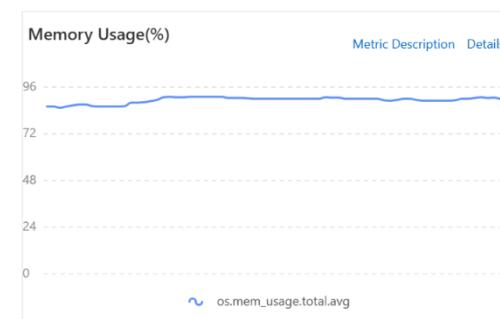
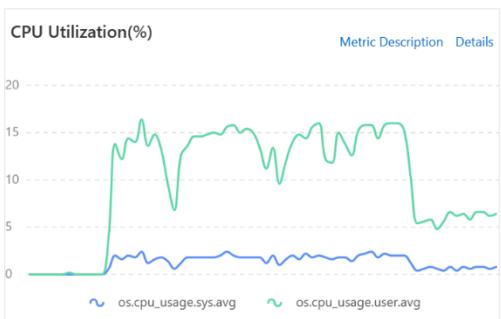




100 concurrent

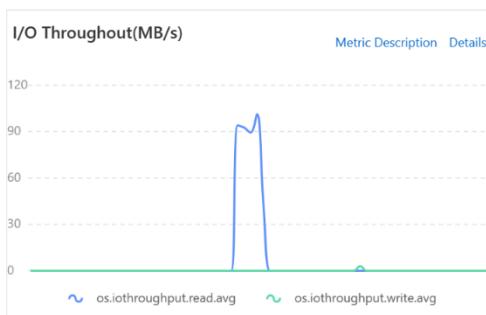
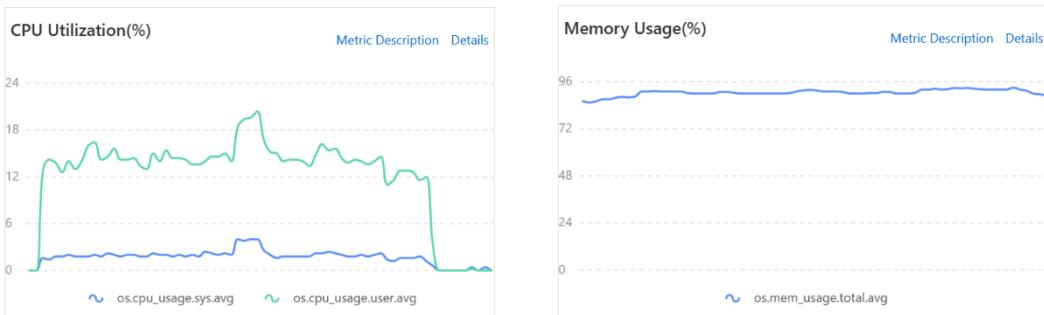


150 concurrent





200 concurrent



5.2.15.4. Analyze Statistics

Account Statement Listing: The Transaction request is initiated using a stepwise number of concurrent users (50,100,120,200), and each gradient continues to run for 5 minutes, with a success rate of 100%.

TPS: TPS is relatively stable, with the increase of the number of concurrent users, TPS remains around 1500+.

AvgRT: The average response time trend is normal, with an average response time of 88ms for 200 concurrent.

Application Service resources: The CPU and Memory resource usage is normal and does not exceed the preset resource setting limit.

Database resources: The CPU usage is under 24% which is normal, but CPU usage is around 96% which is above the target value, this is due to the database configuration is low for test environment when processing this case, and will be upgraded when product goes live.

Overall Observation: While the current observation does not presently affect overall performance based on concurrent user sets, it is advisable to enhance the database specifications as the database's memory utilization is exceeding 60% as compared to the performance indicators. This measure aims to prevent any unexpected behavior resulting from reaching 100% utilization.

5.2.16 Account Statement Retrieval

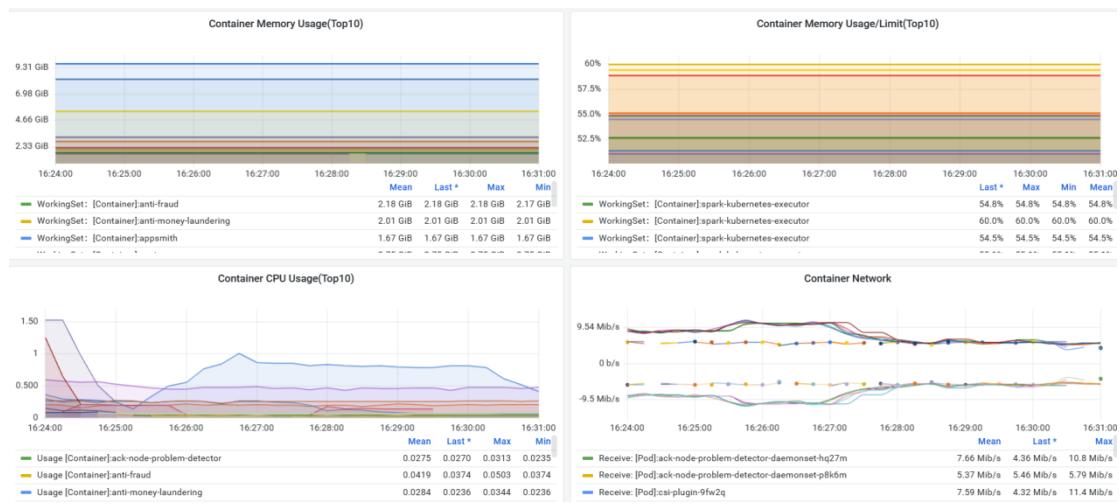
5.2.16.1. Execution Results

Case Name	Concurrent Number	TPS	AvgRT(ms)	Success rate	Application Service		Database	
					CPU Usage	Memory Usage	CPU Usage	Memory Usage
Account Statement Retrieval	50	770.2	50	100%	<1.5%	<60%	<1%	<96%
	100	721.4	94	100%	<0.8%	<60%	<1%	<96%
	150	737	142	100%	<1%	<60%	<3.2%	<96%
	200	835.8	224	100%	<1%	<60%	<0.8%	<96%

5.2.16.2. Application Service Resources Trend Chart

CPU and memory resource trends:

50 concurrent



Performance Test Result

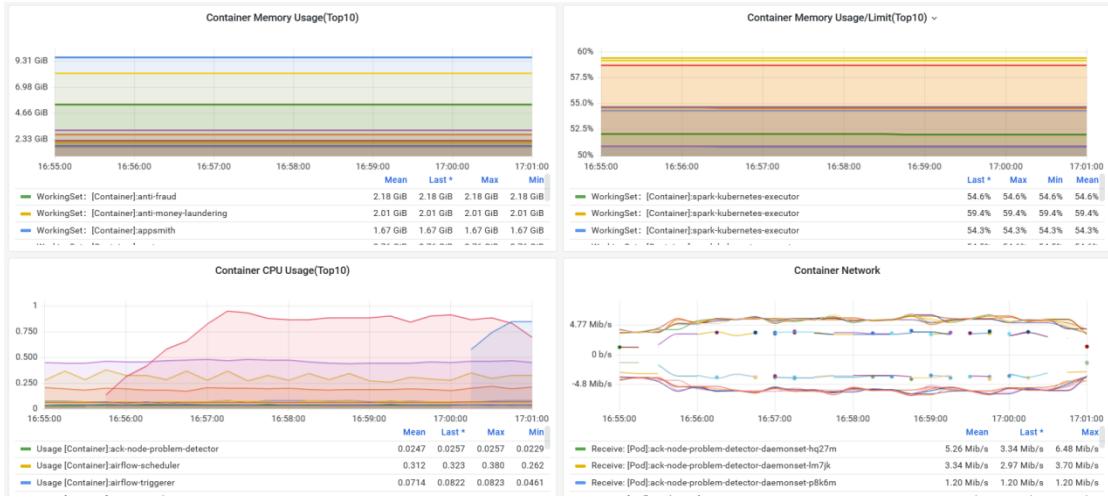
100 concurrent



150 concurrent



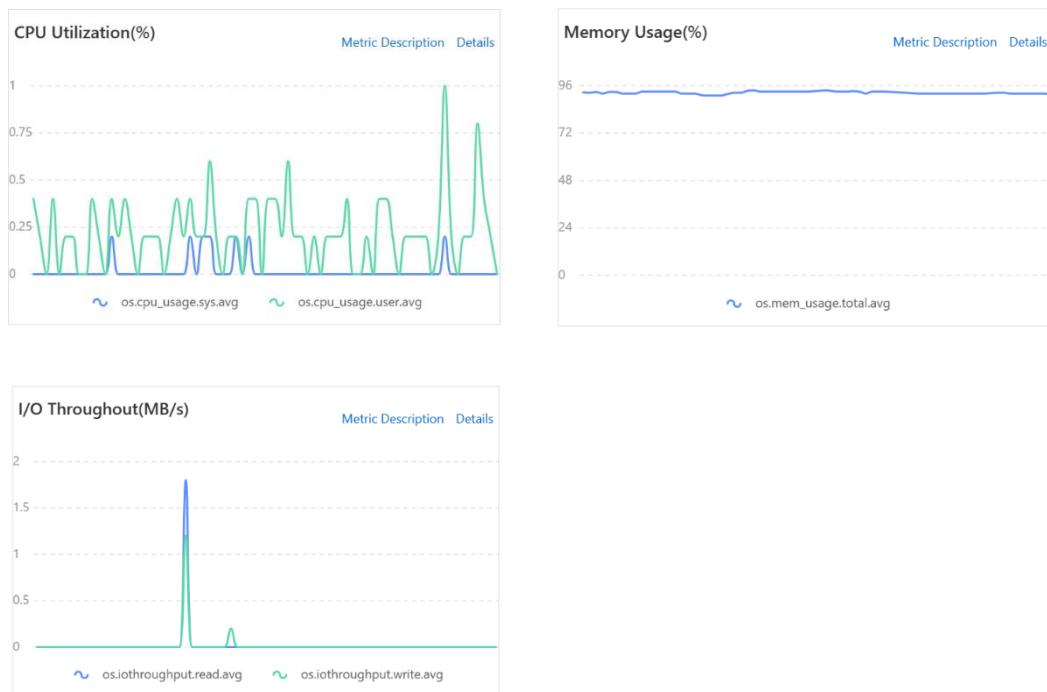
200 concurrent



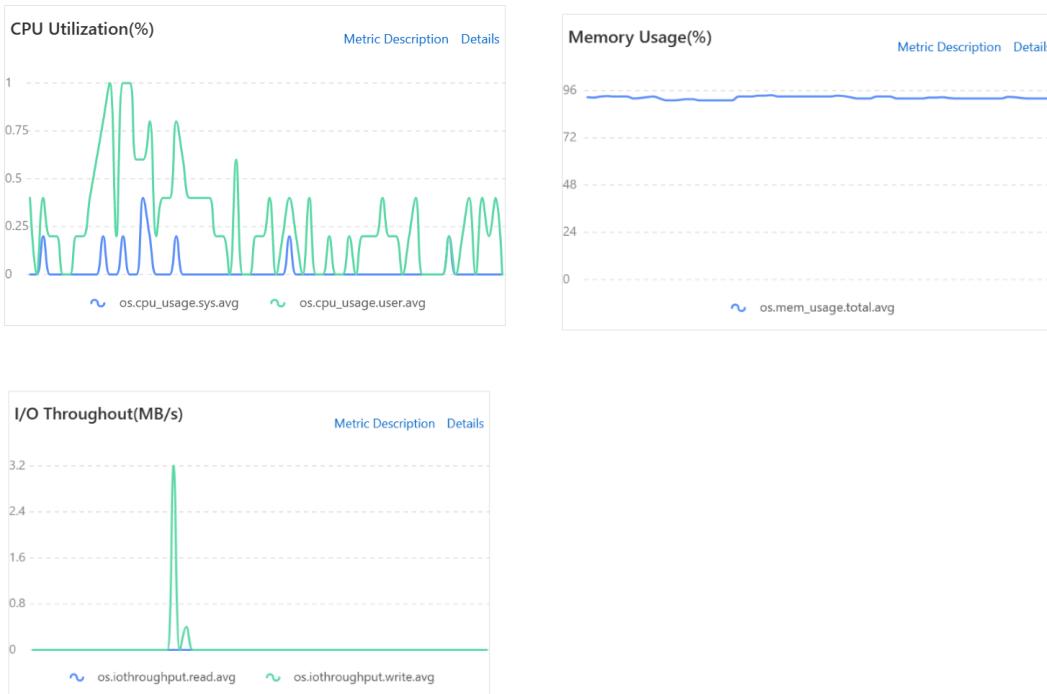
5.2.16.3. Database Resources Trend Chart

Deposit-CPU and memory resource Trends:

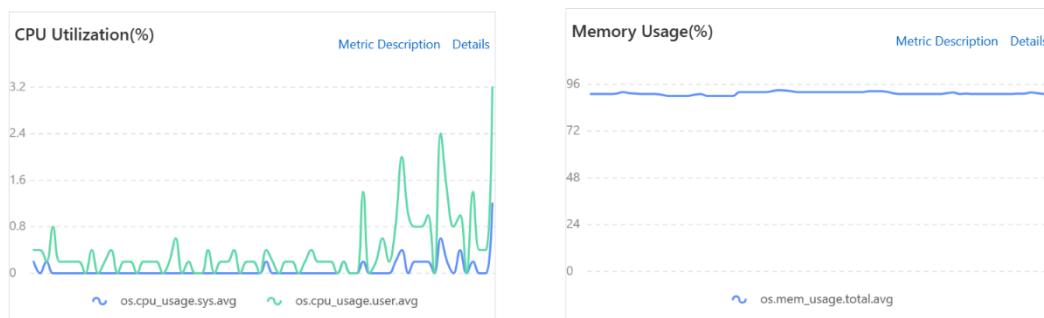
50 concurrent



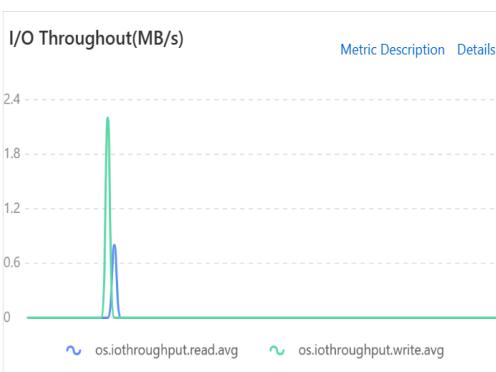
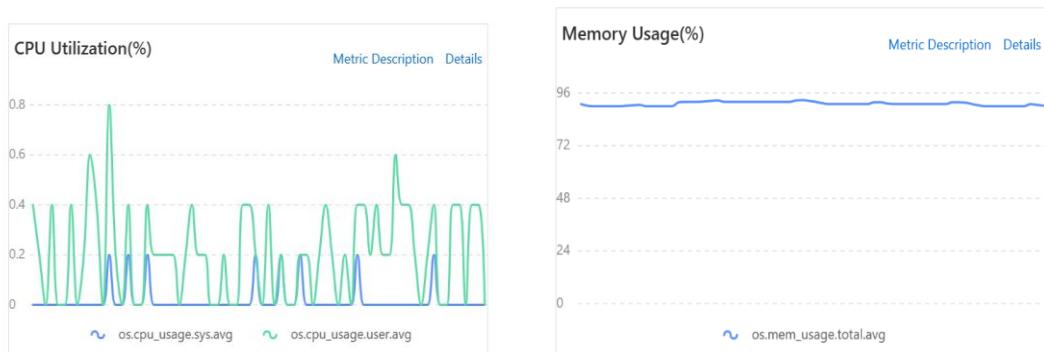
100 concurrent



150 concurrent



200 concurrent



5.2.16.4. Analyze Statistics

Account Statement Retrieval: The Transaction request is initiated using a stepwise number of concurrent users (50,100,150,200), and each gradient continues to run for 5 minutes, with a success rate of 100%.

TPS: TPS is relatively stable, with the increase of the number of concurrent users, TPS remains around 750+.

AvgRT: The average response time trend is normal, with an average response time of 224ms for 200 concurrent.

Application Service resources: The CPU and Memory resource usage is normal and does not exceed the preset resource setting limit.

Database resources: The CPU usage is under 3.2% which is normal, but CPU usage is around 96% which is above the target value, this is due to the database configuration is low for test environment when processing this case, and will be upgraded when product goes live.

Overall Observation: While the current observation does not presently affect overall performance until the max number of concurrent users set are used (exceed 24ms), it is advisable to enhance the database specifications as the database's memory utilization is exceeding 60% as compared to the performance indicators. This measure aims to prevent any unexpected behavior resulting from reaching 100% utilization.

5.2.17 Fund Option Creation

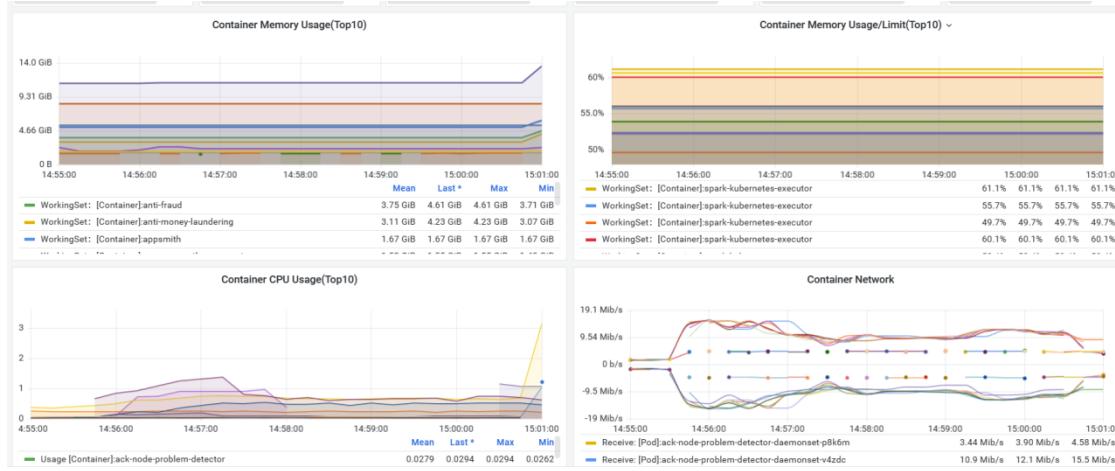
5.2.17.1. Execution Results

Case Name	Concurrent Number	TPS	AvgRT(ms)	Success rate	Application Service		Database	
					CPU Usage	Memory Usage	CPU Usage	Memory Usage
Fund Option Creation	20	578.4	28	100%	<3%	<60%	<16 %	<100%
	40	1357.7	22	100%	<2%	<60%	<24 %	<100%
	60	1360	26	100%	<2%	<60%	<30 %	<96%
	80	1334.8	32	100%	<2%	<60%	<30 %	<96%

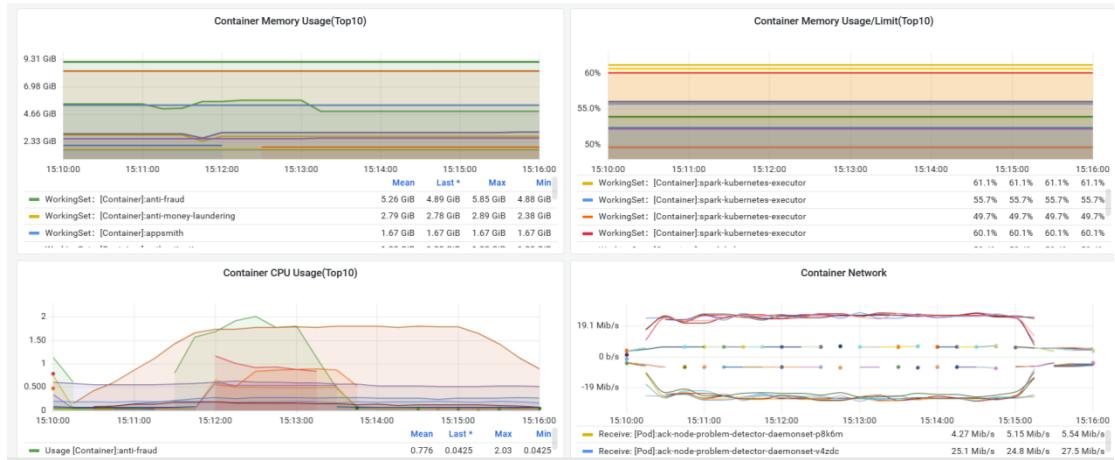
5.2.17.2. Application Service Resources Trend Chart

CPU and memory resource trends:

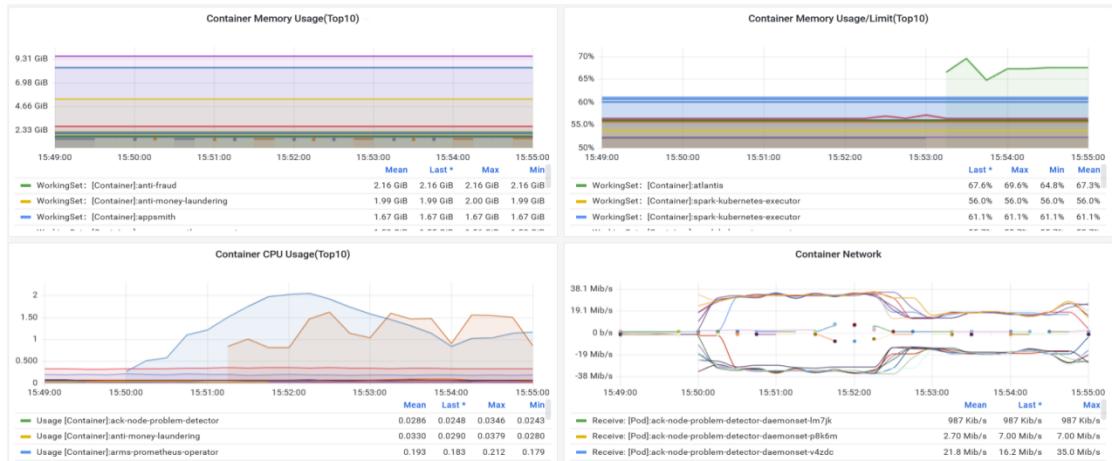
20 concurrent



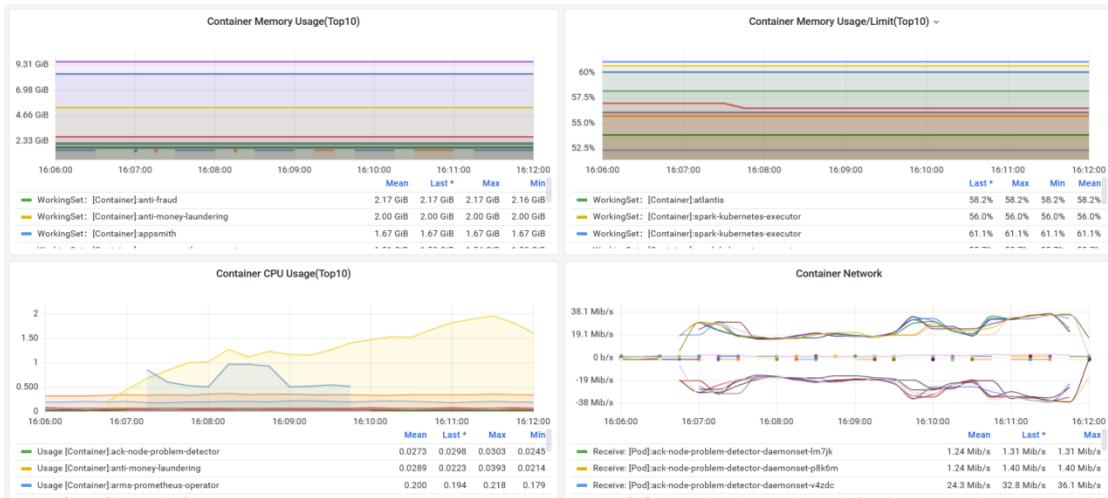
40 concurrent



60 concurrent



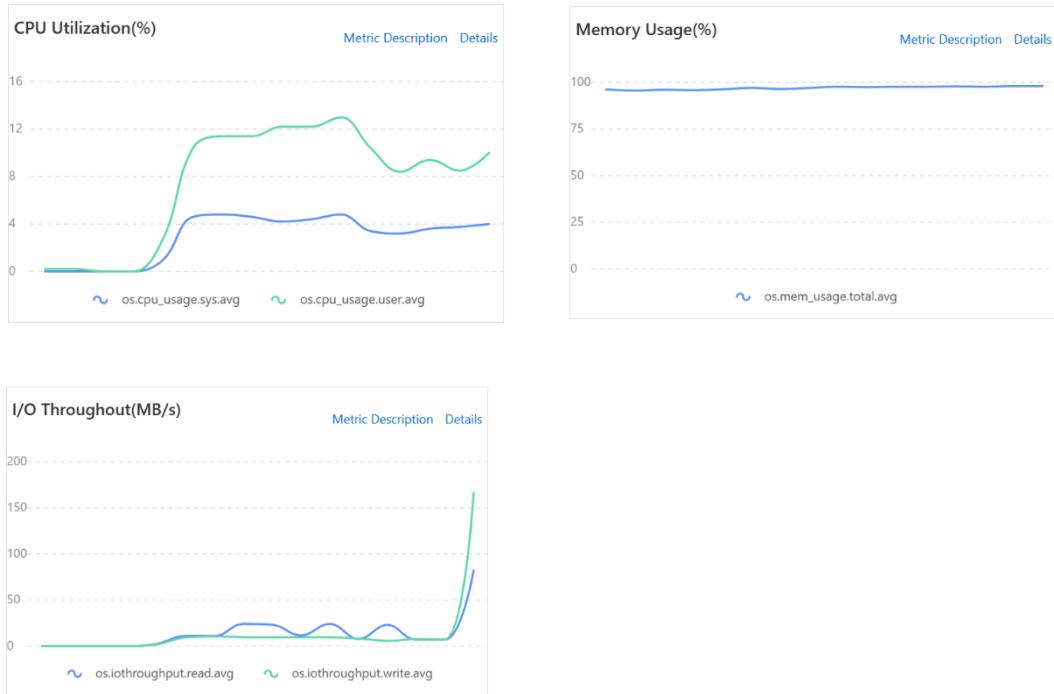
80 concurrent



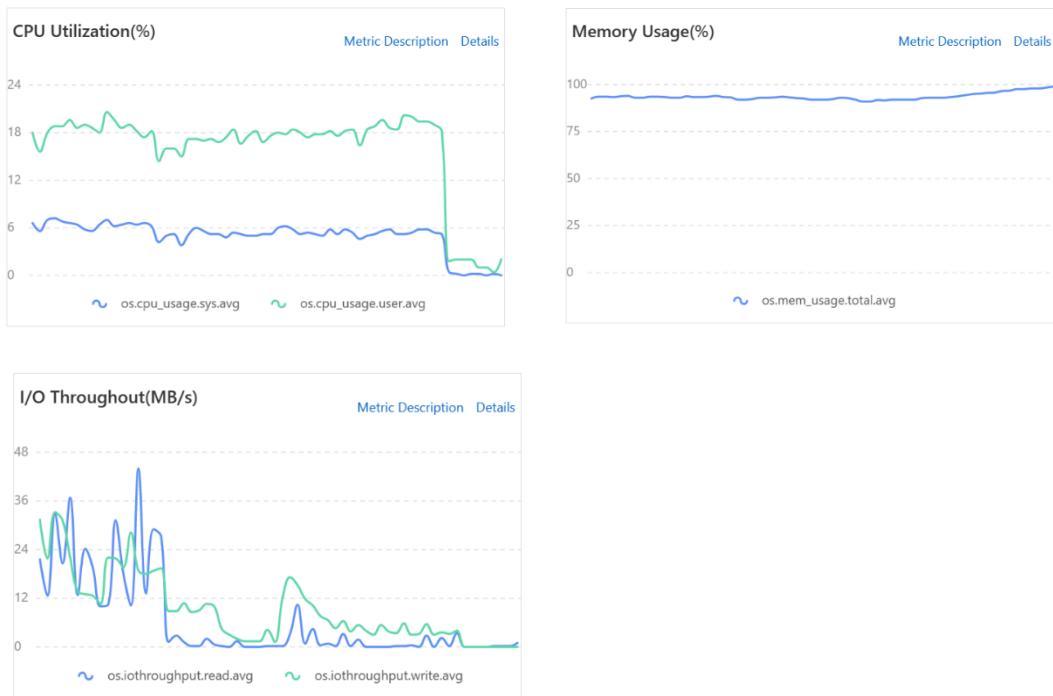
5.2.17.3. Database Resources Trend Chart

Payment-CPU and memory resource Trends:

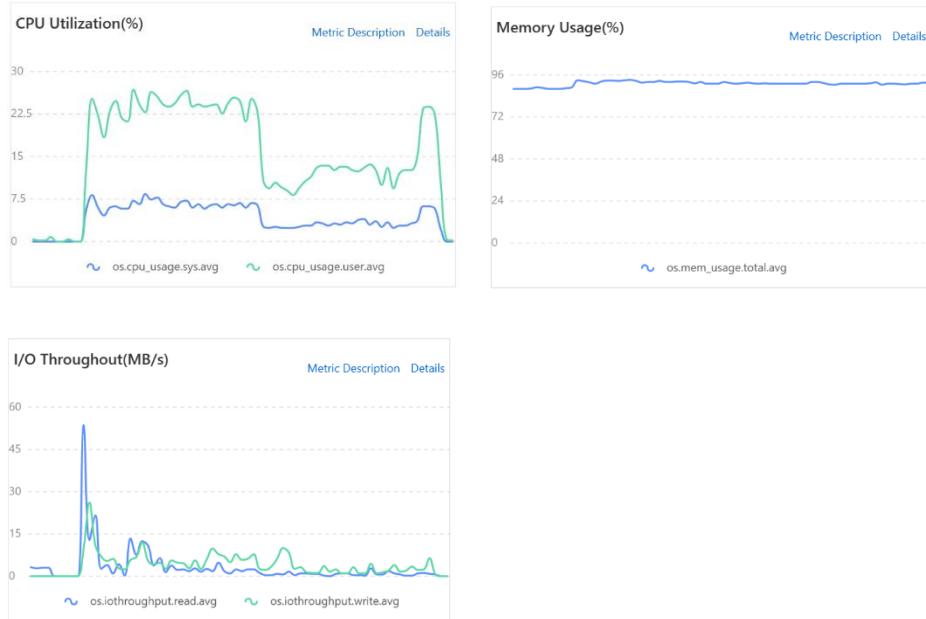
20 concurrent



40 concurrent



60 concurrent



80 concurrent



5.2.17.4. Analyze Statistics

Fund Option Creation: The Transaction request is initiated using a stepwise number of concurrent users (20,40,60,80), and each gradient continues to run for 5 minutes, with a success rate of 100%.

TPS: TPS is relatively stable, with the increase of the number of concurrent users, TPS remains around 1300+.

AvgRT: The average response time trend is normal, with an average response time of 32ms for 80 concurrent.

Application Service resources: The CPU and Memory resource usage is normal and does not exceed the preset resource setting limit.

Database resources: The CPU usage is under 30% which is normal, but CPU usage is around 100% which is above the target value, this is due to the database configuration is low for test environment when processing this case, and will be upgraded when product goes live.

Overall Observation: While the current observation does not presently affect overall performance based on concurrent user sets, it is advisable to enhance the database specifications as the database's memory utilization is exceeding 60% as compared to the performance indicators. This measure aims to prevent any unexpected behavior resulting from reaching 100% utilization.

5.2.18 Financial Institution Listing

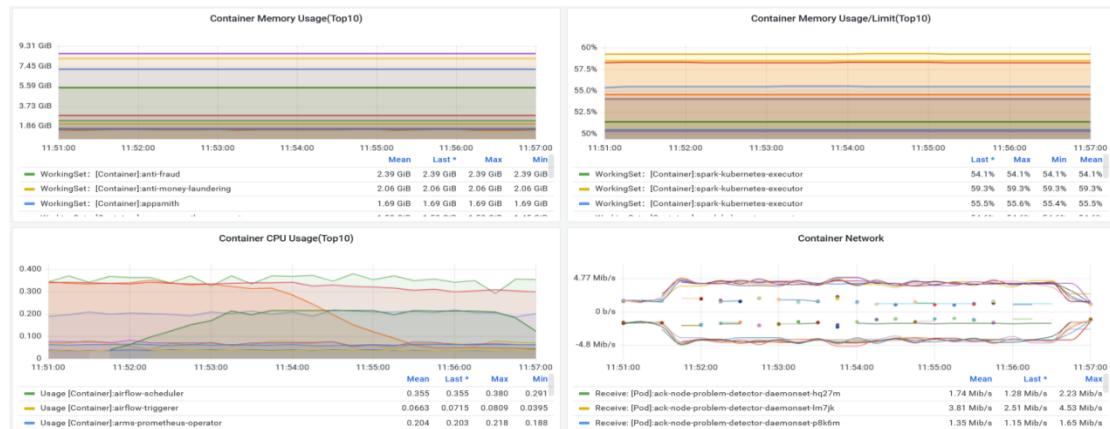
5.2.18.1. Execution Results

Case Name	Concurrent Number	TPS	AvgRT(ms)	Success rate	Application Service		Database	
					CPU Usage	Memory Usage	CPU Usage	Memory Usage
Financial Instituition Listing	20	239.6	70	100%	<0.4%	<60%	<3.2%	<96%
	50	239.7	191	100%	<4%	<60%	<3.2%	<96%
	80	239.8	316	100%	<0.4%	<60%	<3%	<96%
	100	238.9	386	100%	<0.4%	<60%	<3%	<96%

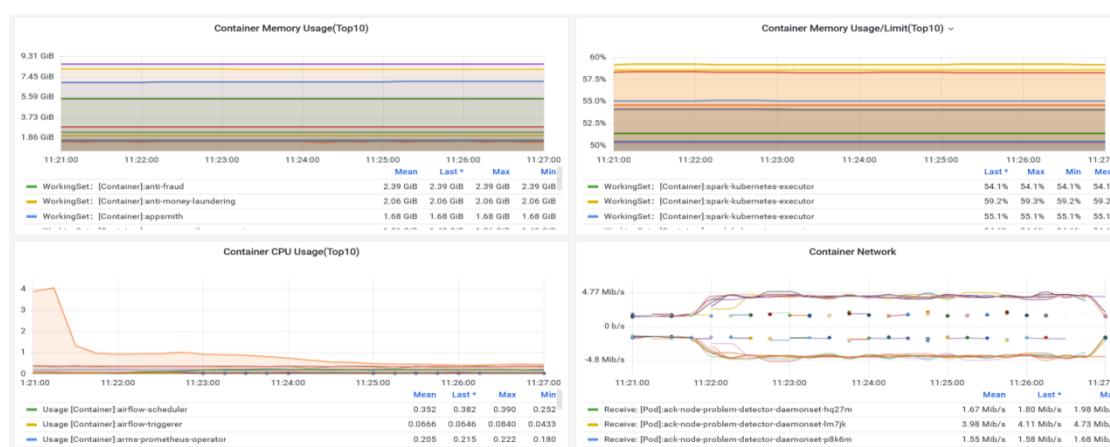
5.2.18.2. Application Service Resources Trend Chart

CPU and memory resource trends:

20 concurrent



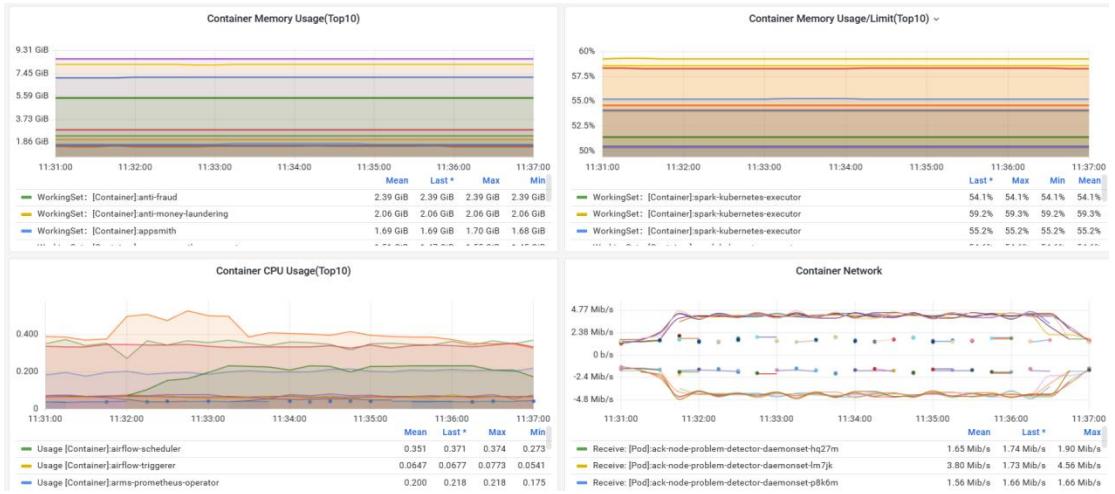
50 concurrent



80 concurrent



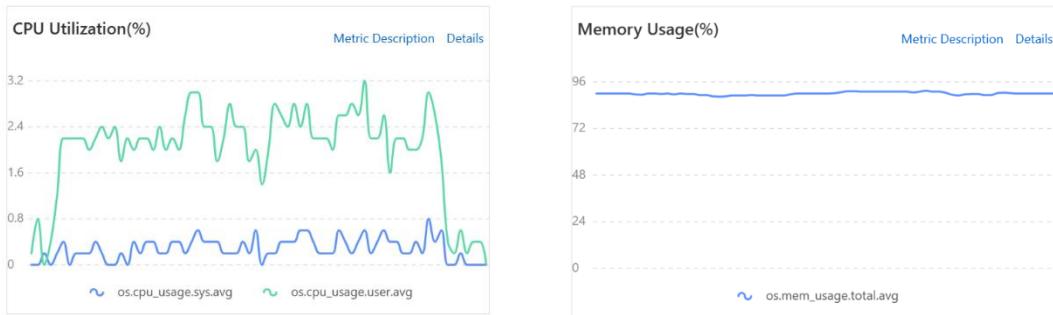
100 concurrent

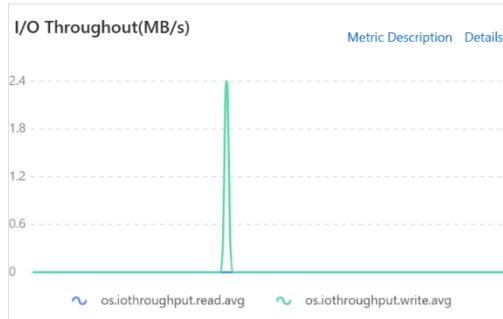


5.2.18.3. Database Resources Trend Chart

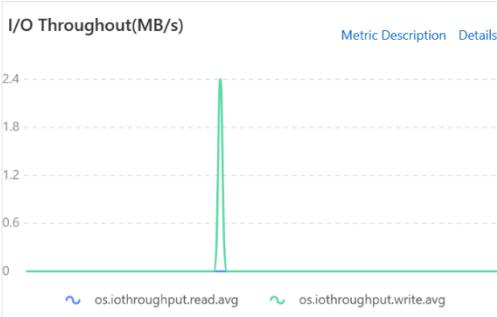
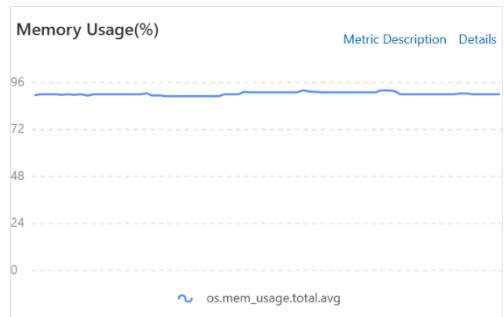
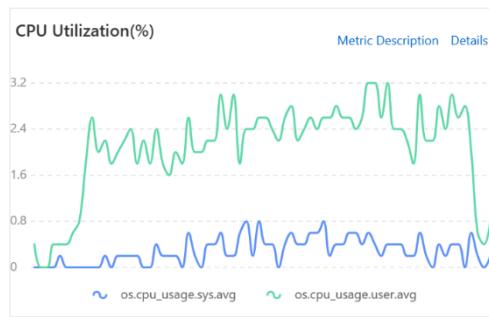
Payment-CPU and memory resource Trends:

20 concurrent

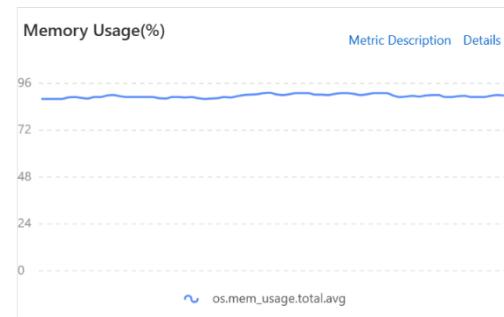
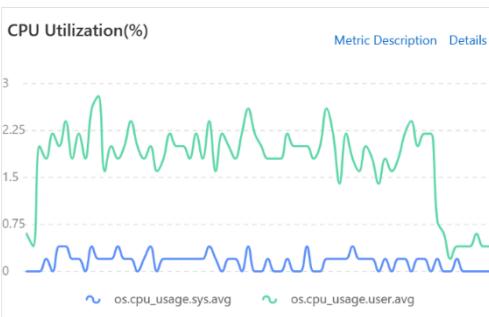


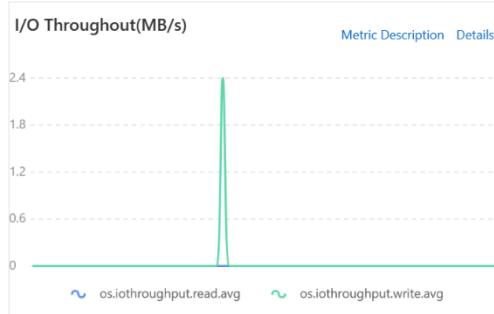


50 concurrent

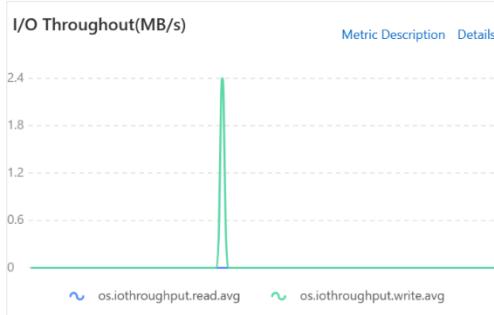
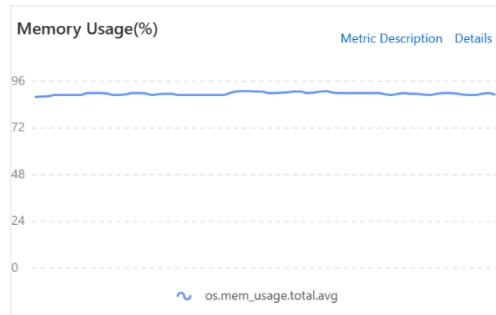
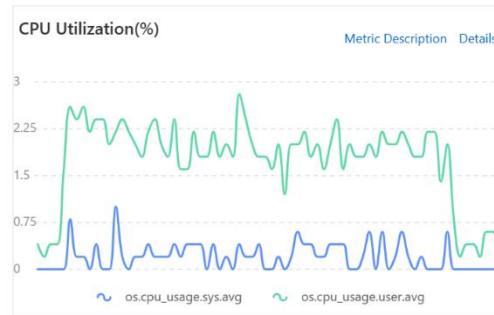


80 concurrent





100 concurrent



5.2.18.4. Analyze Statistics

Financial Institution Listing: The Transaction request is initiated using a stepwise number of concurrent users (20,50,80,100), and each gradient continues to run for 5 minutes, with a success rate of 100%.

TPS: TPS is relatively stable, with the increase of the number of concurrent users, TPS remains around 239+.

AvgRT: The average response time trend is normal, with an average response time of 386ms for 100 concurrent.

Application Service resources: The CPU and Memory resource usage is normal and does not exceed the preset resource setting limit.

Database resources: The CPU usage is under 3.2% which is normal, but CPU usage is around 96% which is above the target value, this is due to the database configuration is low for test environment when processing this case, and will be upgraded when product goes live.

Overall Observation: While the database's CPU and Memory utilization are constantly exceeding the 60% baseline regardless of number of concurrent users and impacting the average response time while increasing the number of concurrent users used, it is advisable to enhance the database specifications to handle the request more effectively.

5.2.19 Transferee Retrieval

5.2.19.1. Execution Results

Case Name	Concurrent Number	TPS	AvgRT(ms)	Success rate	Application Service		Database	
					CPU Usage	Memory Usage	CPU Usage	Memory Usage
Transferee Retrieval	50	1954.1	20	100%	<3%	<60%	<30%	<96%
	100	2478.1	34	100%	<4%	<60%	<32%	<96%
	150	2545.1	51	100%	<4%	<60%	<40%	<96%
	200	2521.7	70	100%	<4%	<60%	<40%	<96%

5.2.19.2. Application Service Resources Trend Chart

CPU and memory resource trends:

50 concurrent



Performance Test Result

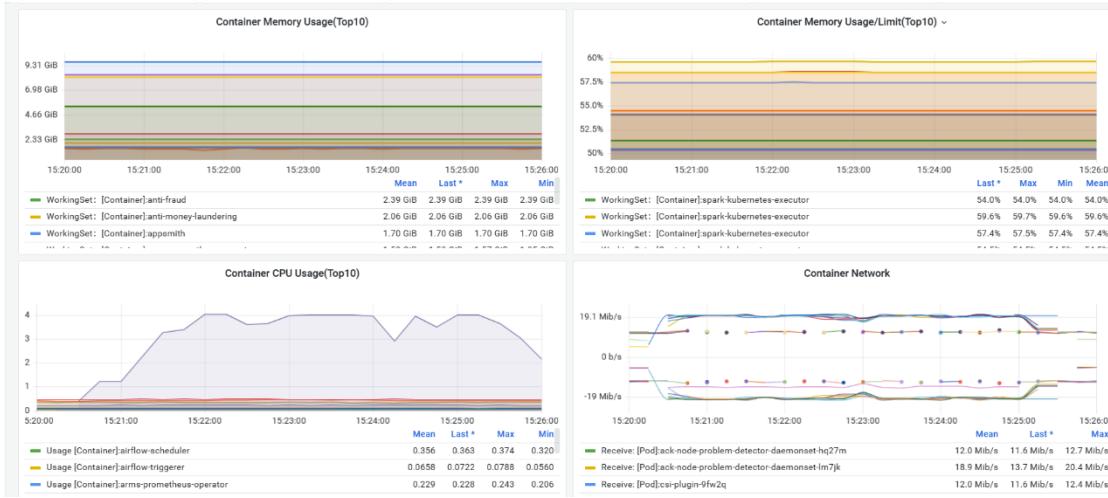
100 concurrent



150 concurrent



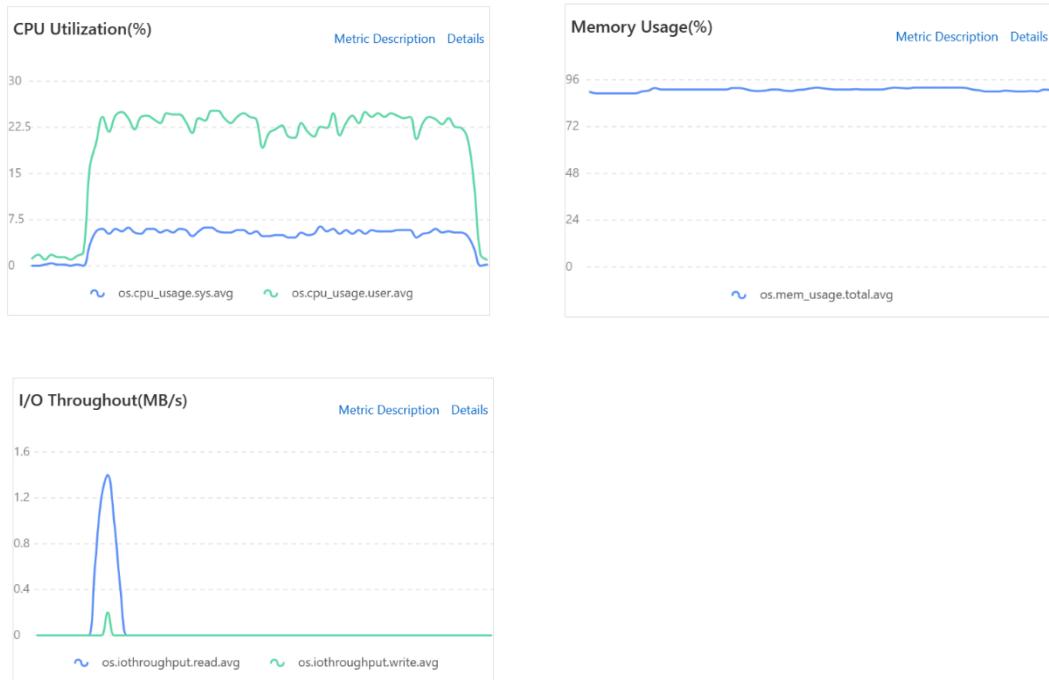
200 concurrent



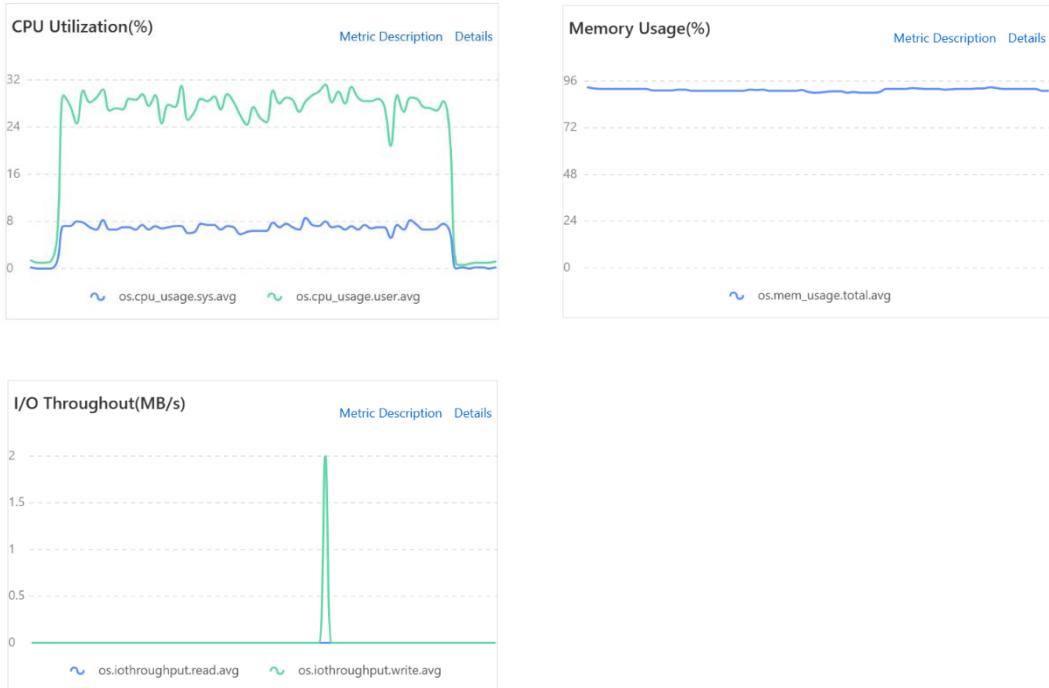
5.2.19.3. Database Resources Trend Chart

Payment-CPU and memory resource Trends:

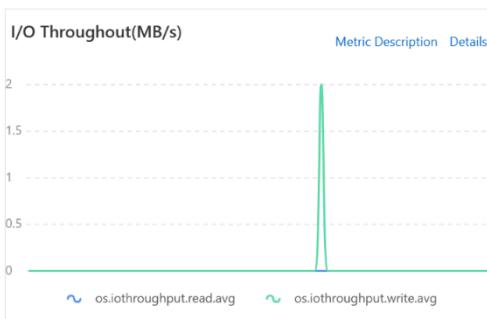
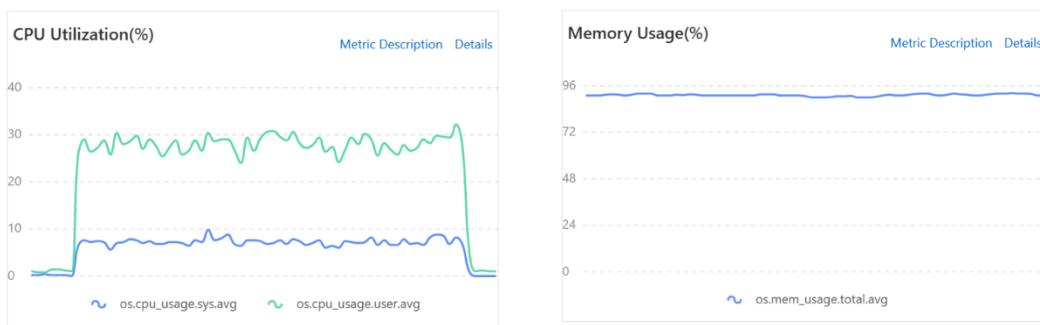
50 concurrent



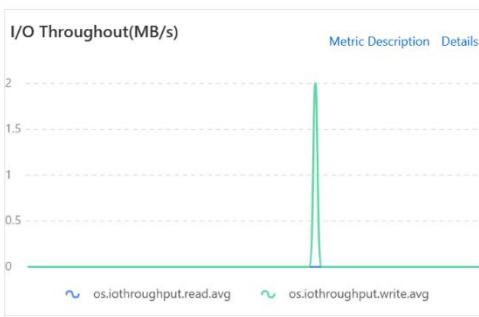
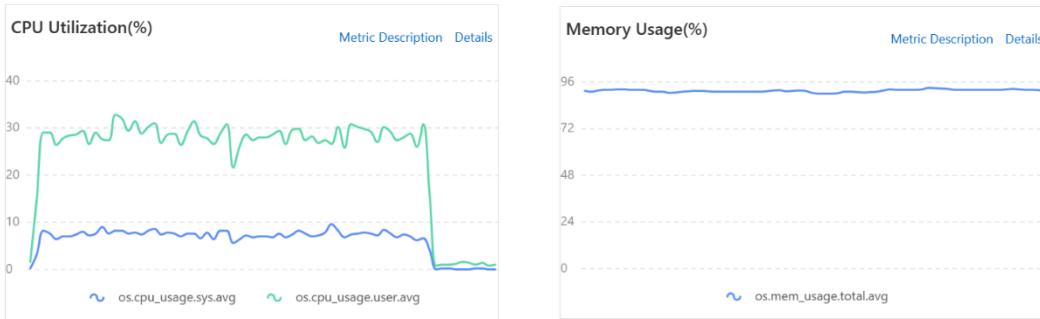
100 concurrent



150 concurrent



200 concurrent



5.2.19.4. Analyze Statistics

Transferee Retrieval: The Transaction request is initiated using a stepwise number of concurrent users (50,100,150,200), and each gradient continues to run for 5 minutes, with a success rate of 100%.

TPS: TPS is relatively stable, with the increase of the number of concurrent users, TPS remains around 2500+.

AvgRT: The average response time trend is normal, with an average response time of 70ms for 200 concurrent.

Application Service resources: The CPU and Memory resource usage is normal and does not exceed the preset resource setting limit.

Database resources: The CPU usage is under 40% which is normal, but CPU usage is around 96% which is above the target value, this is due to the database configuration is low for test environment when processing this case, and will be upgraded when product goes live.

Overall Observation: While the current observation does not presently affect overall performance based on concurrent user sets, it is advisable to enhance the database specifications as the database's memory utilization is exceeding 60% as compared to the performance indicators. This measure aims to prevent any unexpected behavior resulting from reaching 100% utilization.

5.2.20 Transferee UnFavourited

5.2.20.1. Execution Results

Case Name	Concurrent Number	TPS	AvgRT(ms)	Success rate	Application Service		Database	
					CPU Usage	Memory Usage	CPU Usage	Memory Usage
Transferee UnFavourited	20	904.9	20	100%	<115%	<200%	<6%	<48%
	40	1713.1	22	100%	<240%	<200%	<12%	<48%
	60	2299.4	24	100%	<320%	<200%	<20%	<48%
	80	2406.4	31	100%	<320%	<200%	<20%	<48%

5.2.20.2. Application Service Resources Trend Chart

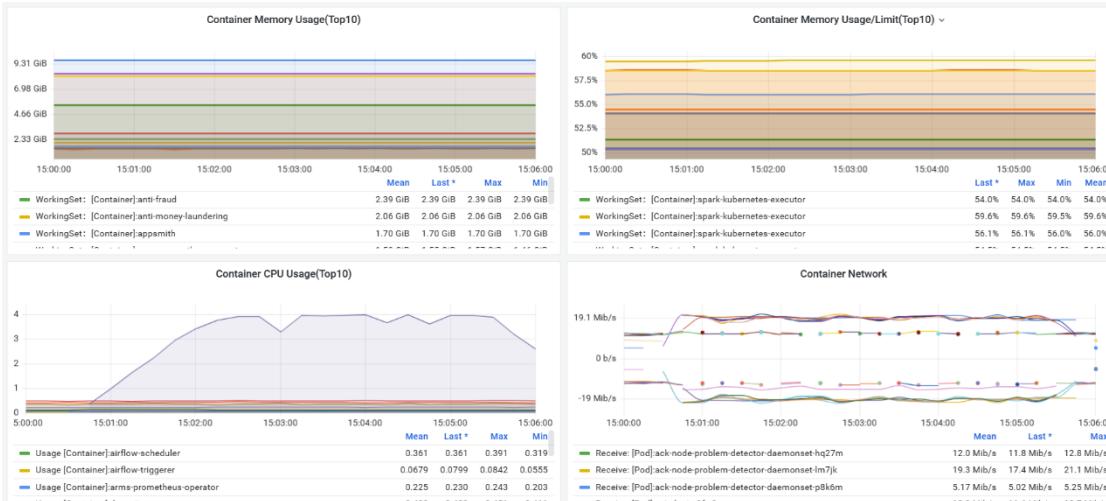
CPU and memory resource trends:

Performance Test Result

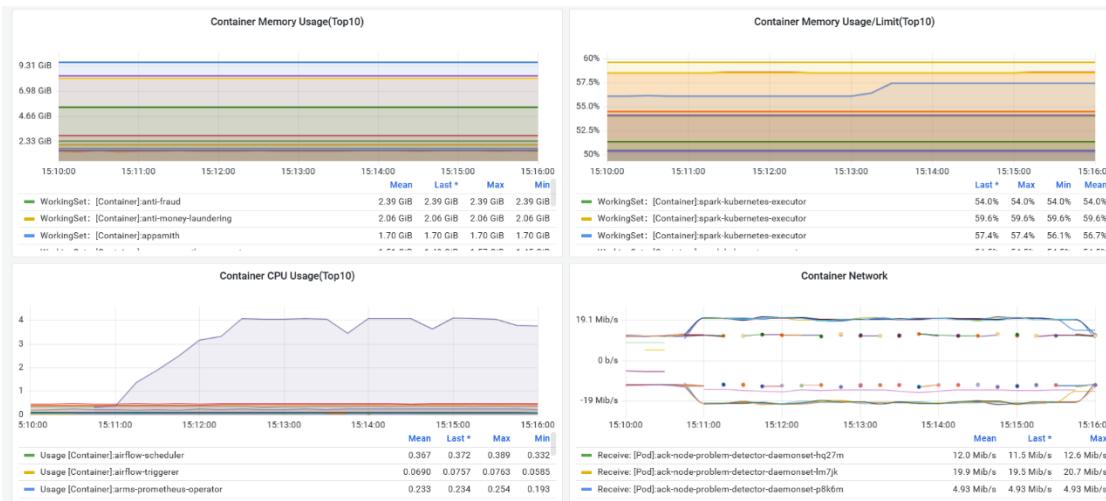
50 concurrent



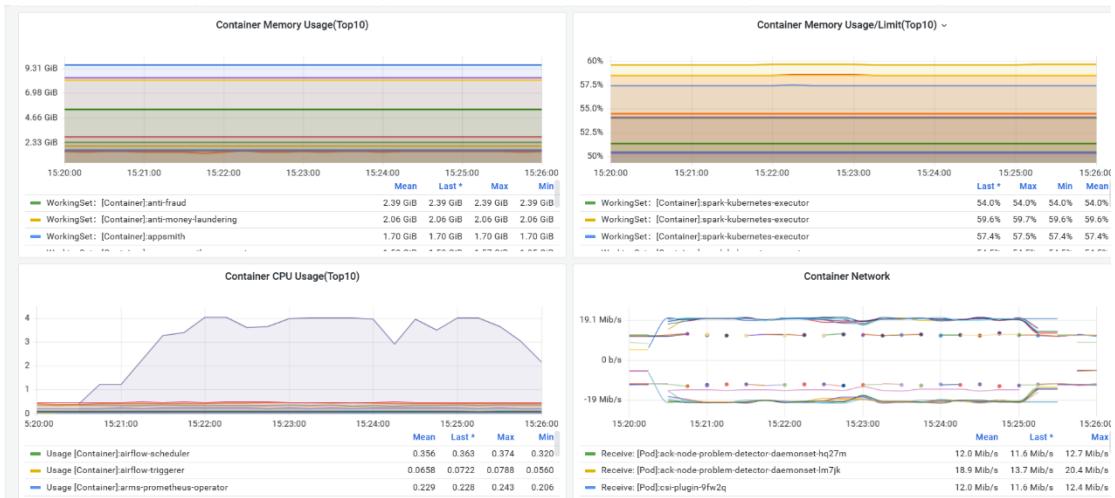
100 concurrent



150 concurrent



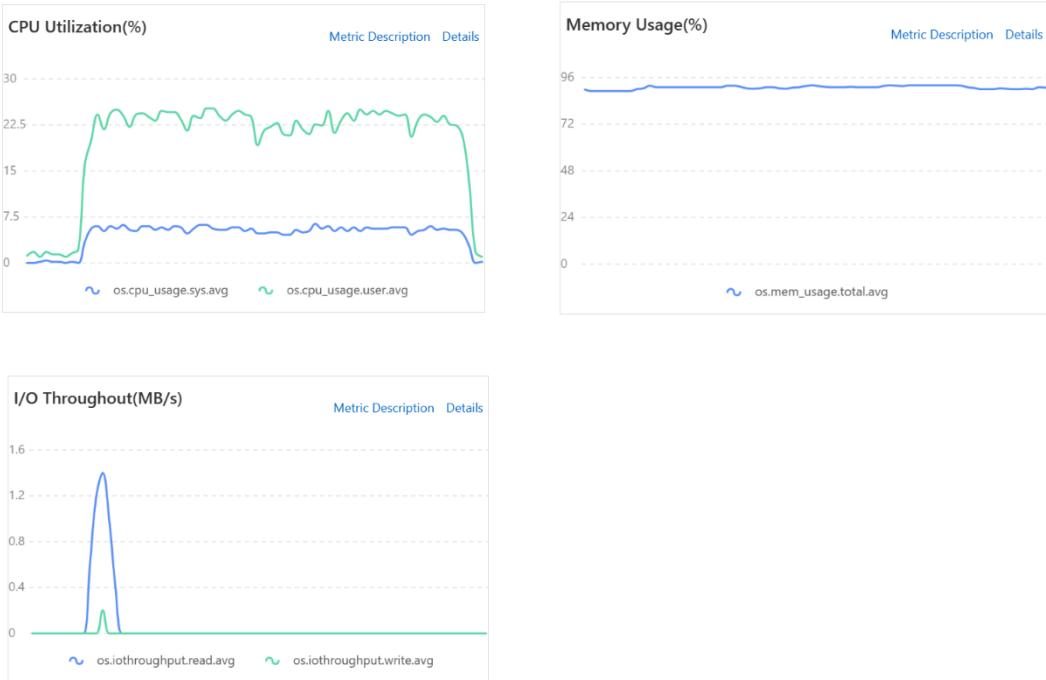
200 concurrent



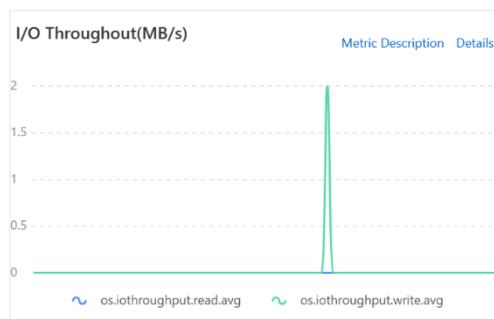
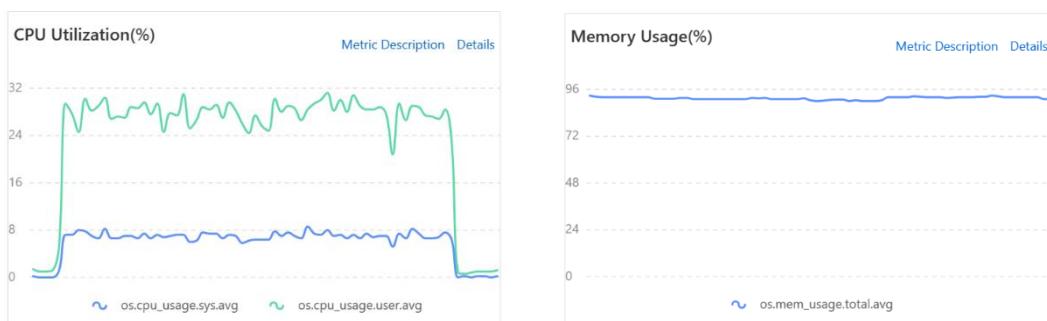
5.2.20.3. Database Resources Trend Chart

Payment-CPU and memory resource Trends:

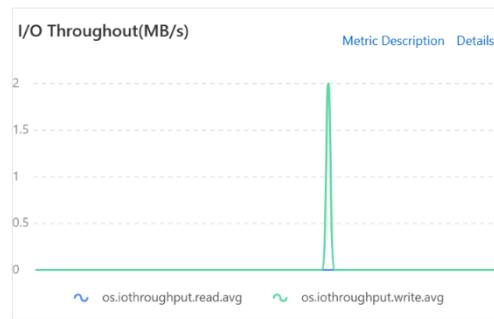
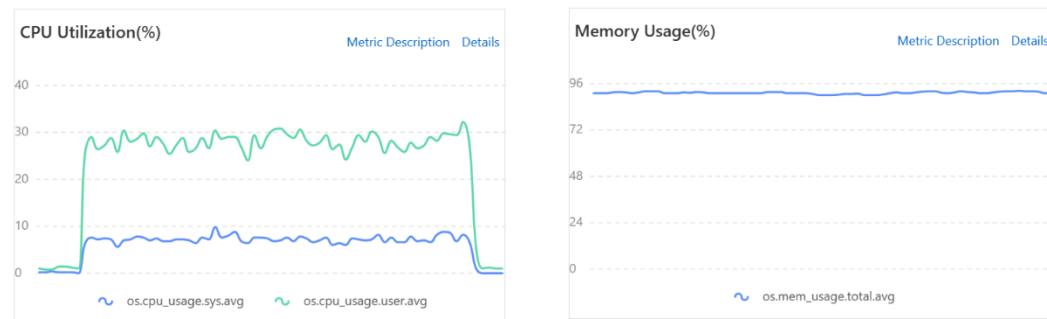
50 concurrent



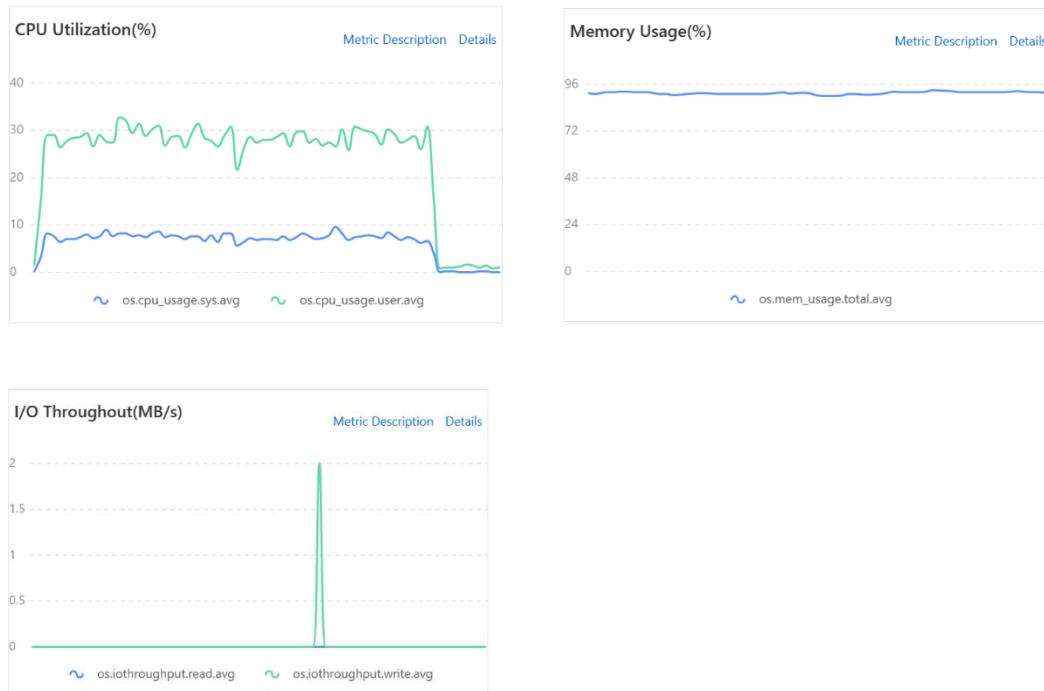
100 concurrent



150 concurrent



200 concurrent



5.2.20.4. Analyze Statistics

Transferee UnFavourited: The Transaction request is initiated using a stepwise number of concurrent users (20,40,60,80), and each gradient continues to run for 5 minutes, with a success rate of 100%.

TPS: TPS is relatively stable, with the increase of the number of concurrent users, TPS remains around 2000+.

AvgRT: The average response time trend is normal, with an average response time of 31ms for 80 concurrent.

Application Server resources: The CPU usage is around 320%, even use the average value for 5 applications 64% still not over the target value, after checking with developer, the usage is increasing according to the pressure, and will back to normal when the case stopped, which is normal behavior. The memory is 40% if taking the average value for 5 application services and is normal.

Database resources: The CPU and Memory resource usage is normal and does not exceed the preset resource setting limit.

Overall Observation: While the current observation does not presently affect overall performance based on concurrent user sets, the CPU and Memory usage have exceeded the baseline defined in the performance indicators too. It is advisable to have pod scaling in place with target % of CPU and Memory utilization defined to ensure the appropriate number of application pods are spun up to manage spikes in incoming traffics effectively while maintaining the healthiness of pod's CPU and Memory usage.

5.2.21 Customer Restriction Retrieval

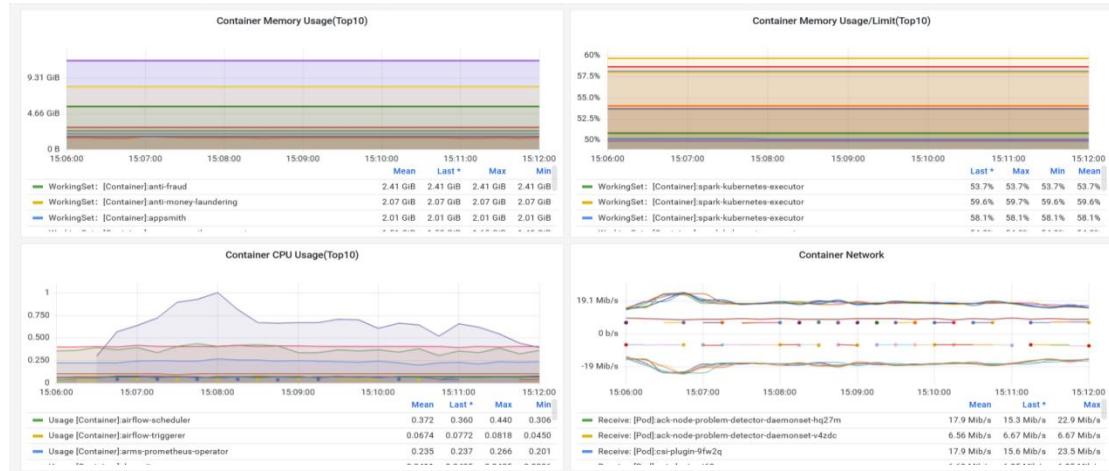
5.2.21.1. Execution Results

Case Name	Concurrent Number	TPS	AvgRT(ms)	Success rate	Application Service		Database	
					CPU Usage	Memory Usage	CPU Usage	Memory Usage
Customer Restriction Retrieval	50	1065.5	37	100%	<1%	<60%	<40%	<96%
	100	949.8	38	100%	<0.8%	<60%	<4%	<96%
	150	1357.7	56	100%	<1.5%	<60%	<24%	<96%
	200	1366.1	79	100%	<1.5%	<60%	<20%	<96%

5.2.21.2. Application Service Resources Trend Chart

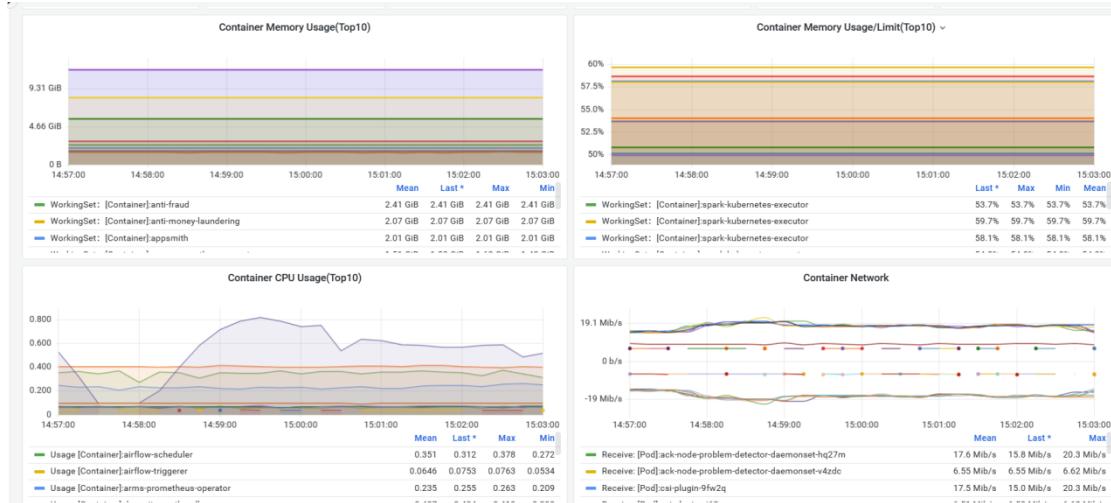
CPU and memory resource trends:

50 concurrent



Performance Test Result

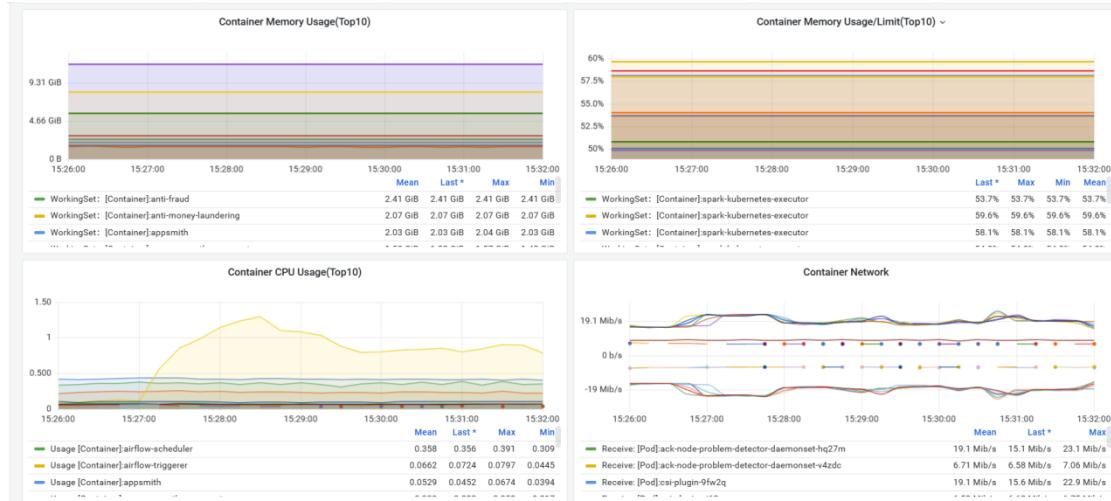
100 concurrent



150 concurrent

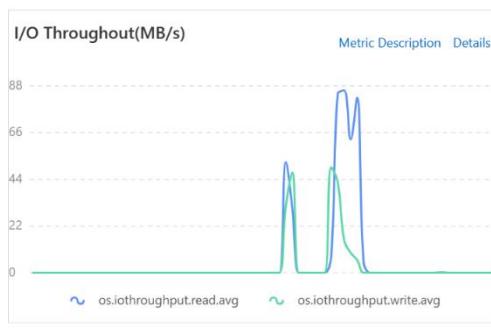
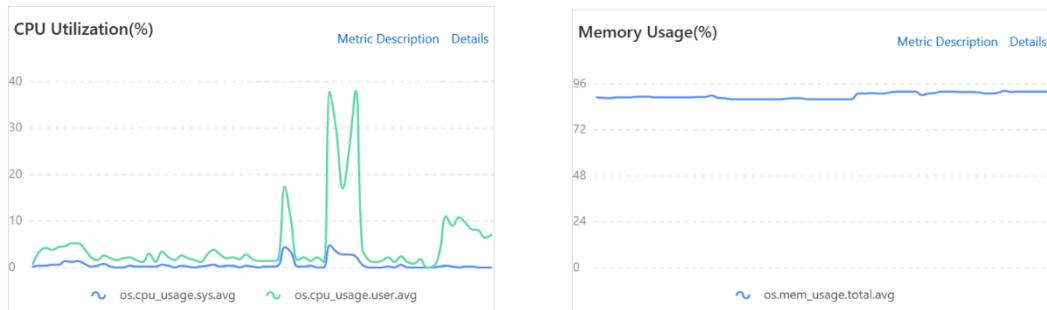


200 concurrent

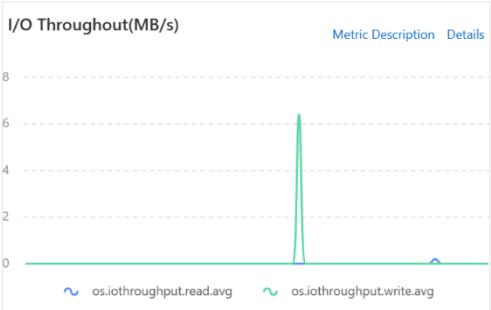
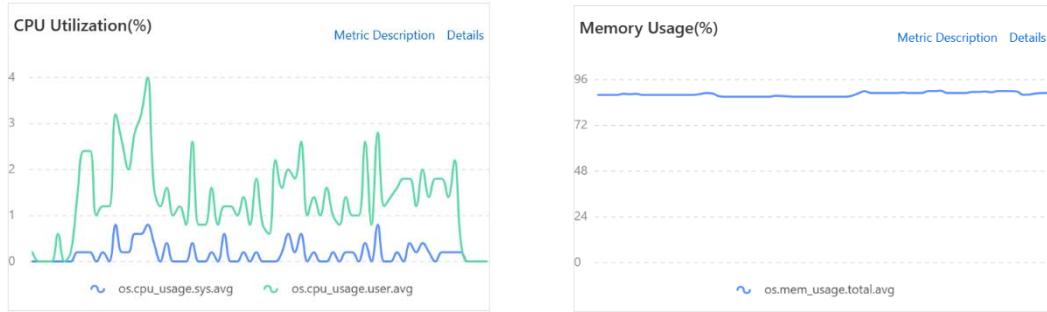


5.2.21.3. Database Resources Trend Chart

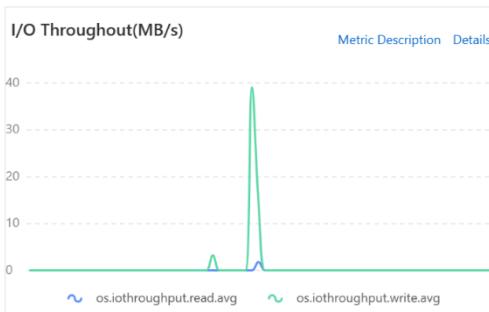
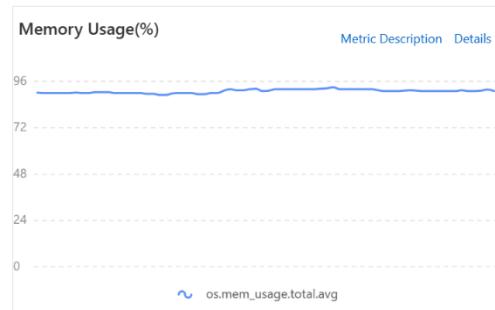
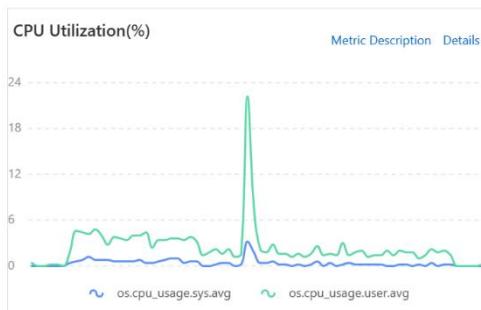
Payment-CPU and memory resource Trends:
50 concurrent



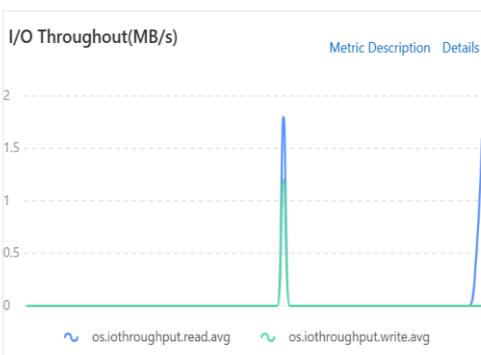
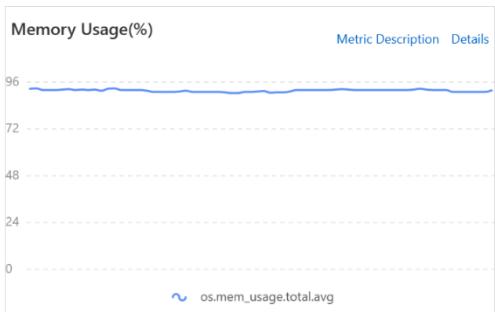
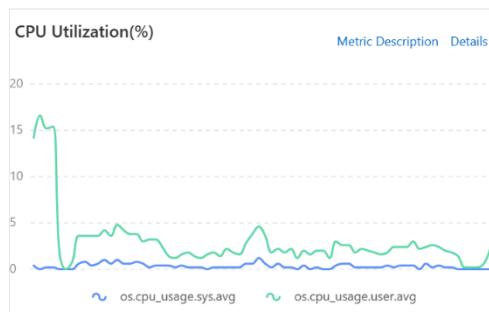
100 concurrent



150 concurrent



200 concurrent



5.2.21.4. Analyze Statistics

Customer Restriction Retrieval: The Transaction request is initiated using a stepwise number of concurrent users (50,100,150,200), and each gradient continues to run for 5 minutes, with a success rate of 100%.

TPS: TPS is relatively stable, with the increase of the number of concurrent users, TPS remains around 1300+.

AvgRT: The average response time trend is normal, with an average response time of 79ms for 200 concurrent.

Application Service resources: The CPU and Memory resource usage is normal and does not exceed the preset resource setting limit.

Database resources: The CPU usage is under 40% which is normal, but CPU usage is around 96% which is above the target value, this is due to the database configuration is low for test environment when processing this case, and will be upgraded when product goes live.

Overall Observation: While the current observation does not presently affect overall performance based on concurrent user sets, it is advisable to enhance the database specifications as the database's CPU and Memory utilization are exceeding 60% as compared to the performance indicators. This measure aims to prevent any unexpected behavior resulting from reaching 100% utilization.

5.3 Link Process Scenario Test Results

5.3.1 Onboarding Process

5.3.1.1. Execution results

Case Name	Concurrent Number	TPS	AvgRT(ms)	Success rate	Application Service		Database	
					CPU Usage	Memory Usage	CPU Usage	Memory Usage
Onboarding	20	474.8	29	100%	<3%	<50%	<8.8%	<96%
	40	711.5	38	100%	<4%	<50%	<20%	<96%
	60	714.5	63	100%	<8%	<50%	<12%	<96%
	80	924.6	64	100%	<8%	<50%	<20%	<96%

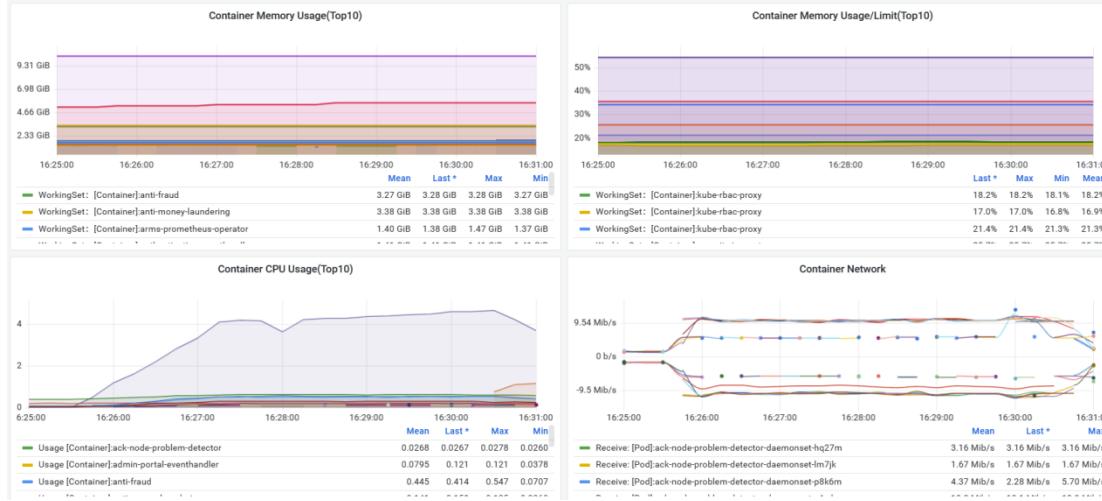
5.3.1.2. Application Service Resources Trend Chart

CPU and memory resource trends:

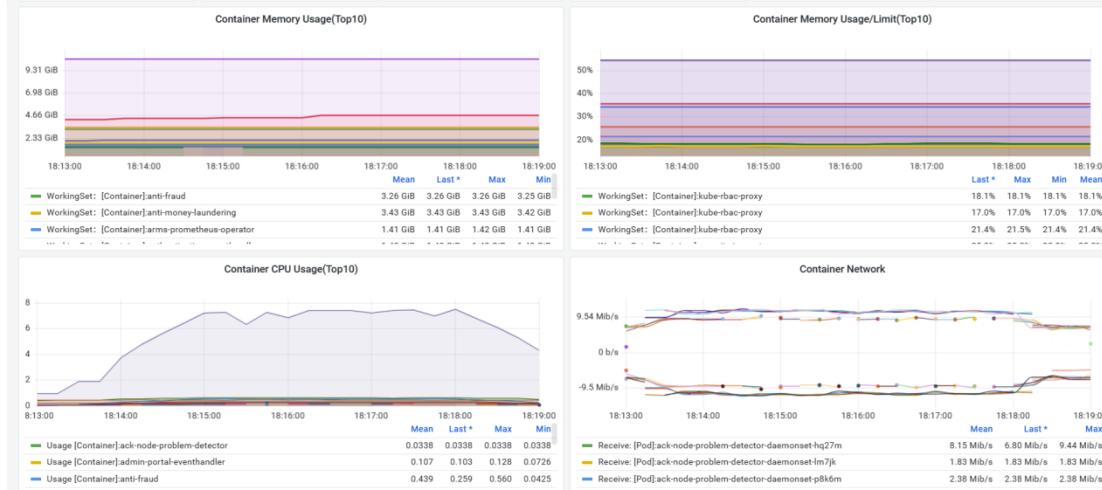
20 concurrent



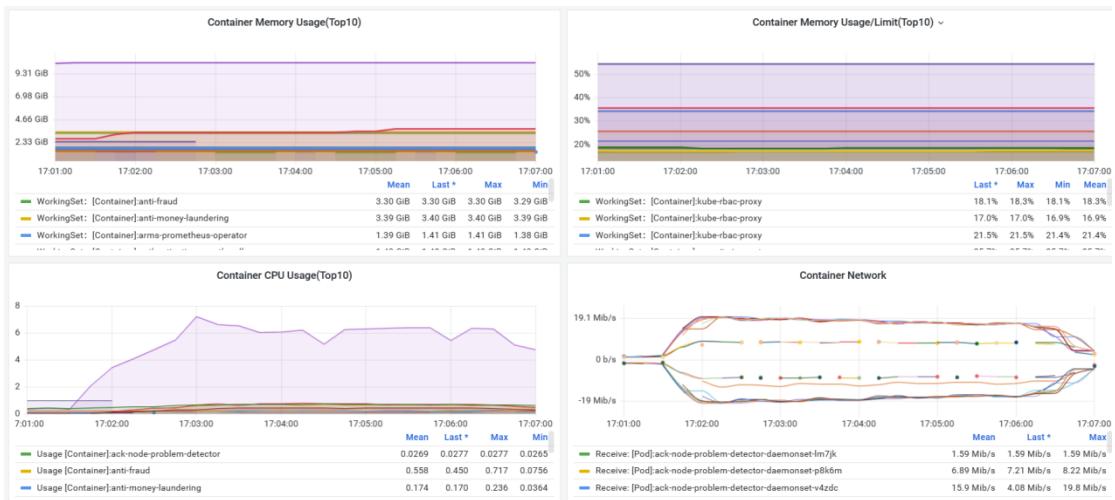
40 concurrent



60 concurrent



80 concurrent



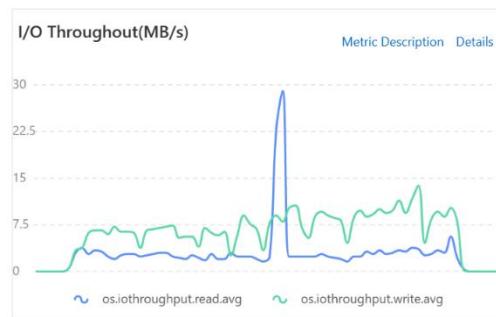
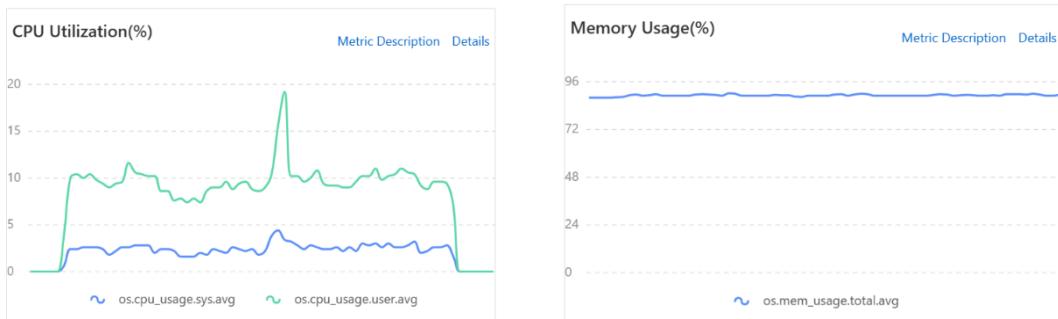
5.3.1.3. Database Resources Trend Chart

Customer-CPU and memory resource Trends:

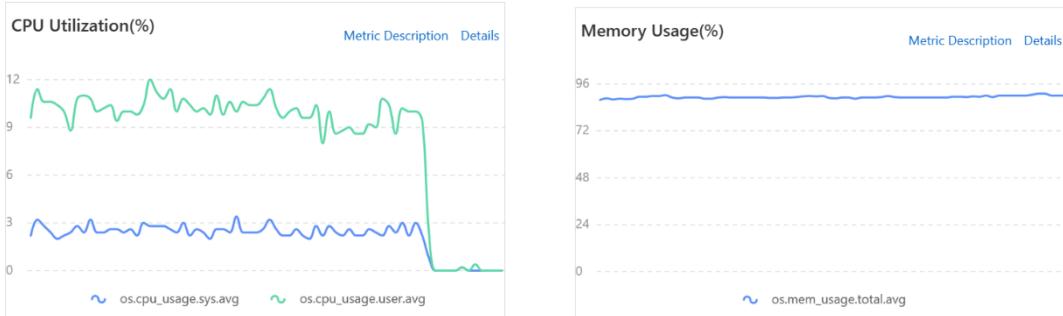
20 concurrent



40 concurrent



60 concurrent



80 concurrent



5.3.1.4. Analyze Statistics

Onboarding: The Transaction request is initiated using a stepwise number of concurrent users (20,40,60,80), and each gradient continues to run for 5 minutes, with a success rate of 100%.

TPS: TPS is relatively stable, with the increase of the number of concurrent users, TPS remains around 700+.

AvgRT: The average response time trend is normal, with an average response time of 64ms for 80 concurrent.

Application Service resources: The CPU and Memory resource usage is normal and does not exceed the preset resource setting limit.

Database resources: The CPU usage is under 20% which is normal, but CPU usage is around 96% which is above the target value, this is due to the database configuration is low for test environment when processing this case, and will be upgraded when product goes live.

Overall Observation: While the current observation does not presently affect overall performance based on concurrent user sets, it is advisable to enhance the database specifications as the database's Memory utilization is exceeding 60% as compared to the performance

indicators. This measure aims to prevent any unexpected behavior resulting from reaching 100% utilization.

5.4 All Interface Mixed Scenario

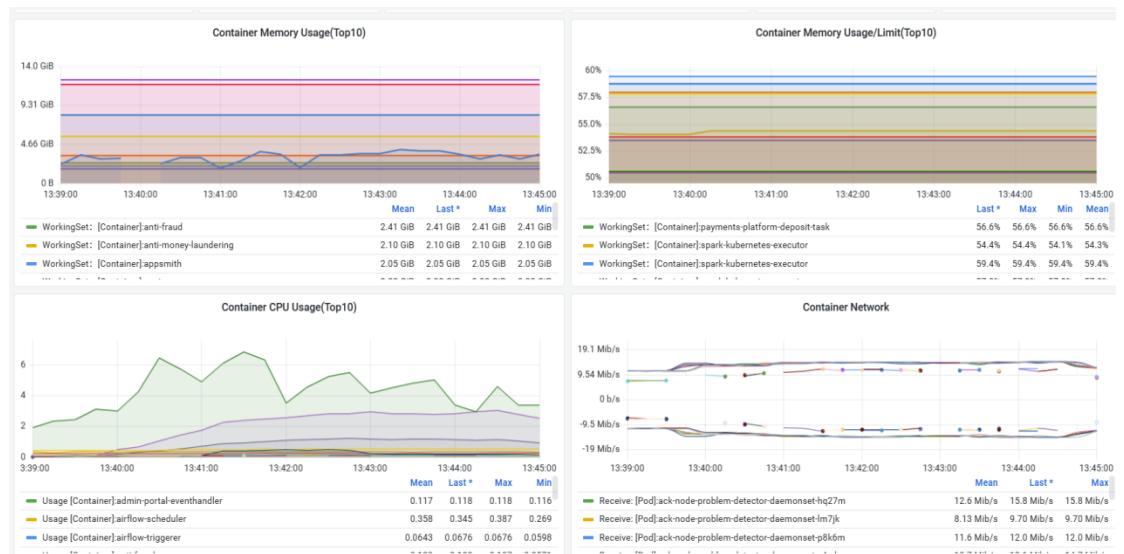
5.4.1.1. Execution Results

Case Name	Concurrent Number	TPS	AvgRT (ms)	Success rate	Application Service		Database			
					CPU Usage	Mem Usage	CPU Usage		Mem Usage	
							Customer	deposit	Customer	deposit
Mixed Scenario	50	950	34	100%	<6%	<60%	<8%	<20%	<100%	<96%
	100	1489	47	100%	<6%	<60%	<8.8%	<24%	<100%	<96%
	150	1393	70	100%	<8%	<60%	<20%	<30%	<96%	<96%
	200	1433	110	100%	<8%	<60%	<8%	<40%	<88%	<96%

5.4.1.2. Application Service Resources Trend Chart

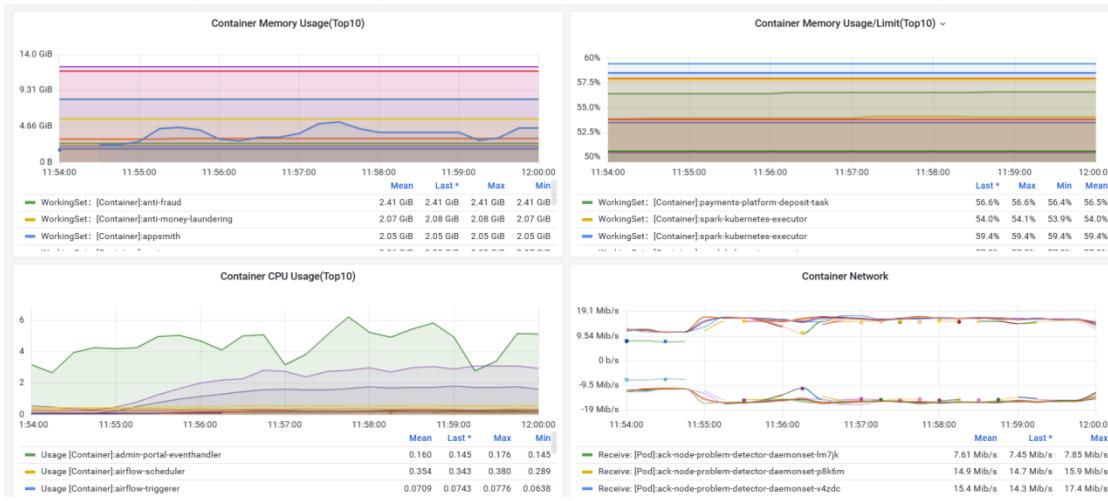
CPU and memory resource trends:

50 concurrent



Performance Test Result

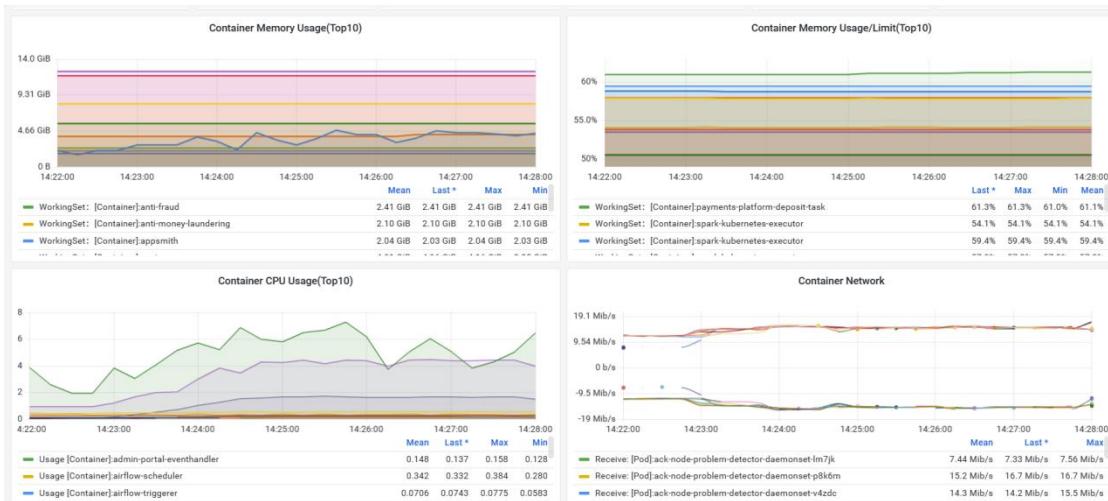
100 concurrent



150 concurrent



200 concurrent

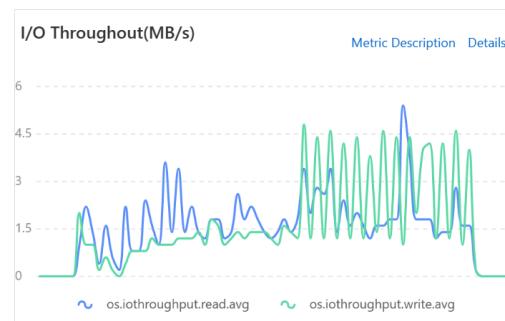
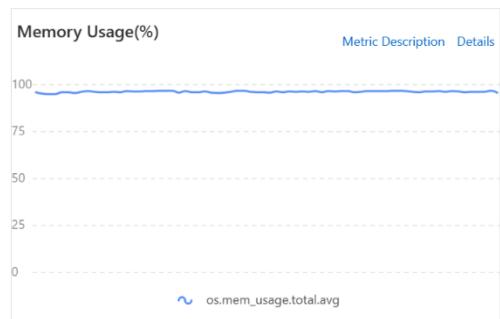
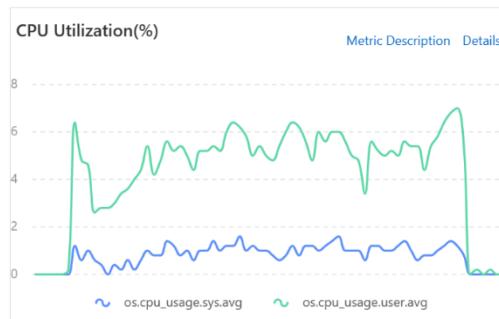


5.4.1.3.Database Resources Trend Chart

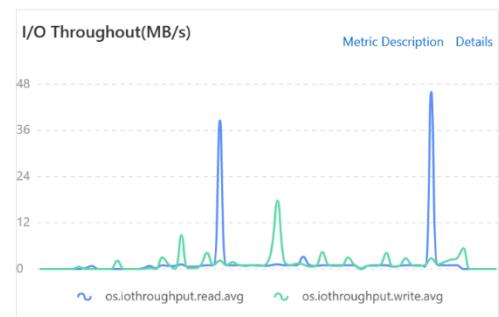
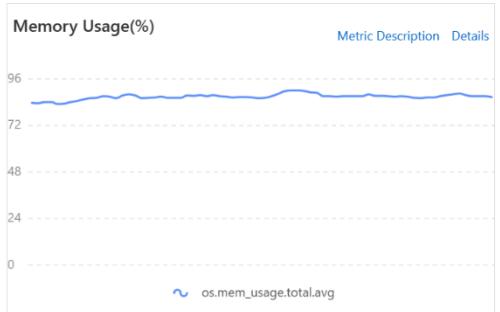
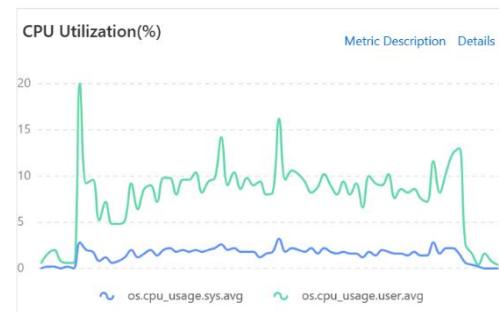
CPU and memory resource Trends:

50 concurrent

Customer

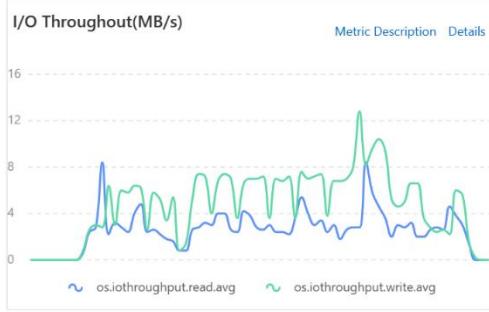
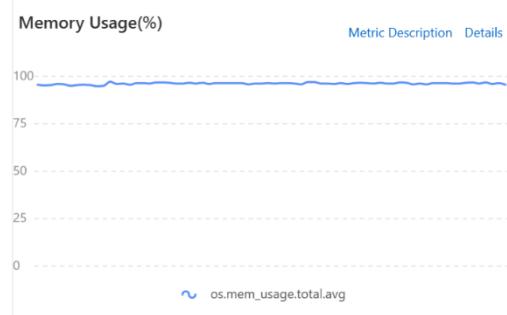
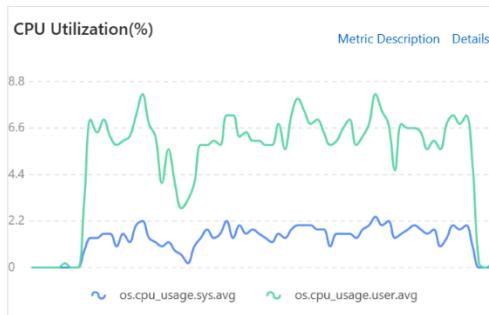


Deposit

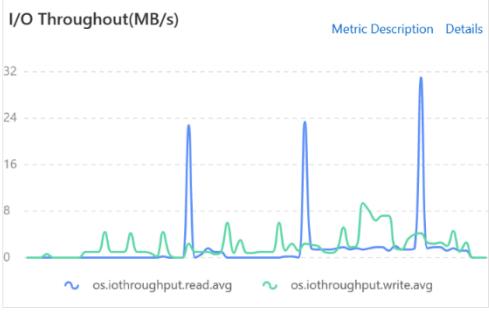
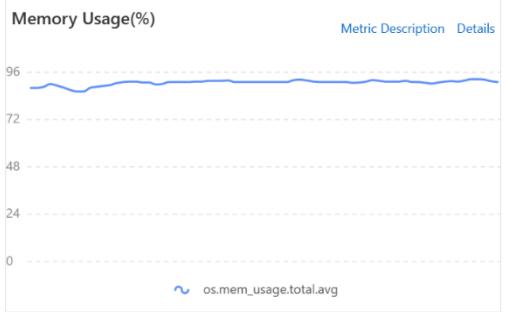
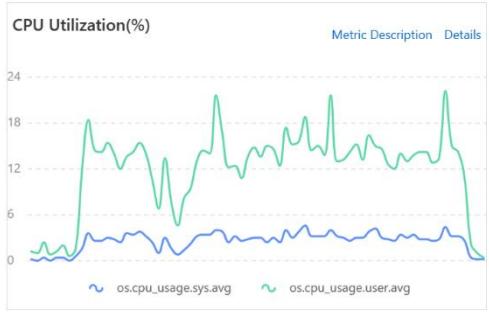


100 concurrent

Customer

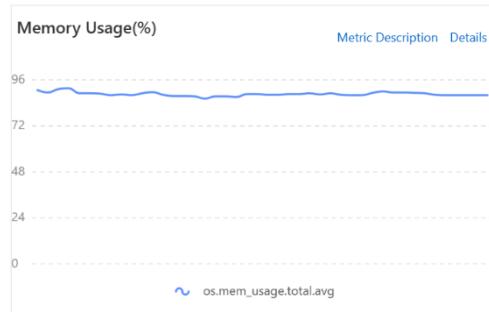
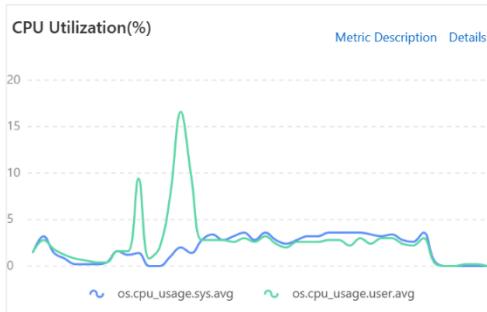


Deposit

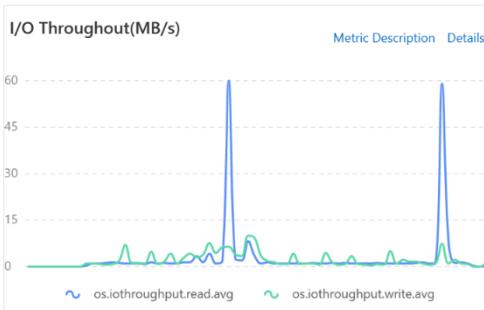
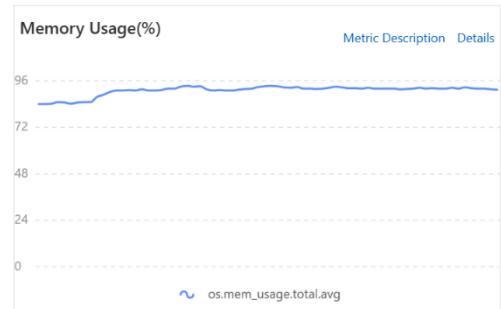
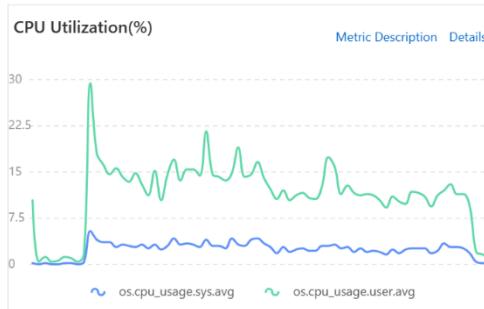


150 concurrent

Customer

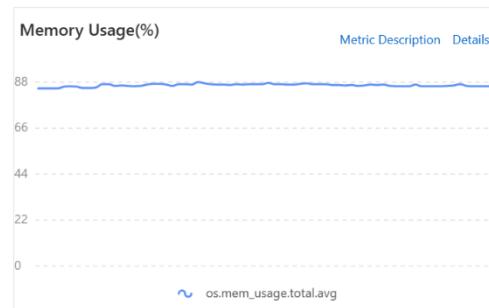
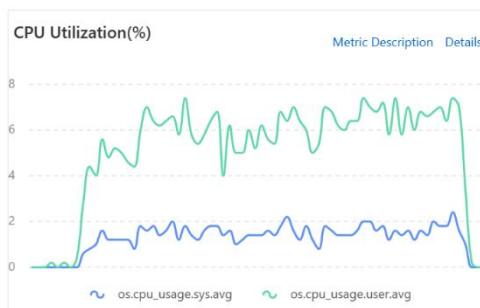


Deposit

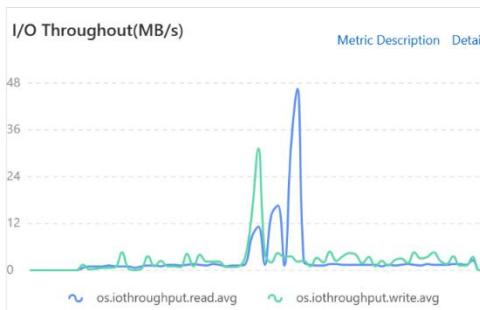
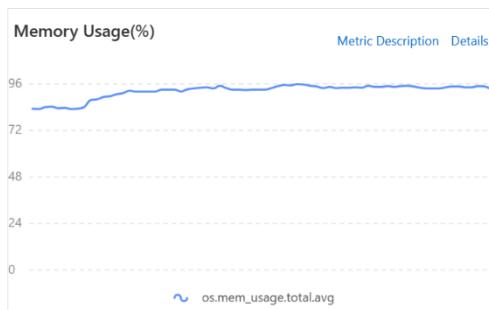
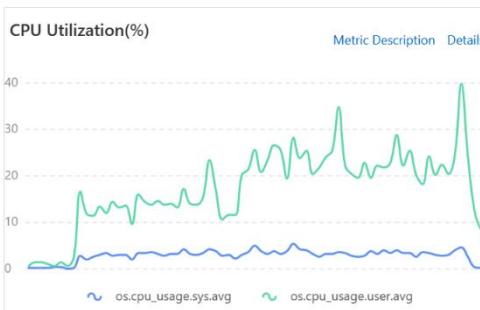


200 concurrent

Customer



Deposit



5.4.1.4. Analyze Statistics

Mixed Scenario: The Transaction request is initiated using a stepwise number of concurrent users (50,100,150,200), and each gradient continues to run for 5 minutes, with a success rate of 100%. TPS: TPS is relatively stable, with the increase of the number of concurrent users, TPS remains around 1400+.

AvgRT: The average response time trend is normal, with an average response time of 110ms for 200 concurrent.

Application Service resources: The CPU and Memory resource usage is normal and does not exceed the preset resource setting limit.

Database resources: The CPU usage for customer and deposit are both under 40% which is normal, but CPU usage is around 100% which is above the target value, this is due to the database configuration is low for test environment when processing this case, and will be upgraded when product goes live.

Overall Observation: While the current observation does not presently affect overall performance based on concurrent user sets, it is advisable to enhance the database specifications as the database's memory utilization is exceeding 60% as compared to the performance indicators. This measure aims to prevent any unexpected behavior resulting from reaching 100% utilization.

5.5 Stability Scenario

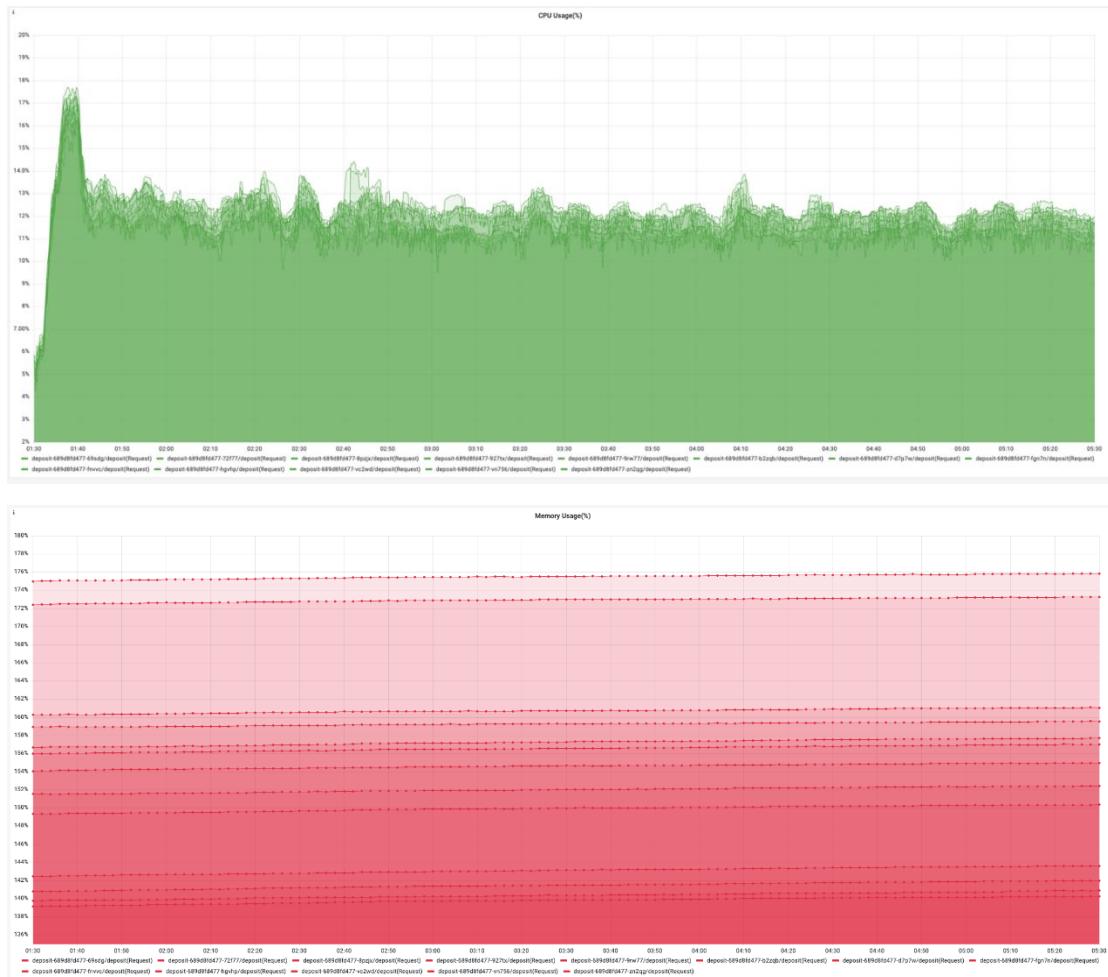
5.5.1 Execution Results

Case Name	TPS	AvgRT (ms)	Success rate	Application Service				Database			
				CPU Usage		Memory Usage		CPU Usage		Memory Usage	
				Deposit	Payment	Deposit	Payment	Deposit	Payment	Deposit	Payments
Stability	199.7	198	100%	<18%	<36%	<179%	<190%	<16%	<96%	<96%	<60%

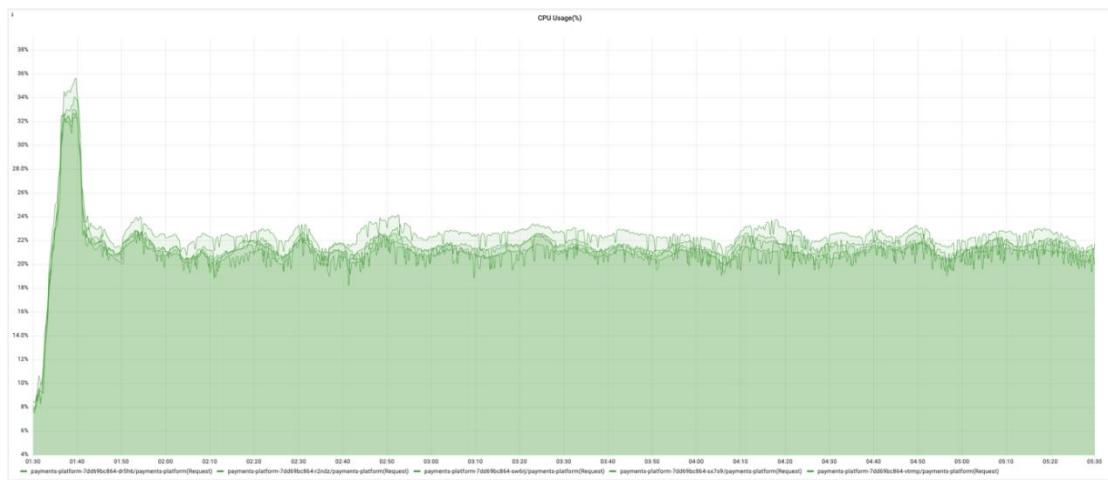
5.5.2 Application Service Resources Trend Chart

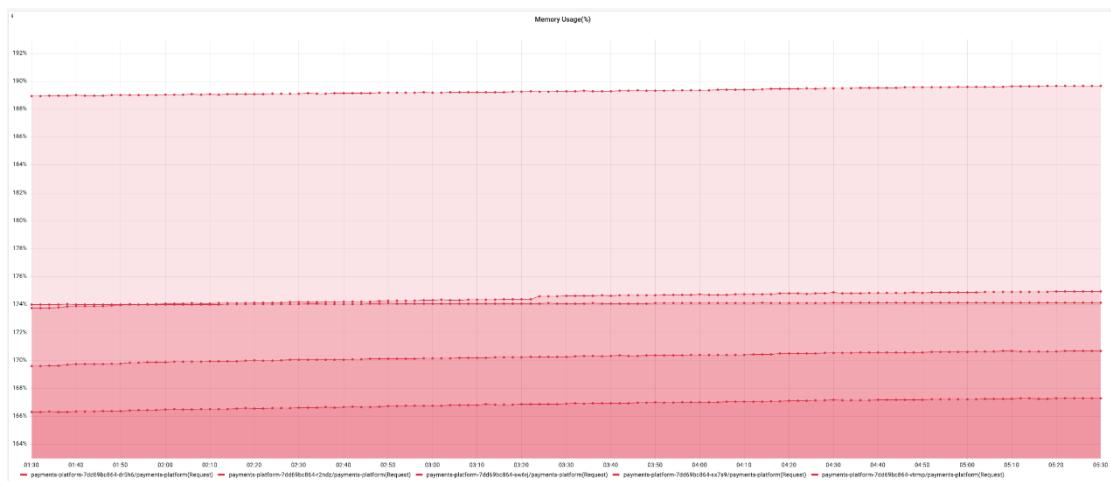
CPU and memory resource trends:
Deposit

Performance Test Result



Payment

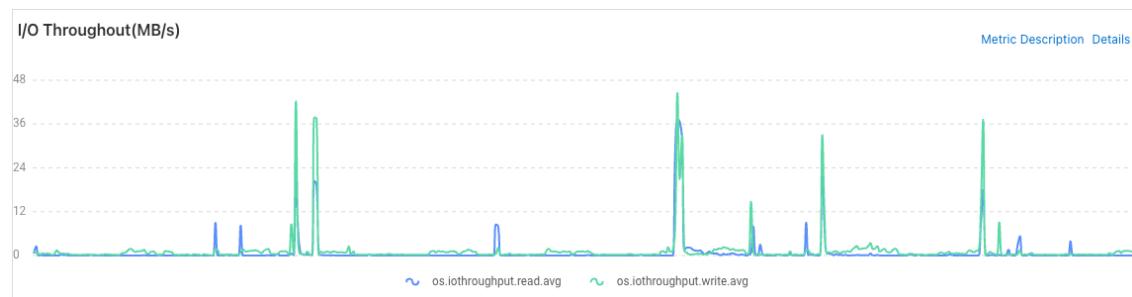
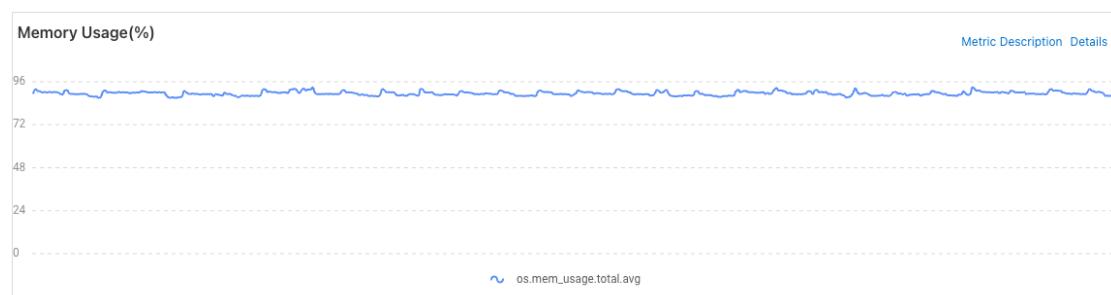
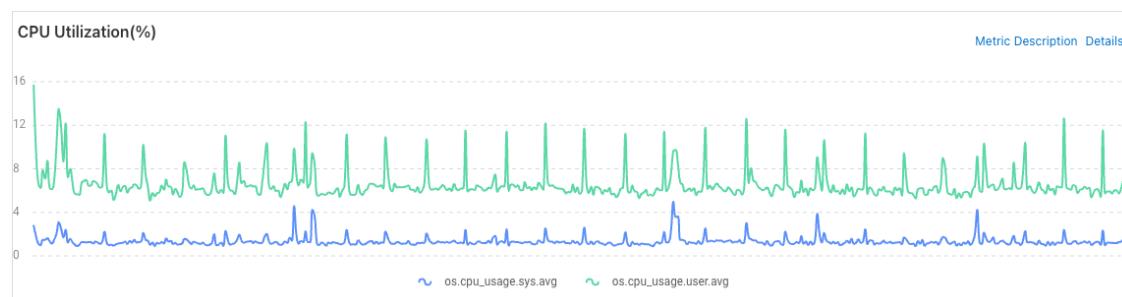




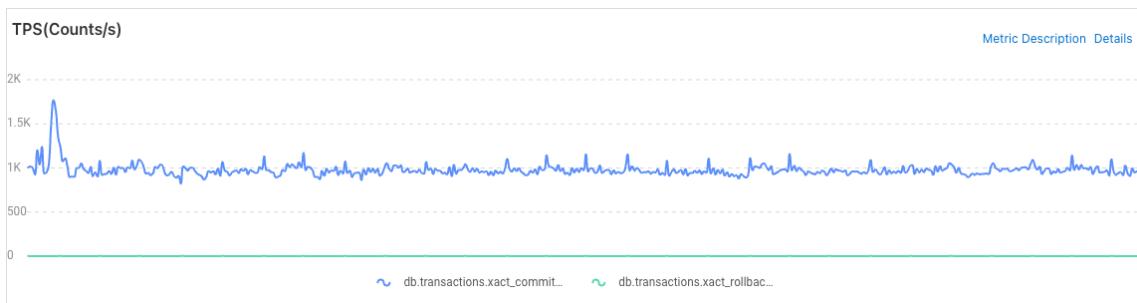
5.5.3 Database Resources Trend Chart

CPU and memory resource Trends:

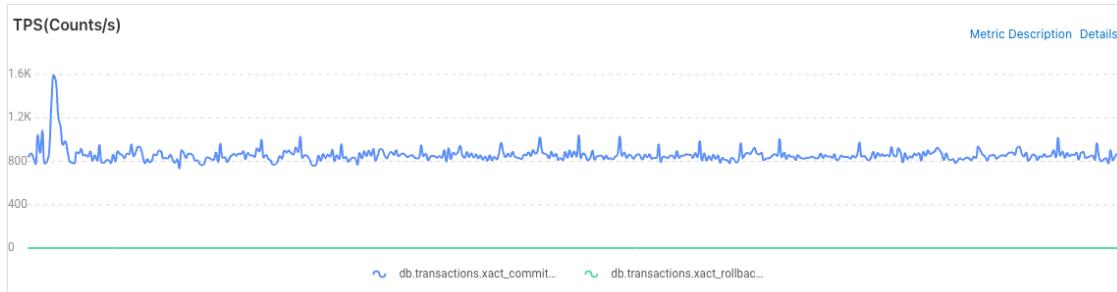
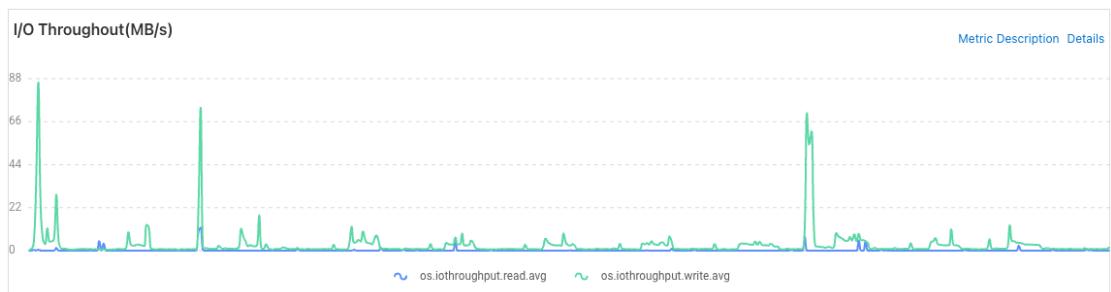
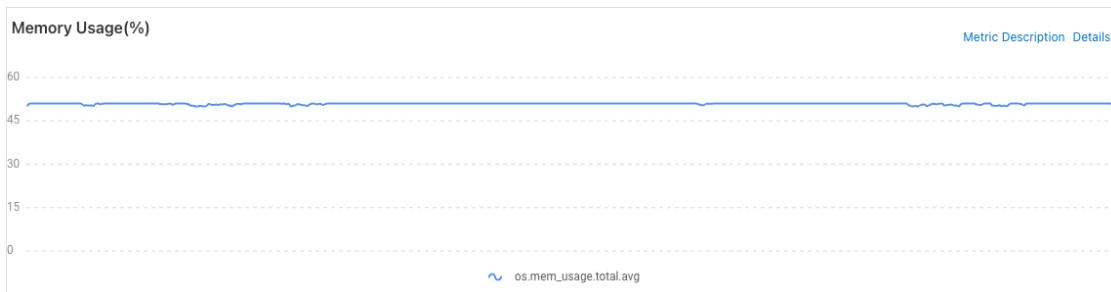
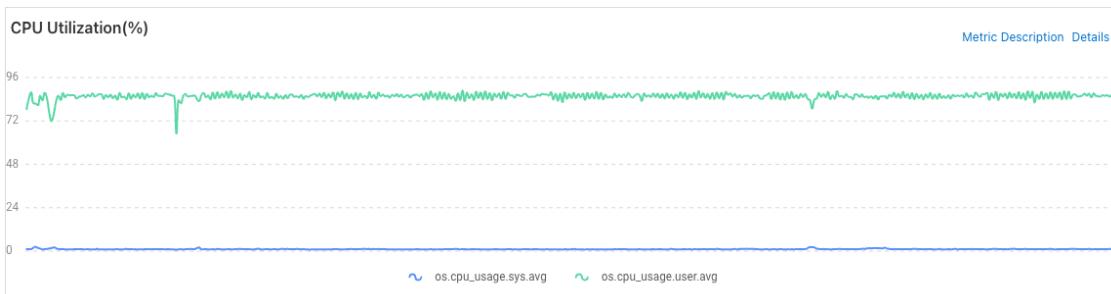
Deposit



Performance Test Result



Payment



5.5.4 Analyze Statistics

Stability Scenario: Stability testing is processed in the base of optimal system capacity, with all single-scenario interfaces running continuously for 4 hours in proportion to their business..

TPS: TPS is relatively stable, TPS remains around 200+.

AvgRT: With an average response time of 198ms.

Application Service resources: The CPU resource usage is normal and does not exceed the preset resource setting limit, the Memory usage is over 100% due to the value is the total for 5 application services.

Database resources: Memory usage is around 96% which is above the target value, this is due to the database configuration is low for test environment when processing this case, and will be upgraded when product goes live.

Overall Observation: While the current observation does not presently affect overall performance based on concurrent user sets, the CPU and Memory usage of both Application and Database have exceeds the baseline defined in the performance indicators too. It is advisable to have pod scaling in place with target % of CPU and Memory utilization defined to ensure the appropriate number of application pods are spun up to manage spikes in incoming traffics effectively while maintaining the healthiness of pod's CPU and Memory usage. In addition, it is advisable to enhance the database specifications as the database's CPU / memory utilization is exceeding 60% as compared to the performance indicators. This measure aims to prevent any unexpected behavior resulting from reaching 100% utilization.

5.6 Batch Scenario

5.6.1 Batch job

HSG Cron is able to complete within 2 hours with 284k transfers and ~4m active accounts which is as expected.

5.6.2 Batch job and Mixed Scenario

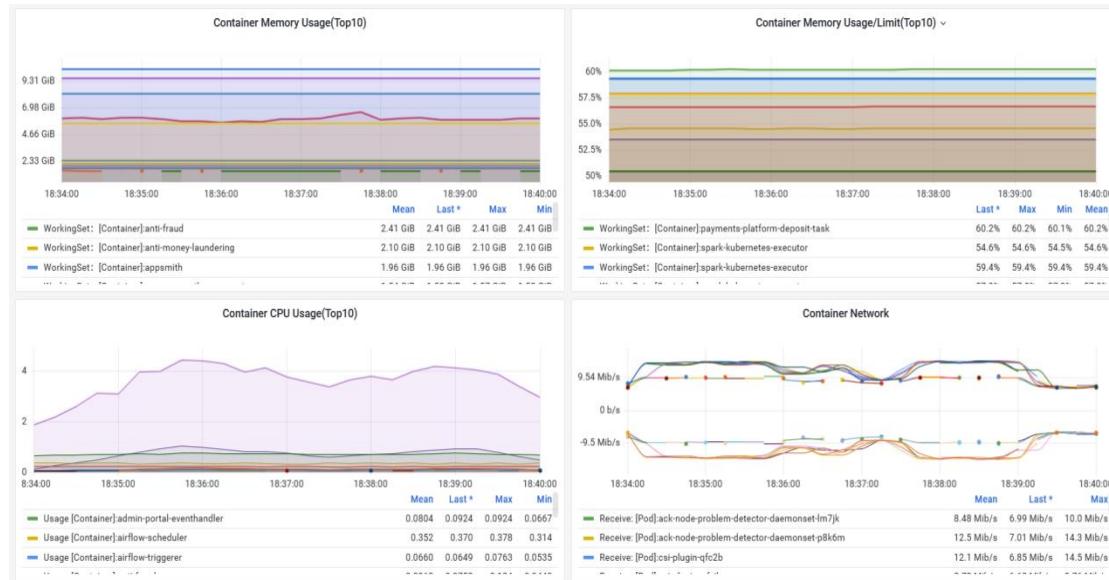
5.6.2.1. Execution Results

Case Name	Concurrent User	TPS	AVGrt (ms)	Success Rate	Application Service		Database					
					CPU Usage	Mem Usage	CPU Usage			Memory Usage		
							Customer	Deposit	Payment	Customer	Deposit	Payment
Mixed Scenario	50	767.7	39	100%	<4%	<60%	<6%	<30%	<0.1%	<88%	<96%	<48%
	100	1087.5	47	100%	<6%	<60%	<16%	<60%	<2.4%	<88%	<96%	<48%
	150	1498.3	75	100%	<4%	<60%	<8.8%	<48%	<9.6%	<88%	<96%	<48%
	200	1471.9	108	100%	<6%	<60%	<8%	<80%	<0.2%	<88%	<96%	<48%

5.6.2.2. Application Service Resources Trend Chart

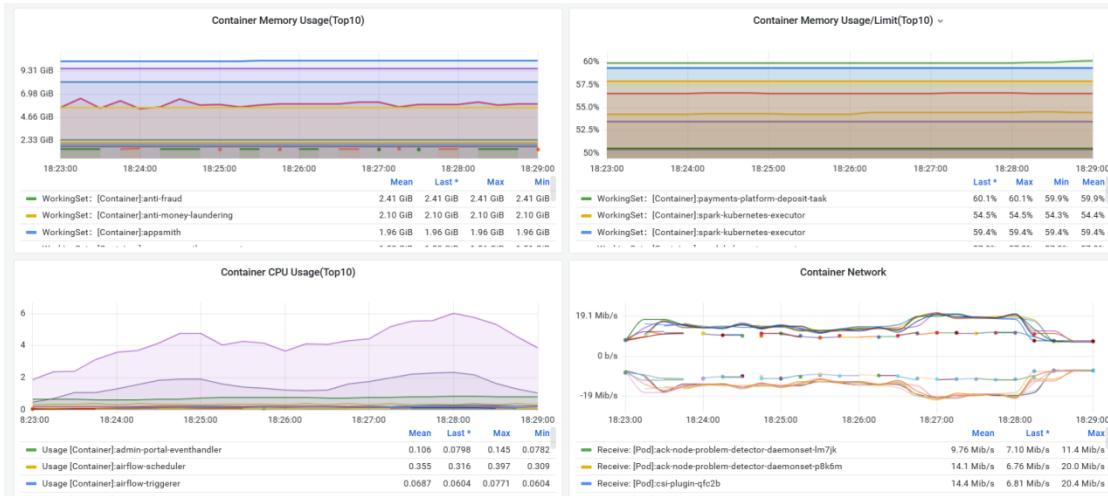
CPU and memory resource trends:

50 concurrent



Performance Test Result

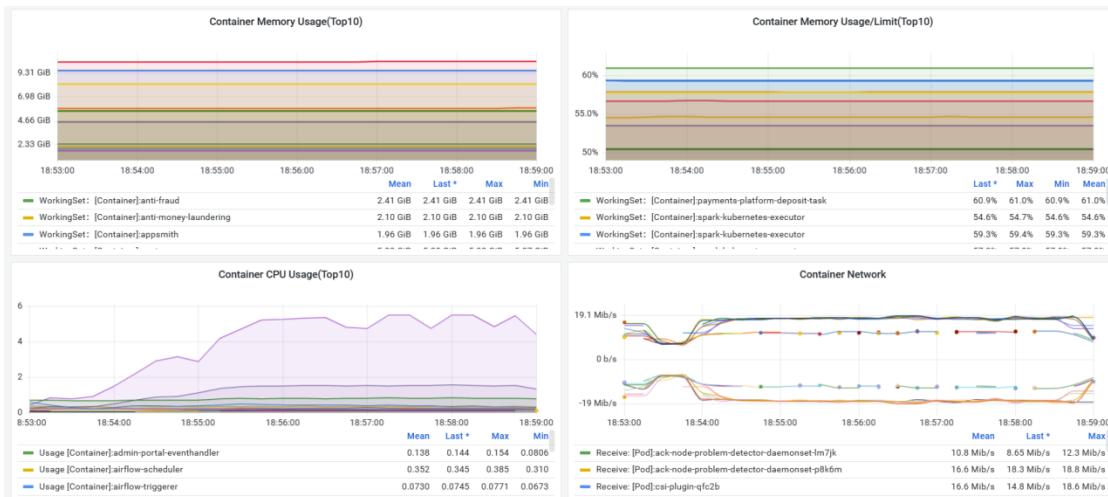
100 concurrent



150 concurrent



200 concurrent

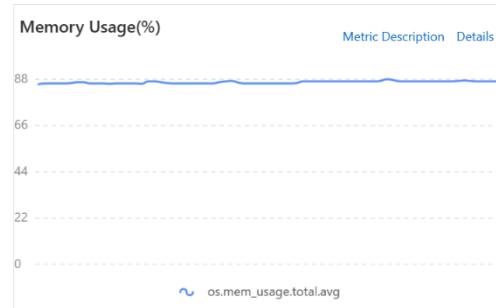
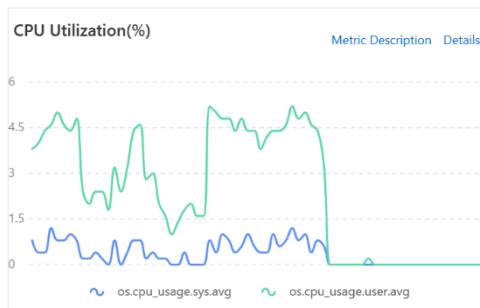


5.6.2.3.Database Resources Trend Chart

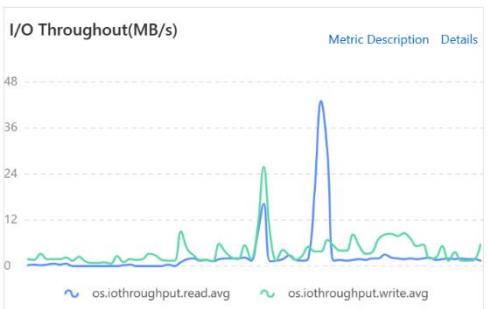
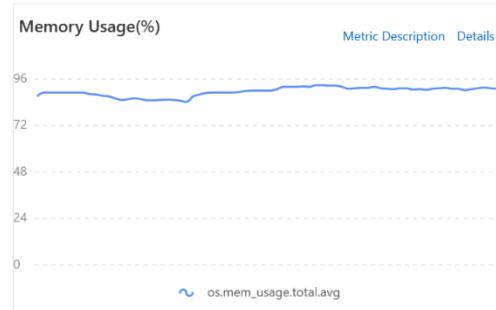
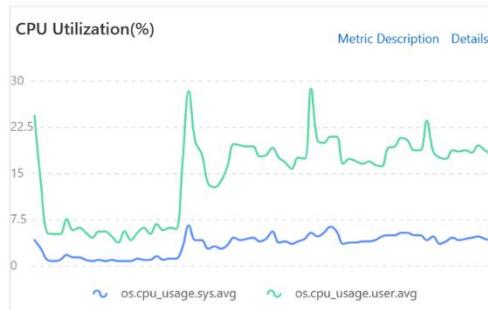
CPU and memory resource Trends:

50 concurrent

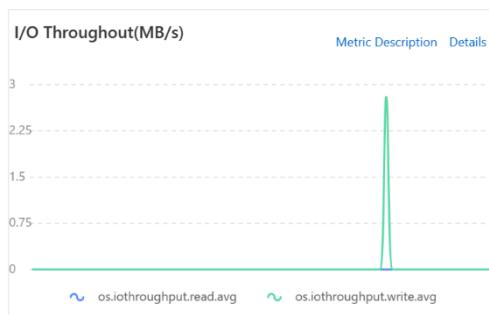
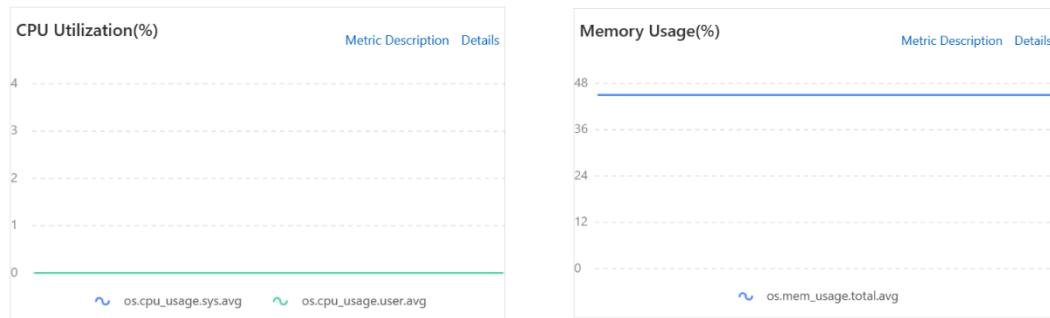
Customer



Deposit

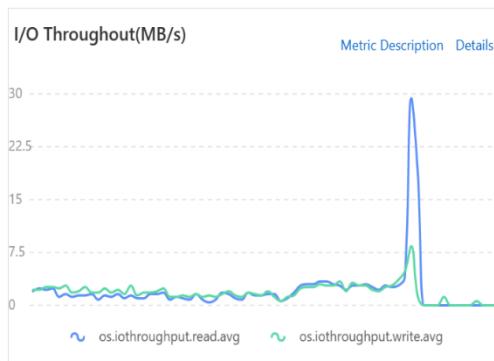
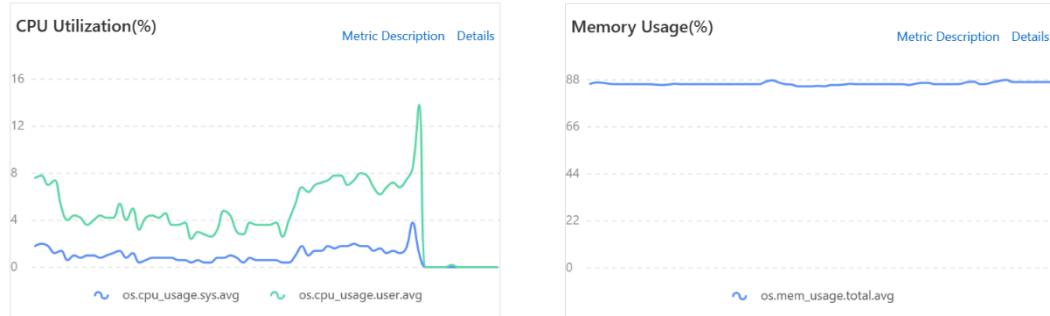


Payments

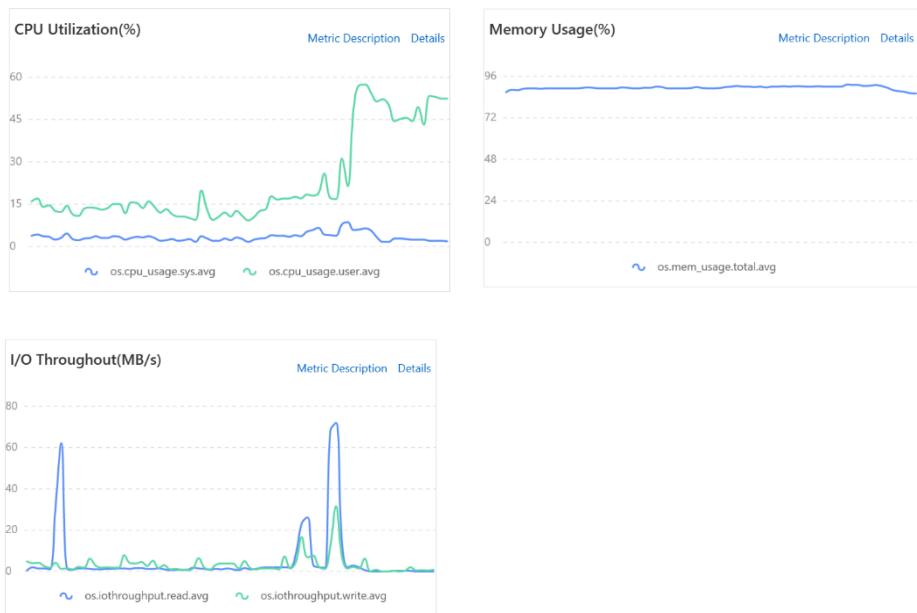


100 concurrent

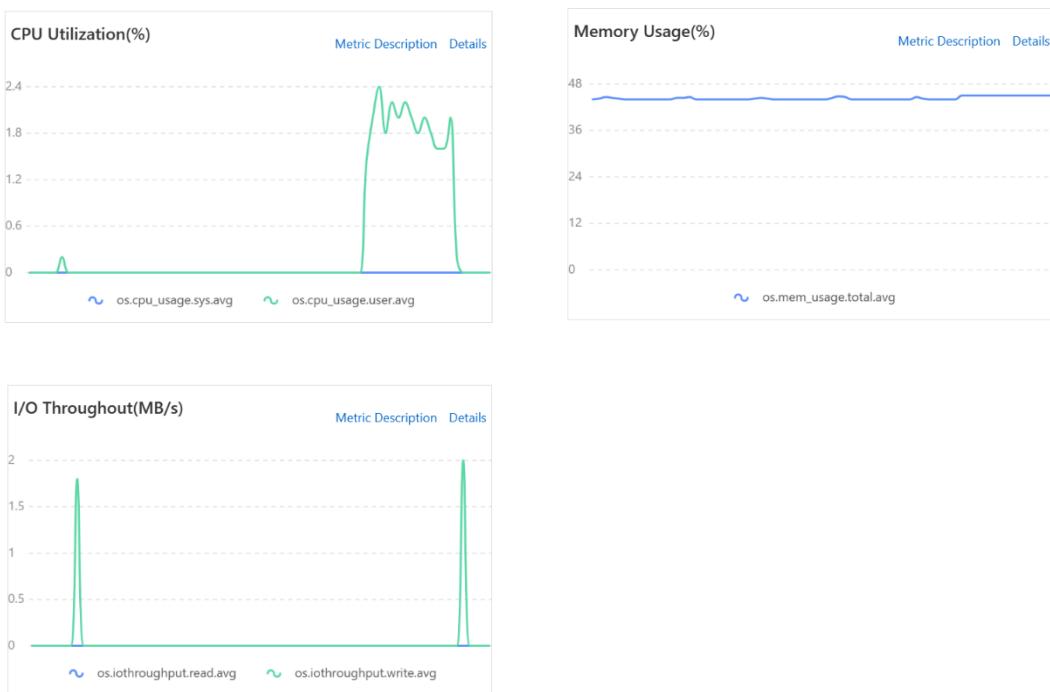
Customer



Deposit

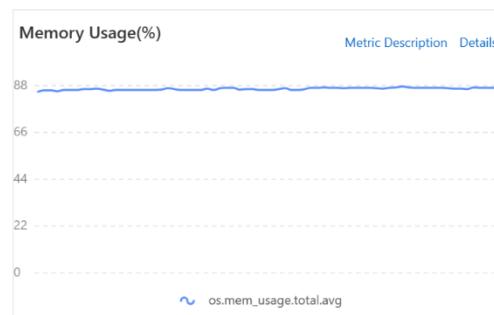
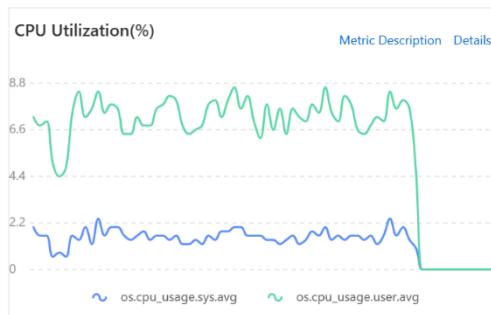


Payments

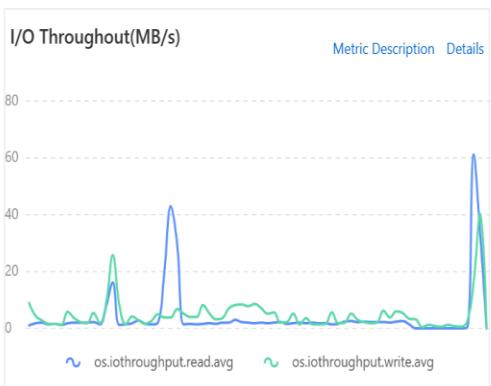
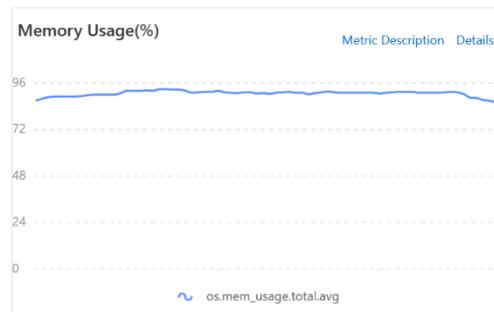
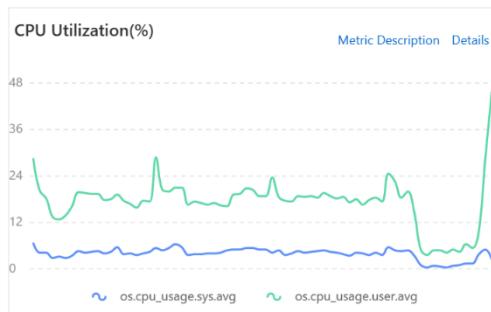


150 concurrent

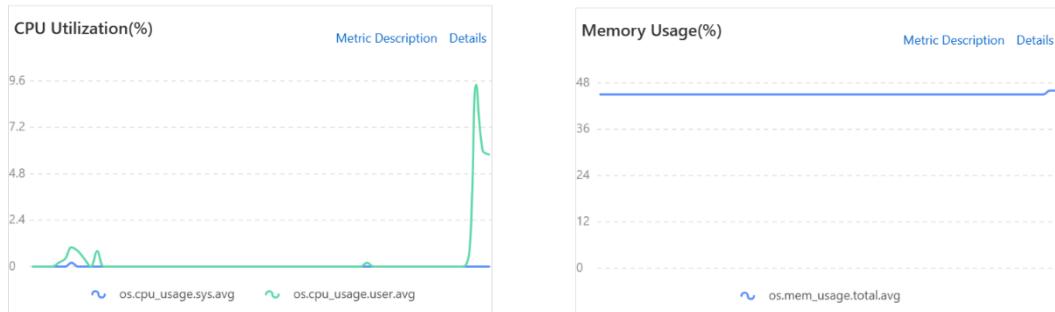
Customer



Deposit

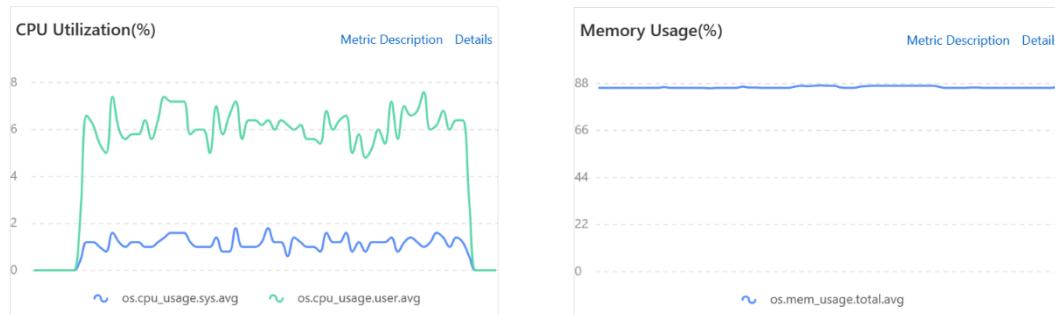


Payments

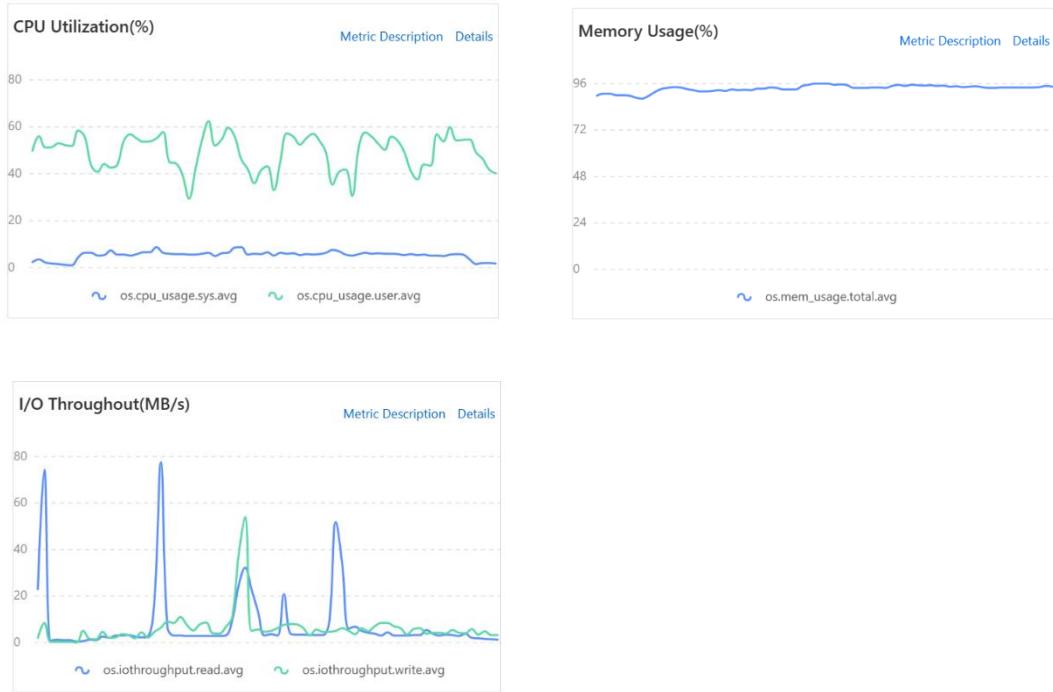


200 concurrent

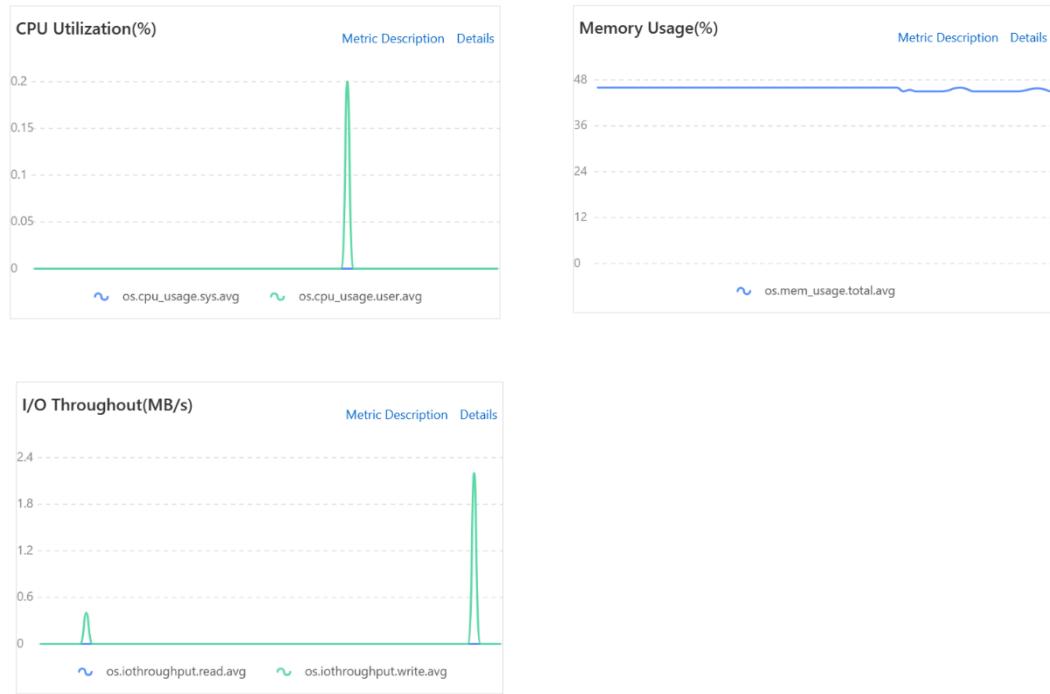
Customer



Deposit



Payments



5.6.2.4.Analyze Statistics

Batch job and Mixed Scenario : The Transaction request is initiated using a stepwise number of concurrent users (50,100,150,200), and each gradient continues to run for 5 minutes, with a success rate of 100%.

TPS: TPS is relatively stable, with the increase of the number of concurrent users, TPS remains around 1400+.

AvgRT: The average response time trend is normal, with an average response time of 108ms for 200 concurrent.

Application Server resources: The resource is used normally and does not exceed the preset resource limit.

Database resources: The usage of Customer service, Deposit-service and Payments-service under 6%, Meet expected goals. but the memory usage is around 96%, which is above the target value, this is due to the database configuration is low for test environment, confirmed with client infra team will update the database configuration when product goes live.

Overall Observation: While the current observation does not presently affect overall performance based on concurrent user sets, the CPU and Memory usage of both Application and Database have exceeds the baseline defined in the performance indicators too. It is advisable to have pod scaling in place with target % of CPU and Memory utilization defined to ensure the appropriate number of application pods are spun up to manage spikes in incoming traffics effectively while maintaining the healthiness of pod's CPU and Memory usage. In addition, it is advisable to enhance the database specifications as the database's CPU / memory utilization is exceeding 60% as compared to the performance indicators. This measure aims to prevent any unexpected behavior resulting from reaching 100% utilization.

5.7 Defect Statistics

During the test, totally 7 defects have been found, and all defects have been fixed and retest passed. Refer to the following attachment for defect details.


Performance
Defects.xls

6 Recommendation and Follow Up

To mitigate the issues observed from the test cases above, there are three actions need to be taken.

1. Setup Application Pod scaling at 60% target CPU and Memory Utilization.
 - a. This allows the application to spin up necessary number of pod to handling the spike of incoming traffics while maintaining a healthy rate of CPU and Memory utilization against the performance indicator
2. Upgrade Application's Database Specification to 8 Core CPU and 32G Memory
 - a. There are a few test cases result in >80% of Database CPU utilization or >96% of Database Memory utilization. While this does not impact the performance result, this measure aims to prevent any unexpected behavior resulting from reaching 100% utilization.
 - b. From the experience of upgrading Database Specification to 8 Core CPU and 32G Memory from 2 Core CPU and 4G Memory on Payment Database, the Database CPU and Memory utilization rate dropped significantly on DuitNow Webhook Credit Transfer test case. Hence, the recommendation spec will be 8 Core CPU and 32G Memory.
3. Conduct on-going performance testing with identified baseline specification to ensure the healthiness of traffic handling
4. Setup monitoring on Application and Databases' CPU and Memory utilization rate to ensure scaling can be done in place and on time.

Core Banking System:

Server	Component Description	Number of nodes	Resource for Each Node
Core Banking + DCP (Worker nodes)	ECS Worker Node	6	CPU: 24C MEMORY: 48G
Report (VM)	ECS for Report BIRT	1	CPU: 8C MEMORY: 32G
Kubernetes Cluster (Core Banking)	MSE Microservice Registry Registration Configuration Center	1	CPU: 2C MEMORY: 4G
MySQL	ApsaraDB RDS for MySQL for core banking	1	CPU: 16C MEMORY: 32G
		1	CPU: 16C

	ApsaraDB RDS for MySQL for DCP, Report management, JGP		MEMORY: 32G
	ApsaraDB RDS for MySQL for report	1	CPU: 16C MEMORY: 32G

Mobile Banking:

Server	Component Description	Number of nodes	Resource for Each Node
Kubernetes Cluster (YTL)	ECS Worker Nodes	5	CPU:16C MEMORY: 32G
Database	ApsaraDB RDS for PosgreSQL for YTL	13	CPU: 8C MEMORY: 32G
	ApsaraDB RDS for PosgreSQL for YTL (Payment for DuitNow Webhook Credit Transfer)	1	CPU: 8C MEMORY: 32G

7 Conclusion

The results of this test meet the completion standard set in this stage of the test, and by PM, technical consensus, the solution to the remaining problems has been identified, the risk degree is known and controllable, so it is determined that the performance test was aligned and meets the testing objectives defined in the report.

No	Type of test scenario	Name	Result
1	Single Load Scenario	Account Creation	Pass
2	Single Load Scenario	DuitNow Webhook Credit Transfer	Fail
3	Single Load Scenario	Account Information Retrieval	Fail
4	Single Load Scenario	Account Insights	Pass
5	Single Load Scenario	Account Transaction Listing	Pass
6	Single Load Scenario	Account Transaction Detail Retrieval	Fail
7	Single Load Scenario	Fund Option Retrieval	Pass
8	Single Load Scenario	Transfer with Intrabank	Pass

9	Single Load Scenario	Transfer with Interbank	Fail
10	Single Load Scenario	Get Remaining transfer limit	Pass
12	Single Load Scenario	Get Transfer details by transfer id	Fail
13	Single Load Scenario	Transfer Limit Update	Pass
14	Single Load Scenario	Account Resolution	Pass
15	Single Load Scenario	Transferee Favourited	Fail
16	Single Load Scenario	Account Statement Listing	Pass
17	Single Load Scenario	Account Statement Retrieval	Fail
18	Single Load Scenario	Fund Option Creation	Pass
19	Single Load Scenario	Financial Institution Listing	Fail
20	Single Load Scenario	Transferee Retrieval	Pass
21	Single Load Scenario	Transferee UnFavourited	Fail
22	Single Load Scenario	Customer Restriction Retrieval	Pass
23	Link Process Scenario	Onboarding Process	Pass
24	All Interface Mixed Scenario		Pass
25	Stability Scenario		Fail
26	Batch Scenario		Fail

As shown from the table above, partial of the test cases (11 out of 26) failed to meet the defined performance indicators. However, the root cause and mitigation plan have been identified, the risk degree is known and controllable. In addition, a re-test exercise on these 11 failed test cases will be conducted in order to get the right baseline for overall initial bank launch setup. Therefore, this exercise is considered as passed as the testing objective had been met.

8 Appendix

Formula for Concurrency Calculation:

- $(\text{Average Hourly Sessions} * \text{Average Session Duration}) / (\text{Number of seconds in an hour})$
- [Reference](#)

Inputs:

- No. Of Customer Projections (Year 1)

Month 1	10645
Month 2	251286
Month 3	455303
Month 4	698161
Month 5	979794
Month 6	1252335
Month 7	1472880
Month 8	1533737
Month 9	1557936
Month 10	1635756
Month 11	1685688
Month 12	1760196

- No. Of Transaction Projections (Year 1)
 - 64660968
 - No. Of Transfer Per Person Per Month Projections (Year 1)
 - 8 (6 Intrabank, 10 Interbank)

High-level Calculations:

- TPS Based on No. Of **Customer Projection**
 - $(1.7m / 30 Days / 24 Hours * 300s \text{ Average Active Second per Active Session}) / 3600 = \sim 196 \text{ Transaction per Second}$
- Concurrent user based on number of **transaction projections** in year 1
 - $(65m / 12 Month / 30 days / 24 hours / 5 \text{ Transaction per users} = \sim 1,500 \text{ concurrent users per hour})$

Test Cases Traffic Categories

- **Default Access:**
 - Affected by no. of active accounts projection and actions are triggered default when customers first launch the mobile-app or by recurring activity.
 - Example: Login and see account details information in home screen, Account Insights, Monthly Statement Available etc.
 - Max Concurrent User Calculation: $(1.7m / 30 Days / 24 Hours * 300s \text{ Average Active Second per Active Session}) / 3600 = \sim 196$
- **Growth or Additional Steps:**
 - Two scenarios -

- Affected by growth on no. of active accounts projection.
- Affected by nature of 2nd / nested step action from default mobile-app access.
- Example:
 - Scenario One: Account Creation, Fund Option Creation etc.
 - Scenario Two: Account Listing in Transfer Screen, Get Remaining Balance on Transfer Screen etc.
- Max Concurrent User Calculation:
 - $(1.7m / 12 \text{ Months} / 30 \text{ Days} / 24 \text{ Hours} * 300\text{s Average Active Seconds per Session}) / 3600 = \sim 17$
 - $(1.7m / 30 \text{ Days} / 24 \text{ Hours} * 300\text{s Average Active Second per Active Session}) / 3600 * 0.7 \text{ (30\% Less from Default Access Pattern)} = \sim 137$
- **Regular:**
 - Affected by no. of transaction projection.
 - Example: Interbank Transfer, Intrabank Transfer, Transferee Favorite etc.
 - Max Concurrent User Calculation: $(64m / 12 \text{ months} / 30 \text{ Days} / 24 \text{ Hours} * 300\text{s Average Active Seconds per Session}) / 3600 / 8 \text{ Avg Transaction Per Person Per Month} = \sim 77$

February 27, 2024