Oracle® Communications

Network Analytics Data Director Benchmarking Guide

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Oracle Communications Network Analytics Data Director Benchmarking Guide, Release 22.0.0

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Contents

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Acronyms

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

Table Acronyms

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

What's New in This Guide

This section lists the documentation updates for Release 22.0.0 in *Oracle Communications Network Analytics Data Director Benchmarking Guide*.

Release 22.0.0 - F74205-02, January 2023

Cosmetic updates have been made to the document.

Release 22.0.0 - F74205-01, November 2022

This is the first release of the document.

1 Introduction

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

OCNADD receives the network traffic data from various sources, 5G network functions (NFs), Non-5G NFs, or third-party producers. It 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.

Purpose and Scope

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

References

For more information about OCNADD, see the following documents:

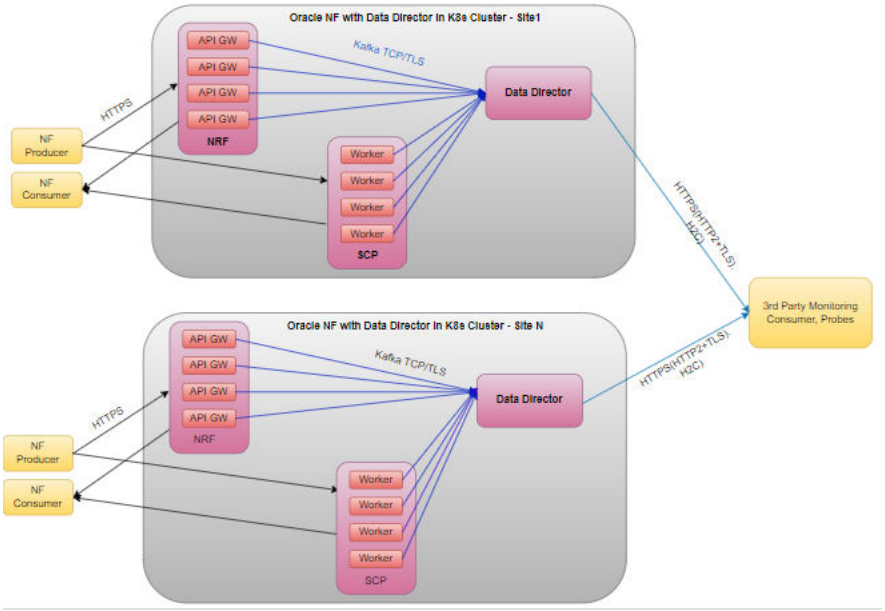
- *Oracle Communications Network Analytics Data Director Installation Guide*
- *Oracle Communications Network Analytics Data Director User Guide*

2
Deployment

OCNADD supports OCCNE 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 Guide*.

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

Figure 2-1 OCNADD Deployment



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 all the profiles (10K, 20K, 40K) 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	7
Storage Class	Standard

Resource Requirements for 10K MPS (Default Profile)

The following table describes the resource requirements for 10K MPS:

> **Note:**
>
> This is the default resource requirement for the OCNADD deployment.

Table 3-2 Resource Requirements for 10K MPS

OCNADD Service	vCPU Req	vCPU Limit	Memory Req(Gi)	Memory Limit (Gi)	Min Replica	Max Replica	Partitions	Topic Name
ocnaddconfiguration	1	2	1	2	1	1		
ocnaddalarm	1	2	1	2	1	1		
ocnaddadmin	1	1	1	1	1	1		
ocnaddhealthmonitoring	1	2	1	2	1	1		
ocnaddbackendrouter	1	2	1	2	1	1		
ocnaddscpaggregation	3	3	4	4	1	2	3	SCP

Table 3-2 (Cont.) Resource Requirements for 10K MPS

OCNADD Service	vCPU Req	vCPU Limit	Memory Req(Gi)	Memory Limit (Gi)	Min Replica	Max Replica	Partitions	Topic Name
ocnaddnrfaggregation	3	3	4	4	1	2	3	NRF
ocnaddadapter	2.5	2.5	8	8	3	5	6	MAIN
ocnaddegressgateway	4	4	8	8	2	3		
ocnaddkafka	4	4	24	24	3	3		
zookeeper	1	2	2	2	3	3		

Note:

- For DISK I/O, see Disk Throughput Requirements.
- For Kafka PVC Storage, see Kafka PVC Storage Requirements
- For information on customizing OCNADD, see *Oracle Communications Network Analytics Data Director Installation Guide*.

Resource Requirements for 20K MPS

Ther following table describes the resource requirements for 20K MPS:

Table 3-3 Resource Requirements for 20K MPS

OCNADD Service	vCPU Req	vCPU Limit	Memory Req(Gi)	Memory Limit (Gi)	Min Replica	Max Replica	Partitions	Topic Name
ocnaddconfiguration	1	2	1	2	1	1		
ocnaddalarm	1	2	1	2	1	1		
ocnaddadmin	1	2	1	2	1	1		
ocnaddhealthmonitoring	1	2	1	2	1	1		
ocnaddbackendrouter	1	2	1	2	1	1		

Table 3-3 (Cont.) Resource Requirements for 20K MPS

OCNADD Service	vCPU Req	vCPU Limit	Memory Req(Gi)	Memory Limit (Gi)	Min Replica	Max Replica	Partitions	Topic Name
ocnaddscpaggregation	3	3	4	4	2	2	6	SCP
ocnaddnrfaggregation	3	3	4	4	1	2	3	NRF
ocnaddadapter	3	3	8	8	6	9	9	MAIN
ocnaddegressgateway	4	4	8	8	4	6		
ocnaddkafka	4	4	24	24	3	3		
zookeeper	1	2	2	2	3	3		

Note:

- For DISK I/O, see Disk Throughput Requirements.
- For Kafka PVC Storage, see Kafka PVC Storage Requirements
- For information on customizing OCNADD, see *Oracle Communications Network Analytics Data Director Installation Guide*.

Resource Requirements for 40K MPS

Ther following table describes the resource requirements for 40K MPS:

Table 3-4 Resource Requirements for 40K MPS

OCNADD Service	vCPU Req	vCPU Limit	Memory Req(Gi)	Memory Limit (Gi)	Min Replica	Max Replica	Partitions	Topic Name
ocnaddconfiguration	1	2	1	2	1	1		
ocnaddalarm	1	2	1	2	1	1		
ocnaddadmin	1	1	1	1	1	1		
ocnaddhealthmonitoring	1	2	1	2	1	1		

Table 3-4 (Cont.) Resource Requirements for 40K MPS

OCNADD Service	vCPU Req	vCPU Limit	Memory Req(Gi)	Memory Limit (Gi)	Min Replica	Max Replica	Partitions	Topic Name
ocnaddbackendrouter	1	2	1	2	1	1		
ocnaddscpaggregation (30K)	3	3	2	4	2	3	6	SCP
ocnaddnrfaggregation (10K)	3	3	2	4	1	2	3	NRF
ocnaddadapter	3	3	8	8	9	11	12	MAIN
ocnaddegressgateway	6	6	8	8	6	9		
ocnaddkafka	6	6	48	48	3	3		
zookeeper	1	2	1	2	3	3		

Note:

- For DISK I/O, see Disk Throughput Requirements.
- For Kafka PVC Storage, see Kafka PVC Storage Requirements
- For information on customizing OCNADD, see *Oracle Communications Network Analytics Data Director Installation Guide*.

Ephemeral Storage Requirements

The following table describes the Ephemeral Storage requirements for OCNADD:

Note:

The Ephemeral Storage requirements remain same for 10K, 20K, and 40K MPS profiles.

Table 3-5 Ephemeral Storage Requirements

Service Name	Ephemeral Storage (min) in Mi	Ephemeral Storage (max) in Mi
<app-name>-adapter	200	800

Table 3-5 (Cont.) Ephemeral Storage Requirements

Service Name	Ephemeral Storage (min) in Mi	Ephemeral Storage (max) in Mi
<app-name>-gw	400	800
ocnaddadminservice	100	200
ocnaddalarm	100	500
ocnaddhealthmonitoring	100	500
ocnaddscpaggregation	100	500
ocnaddnrfaggregation	100	500
ocnaddconfiguration	100	500

Disk Throughput Requirements

The following table describes the disk throughput requirements in OCNADD:

Table 3-6 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 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 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`.
- For OCNADD 22.0.0, 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+..+a(n)b(n))/(a1+a2+..+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*30000)+(3000*9000))/(30000+9000) = 1941 Bytes (approx)

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

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

Table 3-7 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	
Avg Size (in Bytes)	Rate	Avg Size (in Bytes)											Rate
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

Table 3-7 (Cont.) 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	
Avg Size (in Bytes)	Rate	Avg Size (in Bytes)											Rate
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

Kafka PVC Storage Requirements

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

Table 3-8 Retention Period Per Topic

Topic Name	Retention Period
SCP	5 Minutes
NRF	5 Minutes
MAIN	6 Hours

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 explanation.

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

Where,

MPS: Message Per Second

RF: Replication Factor

Examples:

1. **Average Message Size = 1941 Bytes**
   The following example uses the values from the first row of the Table 3-7 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 3-7 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

                   = ~ 8.66 TB
Total Storage Requirement for the Broker Cluster = Storage for SCP
+ Storage for NRF + Storage for MAIN

                   = 123.20 GB + 8.66 TB

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

4
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 and NRF as the source of the message feed and the benchmarking results are provided in the subsequent sections of this chapter.

Benchmark Test Environment

The deployment specifications for all the NFs are as follows:

- OCNADD Release 22.0.0 deployed over TANZU platform
- OCNADD Replication Factor (RF): 1
- OCNADD Data Feed: HTTP2 (secured and unsecured)
- OCNADD Kafka PVC: 200GB
  For more information about PVC requirements, see Kafka PVC Storage Requirements.
- 3rd Party Application: 1 Perfgo Server with 2 End-points
- cnDBTier Release 22.3.0
- NRF Release 22.4.0

> **Note:**
>
> The Ingress Gateway and Egress Gateway message copy feature must be enabled and the gzip functionality must be disabled in NRF.

- SCP Release 22.4.0
- Environment: VMWare TANZU Platform

Benchmark Testcase Specifications

The testcase parameters are as follows:

> **Note:**
>
> 1.

- **OCNADD**
  - A feed is configured using the OCNADD Console with aggregation rule set to both SCP and NRF2.
  - Ingress Message ingestion rate was 29K MPS, where 20K MPS was coming from SCP and 9K MPS was coming from NRF3.

- The latency, resource utilization, and MPS is observed for the period of 12 hrs or more.
- Message Ingestion Rate: 29K 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	2	1	2	1	1	
ocnaddalarm	1	2	1	2	1	1	
ocnaddadmin	1	1	1	1	1	1	
ocnaddhealthmonitoring	1	2	1	2	1	1	
ocnaddbackendrouter	1	2	1	2	1	1	
ocnaddscpaggregation (30K)	3	3	2	4	2	3	6 (SCP)/ retention.ms=300000 (Configurable during topic creation)
ocnaddnrfaggregation (10K)	3	3	2	4	1	2	3 (NRF)/ retention.ms=300000 (Configurable during topic creation)
ocnaddadapter	3	3	8	8	10	11	12 (MAIN)/ retention.ms=300000 (Configurable during topic creation)

Table 4-1 (Cont.) 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
ocnaddegressgateway	6	6	8	8	6	9	
ocnaddkafka	6	6	48	48	3	3	
zookeeper	1	2	1	2	3	3	

- **SCP**
  SCP Traffic: 20K MPS ingested using two trigger points.
- **NRF**
  NRF Traffic: 9K MPS ingested 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	29K MPS	12	3.25ms	99.95%
NRF	2 - IGW/EGW	9K MPS	12		99.98%
SCP	2 - Request Ingress/ Request Egress	20K MPS	12		99.94%

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	10	27.06	52.81
ocnaddegressgateway	6	52.18	30.89
ocnaddkafka	3	38.82	13.08
ocnaddadmin	1	0.10	24.32
ocnaddalarm	1	0.05	18.16
ocnaddbackendrouter	1	0.05	13.28
ocnaddconfiguration	1	0.05	21.00
ocnaddhealthmonitoring	1	0.10	17.58

Table 4-3 (Cont.) OCNADD CPU and Memory Utilization

Microservice/ Container	Pod Count	CPU Utilization (%)	Memory Utilization (%)
ocnaddnrfaggregation (10K)	1	38.57	29.44
ocnaddscpaggregation (30K)	2	40.17	32.51
zookeeper	3	0.10	46.58