

Oracle® Communications

Network Analytics Data Director

Benchmarking Guide



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ORACLE®

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Acronyms

The following table provides information about the acronyms used in the document.

Table Acronyms

Acronym	Description
OCNADD	Oracle Communications Network Analytics Data Director
SCP	Oracle Communications Cloud Native Core, Service Communication Proxy
SEPP	Oracle Communications Cloud Native Core, Security Edge Protection Proxy
NRF	Oracle Communications Cloud Native Core, Network Repository Function
CNE	Oracle Communications Cloud Native Core, Cloud Native Environment
MPS	Messages Per Second

What's New in This Guide

This section lists the documentation updates for Release 23.2.x in *Oracle Communications Network Analytics Data Director Benchmarking Guide*.

Release 23.2.0 - F83157-01, July 2023

Updated the following sections:

- [Resource Requirement](#)
- [Profile Resource Requirements](#)
- [Deployment Profiles](#)
- [OCNADD Benchmarking Testing](#)

Added the following sections:

- [#unique_18](#)
- [#unique_19](#)

1

Introduction

Oracle Communications Network Analytics Data Director (OCNADD) is a specialized Network Data Broker (NDB) in 5G Network Architecture.

OCNADD receives network traffic data from various sources, 5G network functions (NFs), Non-5G NFs, and third-party producers, performs filtering, replication, and aggregation on the received data according to the rules implemented by the subscribed third-party consumers. OCNADD then sends the filtered, replicated, or aggregated data to the subscribed third-party consumers (third-party consumer applications or platforms) securely.

1.1 Purpose and Scope

This document is designed to measure the performance and capacity of OCNADD deployment and resource requirements.

1.2 References

For more information about OCNADD, see the following documents:

- *Oracle Communications Network Analytics Data Director Installation, Upgrade, and Fault Recovery Guide*
- *Oracle Communications Network Analytics Data Director User Guide*

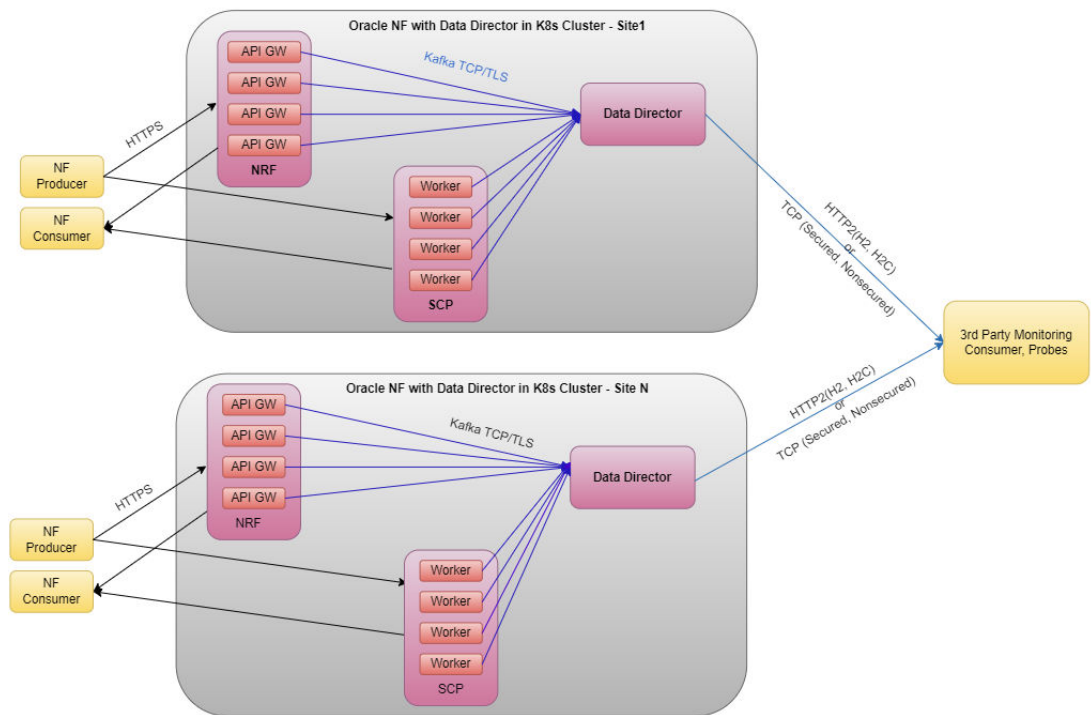
2

Deployment

OCNADD supports CNE and TANZU platforms. There are a few variations in the deployment process for both the platforms. For more information about OCNADD installation, see *Oracle Communications Network Analytics Data Director Installation, Upgrade, and Fault Recovery Guide*.

The following diagram depicts the OCNADD deployment in the 5G architecture:

Figure 2-1 OCNADD Deployment



Note

From release 23.1.0 onwards OCNADD supports Synthetic Feeds along with HTTP2 Feeds.

OCNADD uses the following common services of CNE:

- Kubernetes
- Prometheus
- Metallb (Load balancer)

- cnDBTier

3

Resource Requirement

This section provides information about the resource requirements to install and run Oracle Communications Network Analytics Data Director (OCNADD) with the desired Message Per Second (MPS) profiles.

The resource requirement for the profile is captured using Baremetal CNE with the following CNE and K8 cluster configuration:

Table 3-1 CNE Configuration

Type of Server	Baremetal CNE
Master node	3
Worker node	21
Storage Class	Standard
Top of Rack Switch	1

3.1 Profile Resource Requirements

The following table displays the profile resource requirements:

Table 3-2 Resource Requirements

OCNADD Service	9K NRF Profile				30K SCP Profile				15K SEPP Profile				54K Profile (SCP:30K NRF:9K SEPP:15K)			
Replication Factor = 1, 2 Message Size = 4K FEED Type = HTTP2	vC PU	Tot al Re plic a	Me mory Re qui red (Gi)	Top ic Par titi ons	vC PU	Tot al Re plic a	Me mory Re qui red (Gi)	Top ic Par titi ons	vC PU	Tot al Re plic a	Me mory Re qui red (Gi)	Top ic Par titi ons	vC PU	Tot al Re plic a	Me mory Re qui red (Gi)	Top ic Par titi ons
ocnaddconfi guration	1	1	1		1	1	1		1	1	1		1	1	1	
ocnaddalar m	1	1	1		1	1	1		1	1	1		1	1	1	
ocnaddadm in	1	1	1		1	1	1		1	1	1		1	1	1	
ocnaddheal thmonitorin g	1	1	1		1	1	1		1	1	1		1	1	1	
ocnaddback endrouter	1	1	1		1	1	1		1	1	1		1	1	1	

Table 3-2 (Cont.) Resource Requirements

OCNADD Service	9K NRF Profile				30K SCP Profile				15K SEPP Profile				54K Profile (SCP:30K NRF:9K SEPP:15K)			
ocnaddscpa ggregation					3	2	2	SCP=1 2					3	2	2	SCP=1 2 (6 part ition s in eac h inst anc e)
ocnaddnrfa ggregation	3	1	2	NRF=6									3	1	2	NRF=6 (6 part ition s in eac h inst anc e)
ocnaddsep paggregation									3	1	2	SEPP=6	3	1	2	SEPP=6 (6 part ition s in eac h inst anc e)
ocnaddada pter	3	2	3	MAIN=1 8	3	4	3	MAIN=3 6	3	2	3	MAIN=1 8	3	8	4	MAIN=7 2 (9 part ition s in eac h inst anc e)
ocnaddkafa	2	3	8		3	3	8		3	3	8		5	3	24	
zookeeper	1	3	1		1	3	1		1	3	1		1	3	2	

Table 3-2 (Cont.) Resource Requirements

OCNADD Service	9K NRF Profile				30K SCP Profile				15K SEPP Profile				54K Profile (SCP:30K NRF:9K SEPP:15K)			
ocnaddgui	2	1	1		2	1	1		2	1	1		2	1	1	

Note

- Four instances of Kafka brokers might be required when running RF=2, based on the setup performance. The end-to-end latency might increase when DISK I/O is slow.
- For DISK I/O, see [Disk Throughput Requirements](#).
- For Kafka PVC-Storage, see [Kafka PVC Storage Requirements](#)

3.2 Deployment Profiles

Default Deployment Profile

This profile can stream NFs (SCP, NRF, SEPP) data up to 15K MPS and can be scaled to handle up to 65K MPS for HTTP2 feed when *weighted_lb* is "OFF".

Replication Factor should be "1" and the incoming message size on OCNADD should be less than or equal to 3500K.

Table 3-3 Default Deployment Profile

OCNADD Service Replication Factor = 1 Message Size = 3500K FEED Type = HTTP2, Synthetic	vCPU Req	vCPU Limit	Memory Req (Gi)	Memory Limit (Gi)	Min Replica	Max Replica	Partitio ns	Topic Name
ocnaddconfiguration	1	1	1	1	1	1		
ocnaddalarm	1	1	1	1	1	1		
ocnaddadmin	1	1	1	1	1	1		
ocnaddhealthmonit oring	1	1	1	1	1	1		
ocnaddscppaggrega tion (41K)	1	2	1	2	1	2	12	SCP
ocnaddnrfaggregati on (9K)	1	2	1	2	1	1	6	NRF
ocnaddseppaggreg ation (15k)	1	2	1	2	1	1	6	SEPP
ocnaddadapter	2	3	3	4	HTTP:2 SYNTH ETIC:1	8	72	MAIN

Table 3-3 (Cont.) Default Deployment Profile

OCNADD Service Replication Factor = 1 Message Size = 3500K FEED Type = HTTP2, Synthetic	vCPU Req	vCPU Limit	Memory Req (Gi)	Memory Limit (Gi)	Min Replica	Max Replica	Partitio ns	Topic Name
ocnaddkafka	2	5	4	24	3	3		
zookeeper	1	1	1	2	3	3		
ocnaddgui	1	2	1	1	1	2		
ocnadduirouter	1	2	1	1	1	2		
ocnadd-cache	1	1	20	24	2	3		

Note

- Four instances of Kafka brokers might be required when running RF=2, based on the setup performance. The end-to-end latency might increase when DISK I/O is slow.
- For DISK I/O, see [Disk Throughput Requirements](#).
- For Kafka PVC-Storage, see [Kafka PVC Storage Requirements](#)

Deployment Profile Kafka and Aggregation

Table 3-4 Deployment Profile Kafka and Aggregation

OCNADD Service Replication Factor = 1 Message Size = 3500K FEED Type = HTTP2	vCPU Req	vCPU Limit	Memory Req (Gi)	Memory Limit (Gi)	Min Replica	Max Replica	Partitio ns	Topic Name
ocnaddscppaggregation (41K)	1	2	1	2	1	2	12	SCP
ocnaddnrffaggregation (9K)	1	2	1	2	1	1	6	NRF
ocnaddseppaggregation (15k)	1	2	1	2	1	1	6	SEPP
ocnaddkafka	2	5	4	24	3	3		
zookeeper	1	1	1	2	3	3		

Note

- Four instances of Kafka brokers might be required when running RF=2, based on the setup performance. The end-to-end latency might increase when DISK I/O is slow.
- For DISK I/O, see [Disk Throughput Requirements](#).
- For Kafka PVC-Storage, see [Kafka PVC Storage Requirements](#)

Deployment Profile Kafka and Egress Adapter**Table 3-5 Deployment Profile Kafka and Egress Adapter**

OCNADD Service Replication Factor = 1 Message Size = 3500K FEED Type = HTTP2	vCPU Req	vCPU Limit	Memory Req (Gi)	Memory Limit (Gi)	Min Replica	Max Replica	Partitio ns	Topic Name
ocnaddconfiguration	1	1	1	1	1	1		
ocnaddalarm	1	1	1	1	1	1		
ocnaddadmin	1	1	1	1	1	1		
ocnaddhealthmonitoring	1	1	1	1	1	1		
ocnaddadapter	2	3	3	4	HTTP:2 SYNTH ETIC:1	8	72	MAIN
ocnaddkafka	2	5	4	24	3	3		
zookeeper	1	1	1	2	3	3		
ocnaddgui	1	2	1	1	1	2		
ocnadduirouter	2	2	1	1	1	2		
ocnaddcache	1	1	20	24	2	3		

Note

- Four instances of Kafka brokers might be required when running RF=2, based on the setup performance. The end-to-end latency might increase when DISK I/O is slow.
- For DISK I/O, see [Disk Throughput Requirements](#).
- For Kafka PVC-Storage, see [Kafka PVC Storage Requirements](#)

3.3 Ephemeral Storage Requirements

The following table describes the Ephemeral Storage requirements for OCNADD:

Table 3-6 Ephemeral Storage Requirements

Service Name	Ephemeral Storage (min) in Mi	Ephemeral Storage (max) in Mi
<app-name>-adapter	200	800
<app-name>-gw	400	800
 Note Supported only in release 22.0.0		
ocnaddadminservice	100	200
ocnaddalarm	100	500
ocnaddhealthmonitoring	100	500
ocnaddscpaggregation	100	500
ocnaddseppaggregation	100	500
 Note Supported from release 23.1.0 onwards		
ocnaddnrfaggregation	100	500
ocnaddconfiguration	100	500

3.4 Disk Throughput Requirements

The following table describes the disk throughput requirements in OCNADD:

Table 3-7 Disk Throughput Requirements

Avg Size (in Bytes)	Rate	RF (Kafka Replication Factor)	Topic (NF+MAIN)	Consumer Feed	Total Write Throughput (MB/s)	Total Read Throughput (MB/s)	No. of Brokers	Per Broker Write Throughput (MB/s)	Per Broker Read Throughput (MB/s)	Total per Broker Throughput (MB/s) with 10% buffer	Total Disk Throughput (MB/s) for the Cluster with 10% Buffer
1941	39000	1	2	1	145	145	3	54	54	108	324
1941	39000	2	2	1	289	289	3	106	106	212	636
3769	39000	1	2	1	281	281	3	104	104	208	624
3769	39000	2	2	1	561	561	3	206	206	412	1236

Note

- The average size of OCNADD Ingress message captured in the table includes the size of metadata list + header list of original 5G HTTP2 header frame + 5G-SBI-Message.
- Currently, it is recommended to set the Replication Factor (RF) value to **1** with the assumption that the underlying storage provides data redundancy.

The disk throughput calculations are as follows:

Writes: $W * RF * T$
 Reads: $((RF * T) + C - 1) * W$
 Disk Throughput (Write + Read): $(W * RF * T) + (L * W)$
 W -> MB/sec of data that will be written
 RF -> Replication factor
 T -> No of topics to which data copied. As of now, each message will be copied into two topics.
 C -> Number of consumer groups, that is the number of readers for each write
 L -> $(RF * T) + C - 1$

Average Message in Table:

Average Message Size = $(a1b1 + a2b2 + \dots + a(n)b(n)) / (a1 + a2 + \dots + a(n))$
 a1 -> SCP MPS
 b1 -> SCP message size
 a2 -> NRF MPS
 b2 -> NRF message size
 a(n) -> NF(n) MPS
 b(n) -> NF(n) message size

Example:

Average message size for row 1 = $((1624 \times 30000) + (3000 \times 9000)) / (30000 + 9000) = 1941$ Bytes (approx)

Average message size for row 4 = $((4000 \times 30000) + (3000 \times 9000)) / (30000 + 9000) = 3769$ Bytes (approx)

The following table describes the disk throughput for SCP and NRF:

Table 3-8 SCP and NRF Disk Throughput

SCP Message		NRF Message	RF (Kafka Replication Factor)	Topic (NF+MAIN)	Consumer Feed	Total Write Throughput (MB/s)	Total Read Throughput (MB/s)	No. of Broker	Per Broker Write Throughput (MB/s)	Per Broker Read Throughput (MB/s)	Total per Broker Throughput (MB/s) with 10% buffer	Total Disk Throughput (MB/s) for Cluster with 10% Buffer	Rate
Avg Size (in Bytes)	Rate	Avg Size (in Bytes)											
1624	30000	3000	9000	1	2	1	145	145	3	54	54	108	324
1624	30000	3000	9000	2	2	1	289	289	3	106	106	212	636
4000	30000	3000	9000	1	2	1	281	281	3	104	104	208	624
4000	30000	3000	9000	2	2	1	561	561	3	206	206	412	1236

3.5 Kafka PVC Storage Requirements

The following table describes the retention period per topic for different NFs:

Table 3-9 Retention Period Per Topic

Topic Name	Retention Period
SCP	5 Minutes
NRF	5 Minutes
SEPP	5 Minutes
MAIN	6 Hours (Max)

The following calculation is for storage requirements for a topic:

! Important

For the 6 hrs storage in the MAIN topic, the storage requirement must be calculated using the following information:

Storage Requirement for a topic = MPS * Retention Period * RF * Average Message Size

Where,

MPS is "Message Per Second"

RF is "Replication Factor"

Examples:**1. Average Message Size = 1941 Bytes**

The following example uses the values from the first row of the [Table 3-8](#) table. For more information about the table, see [Disk Throughput Requirements](#):

Storage Requirement for SCP and NRF Topics = MPS * Retention Period * RF * Message Size
= 39000 * 5 Minutes * 3 * 1941

= 39000 * 5 * 60 * 3 * 1941

= ~ 63.45 GB

Storage Requirement for MAIN = MPS * Retention Period * RF * Message Size
= 39000 * 6 Hours * 3 * 1941

= 39000 * 6 * 60 * 60 * 3 * 1941

= ~ 4.46 TB

Total Storage Requirement for the Broker Cluster = Storage for SCP + Storage for NRF + Storage for MAIN

= 63.45 GB + 4.46 TB

= ~ 4.53 TB

Total Storage for each broker = (4.53/Number of Brokers) TB = (4.53/3) TB
= ~ 1.51 TB [Assuming 3 Broker cluster]

2. Average Message Size = 3769 Bytes

The following example uses the values from the fourth row of the [Table 3-8](#) table. For more information about the table, see [Disk Throughput Requirements](#):

Storage Requirement for SCP and NRF Topics = MPS * Retention Period * RF * Message Size
= 39000 * 5 Minutes * 3 * 3769

= 39000 * 5 * 60 * 3 * 3769

= ~ 123.20 GB

Storage Requirement for MAIN = MPS * Retention Period * RF * Message Size
= 39000 * 6 Hours * 3 * 3769

$$= 39000 * 6 * 60 * 60 * 3 * 3769$$

$$= \sim 8.66 \text{ TB}$$

Total Storage Requirement for the Broker Cluster = Storage for SCP +
Storage for NRF + Storage for MAIN

$$= 123.20 \text{ GB} + 8.66 \text{ TB}$$

$$= \sim 8.79 \text{ TB}$$

Total Storage for each broker = (8.79/Number of Brokers) TB = (8.79/3) TB
= ~ 2.93 TB [Assuming 3 Broker cluster]

OCNADD Benchmarking Testing

This section describes the performance testing scenarios and results for the Message Feed functionality provided by Oracle Communications Network Analytics Data Director. The message feed feature is tested with SCP, NRF, and SEPP as the source of the message feed. The performance benchmarking test is performed on OCNADD with 54K MPS feed which includes 30K MPS SCP traffic (15K TPS with 2 trigger points), 9K MPS NRF traffic (4.5K TPS with 2 trigger points) and 15K MPS SEPP traffic (7.5K TPS with 2 trigger points). The benchmarking results are provided in the subsequent sections of this chapter.

Benchmark Test Environment

The test environment specifications are listed below:

- Call Rate: 54K MPS
- The latency, resource utilization, and MPS is observed for the period of 12 hrs or more.
- OCNADD single site deployment with ASM disabled
- OCNADD Release 23.1.0 deployed over CNE (Bare metal) 22.3.0 version
- OCNADD Replication Factor (RF): 1
- OCNADD Data Feed: HTTP2/TLS
- OCNADD Kafka PVC: 300GB
For more information about PVC requirements, see [Kafka PVC Storage Requirements](#).
- 3rd Party Application: 1 Perfgo Server with 2 End-points
- cnDBTier Release 23.1.0
- NRF Release 23.1.0
- SCP Release 23.1.0
- SEPP Release 23.1.0
- SASL/SSL, enabled between NRF/SCP/SEPP and OCNADD
- CNCC Release 23.1.0
- Message Size: 3638 Bytes
- Environment: CNE (Bare metal)

Benchmark Testcase Specifications

The testcase parameters are as follows:

- **OCNADD**
 - A feed is configured using the OCNADD Console with aggregation rules set for SCP, NRF and SEPP.
 - Message Ingestion Rate: 54K MPS

Resource Specifications:

Table 4-1 OCNADD Resource Specifications

Services	CPU Request Per Pod	CPU Limit Per Pod	Memory Request Per Pod (Gi)	Memory Limit Per Pod (Gi)	min Replicas	max Replicas	Partitions / Retention
ocnaddconfiguration	1	1	1	1	1	1	
ocnaddalarm	1	1	1	1	1	1	
ocnaddadmin	1	1	1	1	1	1	
ocnaddhealthmonitoring	1	1	1	1	1	1	
ocnaddbackendrouter	1	1	1	1	1	1	
ocnaddscppaggregation (30K)	3	3	2	2	2	3	12 (SCP)/ retention. ms=300000 (Configurable during topic creation)
ocnaddnrffaggregation (10K)	3	3	2	2	1	1	6 (NRF)/ retention. ms=300000 (Configurable during topic creation)
ocnaddseppaggregation (10K)	3	3	2	2	1	1	6 (SEPP)/ retention. ms=300000 (Configurable during topic creation)
ocnaddadapter	3	3	4	4	8	8	72 (MAIN)/ retention. ms=300000 (Configurable during topic creation)
ocnaddkafka	5	5	30	30	3	3	
zookeeper	1	1	2	2	3	3	
ocnaddgui	2	2	1	1	1	1	

- **SCP**
SCP Traffic: 15K TPS using two trigger points.

- **NRF**
NRF Traffic: 4.5K TPS using two trigger points.
- **SEPP**
SEPP Traffic: 7.5K TPS using two trigger points.

Benchmark Test Results

Traffic Feed Details

Table 4-2 Traffic Feed Details

NF	Traffic Feed Configuration	Traffic	Duration in hours	Average Latency	E2E Traffic Feed Success Rate
OCNADD	NA	54K MPS	12	2.66 ms	99.95%
NRF	2 - IGW/EGW	9K MPS	12		99.95%
SCP	2 - Request Ingress/ Request Egress	30K MPS	12		99.93%
SEPP	2 - PLMN IGW	15K MPS	12		99.98%

CPU and Memory Utilization

The following table describes the OCNADD CPU and memory utilization:

Table 4-3 OCNADD CPU and Memory Utilization

Microservice/ Container	Pod Count	CPU Utilization (%)	Memory Utilization (%)
ocnaddadapter	8	65.05	43.5
ocnaddkafka	3	87.73	36.93
ocnaddadmin	1	0.12	27.5
ocnaddalarm	1	0.11	31.7
ocnaddbackendrouter	1	0.06	19.5
ocnaddconfiguration	1	0.09	31.3
ocnaddhealthmonitoring	1	0.15	29
ocnaddgui	1	0.03	4.5
ocnaddnrfaggregation (9K)	1	43.7	44.6
ocnaddscpaggregation (30K)	2	40.3	55.3
ocnaddseppaggregation (15K)	1	45.1	51.8
zookeeper	3	0.14	15.13