Oracle® Communications

Cloud Native Core, Security Edge Protection Proxy Benchmarking Guide

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Preface

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The following text conventions are used in this document:

Convention	Meaning
boldface	Boldface type indicates graphical user interface elements associated with an action, or terms defined in text or the glossary.
italic	Italic type indicates book titles, emphasis, or placeholder variables for which you supply particular values.
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Acronyms

The following table lists the acronyms and the terminologies used in the document:

Table Acronyms and Terminologies

Acronym	Description
Cat-0	Category 0 SBI Message Schema Validation Feature
Cat-1	Category 1 Service API Validation Feature
Cat-2	Category 2 Network ID Validation Feature
Cat-3	Category 3 Previous Location Check/ Category 3 Time location check
CNC Console	Oracle Communications Cloud Native Configuration Console
CRD	Custom Resource Definition
CNE	Oracle Communications Cloud Native Environment
cSEPP/C-SEPP	Consumer Security Edge Protection Proxy
DB	Database
DNS	Domain Name System
DRL	Drools Rule Language
EGW	Egress Gateway
FQDN	Fully Qualified Domain Name
GSMA	Groupe Speciale Mobile Association (GSMA). Represents the interests of mobile operators and the broader mobile industry worldwide.
Hosted SEPP	Hosted SEPP functionality provides selective routing in Roaming Hub Mode
IGW	Ingress Gateway
IPX	Internetwork Packet Exchange
K8s	Kubernetes
Local PLMN	PLMN managed by Local SEPP
Local SEPP	SEPP in Local PLMN
MNO	Mobile Network Operator
NDB	Network Database
NF	Network Function
Network Function	A functional building block within a network infrastructure, which has well defined external interfaces and well defined functional behavior. In practical terms, a network function is often a network node or physical appliance.
NF Consumer	A generic way to refer to an NF which consumes services provided by another NF. Example: An AMF acts as a Consumer NF that consumes AMPolicy services provided by the PCF.
NF Instance	A specific instance of a network function type.
NF Producer or NF Provider	A generic way to refer to an NF which provides services that can be consumed by another NF. Example: A PCF acts as a Producer NF that provides AMPolicy Services to the AMF.
NRF	Oracle Communications Cloud Native Core, Network Repository Function
OHC	Oracle Help Center
OSDC	Oracle Software Delivery Cloud
PDB	PodDisruptionBudget

Table (Cont.) Acronyms and Terminologies

Acronym	Description
PLMN	Public Land Mobile Network
pSEPP/P-SEPP	Producer Security Edge Protection Proxy
Remote PLMN	PLMN managed by Remote SEPP
Remote SEPP	SEPP in Remote PLMN
Remote SEPP Set	Set of Remote SEPPs to allow alternate routing across Remote SEPPs
REST API	Representational State Transfer Application Programming Interface
Roaming Hub	Roaming Hub is the deployment mode of SEPP. Roaming Hub is used as an intermediate proxy. Each SEPP connects to the Roaming Hub which further connect to another SEPP. All the Remote SEPPs can communicate with each other through roaming hub.
Scaling	Ability to dynamically extend or reduce resources granted to the Virtual Network Function (VNF) as needed. This includes scaling out and in or scaling up and down.
SCM	Security Coutermeasure
SEPP	Oracle Communications Cloud Native Core, Security Edge Protection Proxy
SUCI	Subscription Concealed Identifier
SUPI	Subscription Permanent Identifier
SVC	Service
TLS	Transport Layer Security
TH	Topology Hiding
TUH	Topology Unhiding
TPS	Transactions Per Second
UE	User Equipment
UDR	Oracle Communications Cloud Native Core, Unified Data Repository

What's New in This Guide

This section introduces the documentation updates for Release 25.2.2xx.

Release 25.2.200 - G55480-01, April 2026

Added the following test scenario:

- Test Scenario 1: SEPP 40K MPS, 72 Hrs Run with Features Enabled with 50ms Delay at Server End

1 Overview

Security Edge Protection Proxy (SEPP) is a key component of the 5G Service Based Architecture. It is a proxy Network Function (NF) which is used for the secured communication for inter Public Land Mobile Network (PLMN) messages.

For more information about the SEPP architecture, see *Oracle Communications Cloud Native Core, Security Edge Protection Proxy User Guide*.

The user can install either SEPP or Roaming Hub/Hosted SEPP.

> **Note**
>
> The performance and capacity of the SEPP system may vary based on the call model, Feature/Interface configuration, and underlying CNE and hardware environment.

1.1 Purpose and Scope

This document is designed to help operators measure the capacity and performance of SEPP, SEPP microservices, and deployment environment setup software such as Cloud Native Environment (CNE) and cnDBTier.

This document provides SEPP performance and capacity data. It is recommended that SEPP is run through a benchmark on the target cloud native infrastructure to determine the capacity and performance in the target infrastructure. This information can be used to adjust the initial deployment resources and to help predict resource requirements when SEPP is scaled up.

1.2 References

For more information on Security Edge Protection Proxy (SEPP), refer to the following documents:

- *Oracle Communications Cloud Native Core, Security Edge Protection Proxy Installation, Upgrade, and Fault Recovery Guide*
- *Oracle Communications Cloud Native Core, Security Edge Protection Proxy User Guide*
- *Oracle Communications Cloud Native Core, Security Edge Protection Proxy REST Specification Guide*
- *Oracle Communications Cloud Native Core, Security Edge Protection Proxy Troubleshooting Guide*
- *Oracle Communications Cloud Native Core, cnDBTier Installation, Upgrade, and Fault Recovery Guide*
- *Oracle Communications Cloud Native Core, cnDBTier User Guide*

2
Deployment Environment

This section provides information about the cloud native infrastructure used for SEPP benchmarking.

The following diagram represents the deployment configurations of SEPP:

Figure 2-1 Deployment Diagram

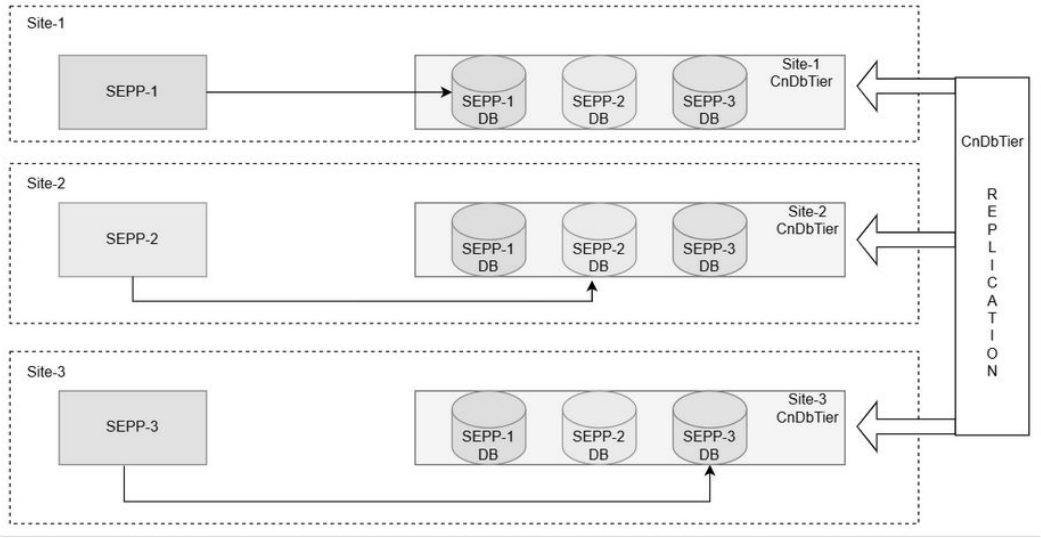
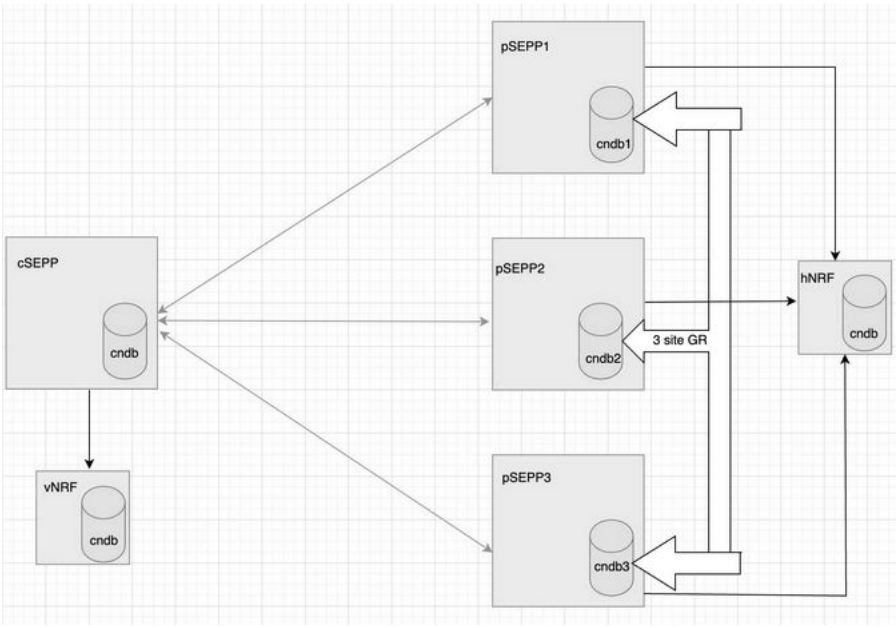


Figure 2-2 Deployment Diagram



The details about the deployment configurations are as follows:

3-Site GR Setup Traffic Distribution Overview

The 3-Site GR (Geo-Replication) setup includes one CSEPP and three PSEPPs:

- CSEPP and PSEPP1 are fully deployed and operational.
- PSEPP2 and PSEPP3 are partially deployed, each with 3 pods running the following components:
  - cn32f
  - pn32f
  - plmn-ingress-gateway (PLMN Ingress Gateway)
  - plmn-egress-gateway (PLMN Egress Gateway)
  - n32-ingress-gateway (N32 Ingress Gateway)
  - n32-egress-gateway (N32 Egress Gateway)

Traffic Distribution
The total traffic handled by this setup is 40K MPS (Messages Per Second). Currently, the traffic distribution between the CSEPP and PSEPPs is uneven. Below are the details of how the traffic is routed and distributed:

Outbound Traffic (CSEPP → PSEPPs)

- **CSEPP → PSEPP1**: 80% of the traffic is routed to PSEPP1.
- **CSEPP → PSEPP2**: 10% of the traffic is routed to PSEPP2.
- **CSEPP → PSEPP3**: 10% of the traffic is routed to PSEPP3.

Inbound Traffic (PSEPPs → CSEPP)

- **PSEPP1 → CSEPP**: 75% of the inbound traffic is sent from PSEPP1 to CSEPP.
- **PSEPP2 → CSEPP**: 12.5% of the inbound traffic is sent from PSEPP2 to CSEPP.
- **PSEPP3 → CSEPP**: 12.5% of the inbound traffic is sent from PSEPP3 to CSEPP.

2.1 Overall Summary of Benchmarking Configurations

The following table lists the overall summary of benchmarking configurations.

Overall Summary

Table 2-1 Overall Summary

S. No.	Execution Time	SEPP Release	CNC Console Release	cnDB Tier Release	ASM Enabled/ Disabled	OSO(Yes/No)	HA Proxy Installed	Cluster	Site-1 csepp MPS	Site-2 (psepp1+psepp2+psepp3) MPS	Overall MPS	Network Delay on server side	Features Enabled
Run1	72 Hr	25.2.200	25.2.200	25.2.200	Disabled	Yes	NA	Hardhead1	20K	20K	40K	50 ms	• Topology Hiding • Security Counter Measure features: – Cat-0 SBI Message Schema Validation Feature – Cat-1 NRF Service API Query Parameters Validation – Cat-1 Service API Validation Feature – Cat -2 Network ID Validation Feature – Cat-3 Previous Location Check Feature – Cat-3 Time Check for Roaming Subscribers • Overload Control • 5G SBI Message Mediation Support • Steering of Roaming (SOR) Feature • Global Rate Limiting on Ingress Gateway of SEPP • Alternate Routing and Load Sharing based on the DNS SRV Record for Home Network Functions. • LCI and OCI Header feature • NRF Auto route feature

3 SEPP Benchmark Testing

This section provides information about the SEPP testcases run in different scenarios.

3.1 Test Scenario 1: SEPP 40K MPS, 72 Hrs Run with Features Enabled with 50ms Delay at Server End

This test scenario describes the performance and capacity of SEPP and provides the benchmarking results for 40K MPS, 72 hours run with the following SEPP features enabled with 50ms delay at the server end:

- Topology Hiding
- Security Counter Measure features:
  - Cat-0 SBI Message Schema Validation Feature
  - Cat-1 NRF Service API Query Parameters Validation
  - Cat-1 Service API Validation Feature
  - Cat -2 Network ID Validation Feature
  - Cat-3 Previous Location Check Feature
  - Cat-3 Time Check for Roaming Subscribers
- Overload Control
- 5G SBI Message Mediation Support
- Steering of Roaming (SOR) Feature
- Global Rate Limiting on Ingress Gateway of SEPP
- Alternate Routing and Load Sharing based on the DNS SRV Record for Home Network Functions
- LCI and OCI Header feature
- NRF Autoroute Feature

> **Note**
>
> ASM is not enabled in this test case scenario.

3.1.1 Testcase and Setup Details

Following are the testcase and setup details:

Traffic Model Details

Table 3-1 Transactions Per Second (TPS)

Total TPS	Site 1	Site 2
40K MPS	20K MPS	20K MPS

Setup Details

Table 3-2 Setup Details

Setup Details	Values
Active User	NA for SEPP
Execution Time	72 Hrs
Environment	vCNE
Cluster	Hardhead1
cnDBTier	25.2.200
cSEPP	25.2.200
pSEPP	25.2.200
CNC Console	25.2.200
Setup Configuration	• Both SEPPs are deployed on Model-B. • cnDBTier is deployed on both sites.
List of SEPP Features enabled	• Topology Hiding • Security Counter Measure features: – Cat-0 SBI Message Schema Validation Feature – Cat-1 NRF Service API Query Parameters Validation – Cat-1 Service API Validation Feature – Cat -2 Network ID Validation Feature – Cat-3 Previous Location Check Feature – Cat-3 Time Check for Roaming Subscribers • Overload Control • 5G SBI Message Mediation Support • Steering of Roaming (SOR) Feature • Global Rate Limiting on Ingress Gateway of SEPP • Alternate Routing and Load Sharing based on the DNS SRV Record for Home Network Functions • LCI and OCI Header feature • NRF Autoroute Feature

Resource Footprint

Table 3-3 Resource Footprint

App/ Container	Site-1		Site-2	Site-3		
	CPU	Memory	CPU	Memory	CPU	Memory
ocsepp-alternate-route/ alternate-route	0.006 (0.15%)	1.387 (17.33%)	0.005 (0.12%)	0.741 (9.27%)	0.006 (0.15%)	1.062 (13.27%)
ocsepp-appinfo/ appinfo	0.053 (2.65%)	0.546 (13.65%)	0.043 (2.15%)	0.558 (13.94%)	0.050 (2.50%)	0.542 (13.55%)
ocsepp-cn32c-svc/ cn32c-svc	0.008 (0.20%)	0.845 (21.12%)	0.010 (0.25%)	0.837 (20.92%)	0.011 (0.27%)	0.801 (20.02%)
ocsepp-cn32f-svc/ cn32f-svc	9.211 (26.32%)	9.625 (17.19%)	1.882 (12.55%)	2.763 (11.51%)	1.905 (12.70%)	2.813 (11.72%)
ocsepp-coherence-svc/ coherence-svc	0.099 (2.48%)	0.807 (20.17%)	0.128 (3.20%)	0.806 (20.14%)	0.072 (1.80%)	0.844 (21.09%)
ocsepp-config-mgr-svc/config-mgr-svc	0.012 (0.60%)	0.675 (33.74%)	0.009 (0.45%)	0.595 (29.74%)	0.008 (0.40%)	0.620 (31.01%)
ocsepp-n32-egress-gateway/n32-egress-gateway	9.224 (26.35%)	19.276 (55.08%)	1.782 (11.88%)	7.080 (47.20%)	2.005 (13.37%)	6.917 (46.11%)
ocsepp-n32-ingress-gateway/n32-ingress-gateway	5.800 (13.81%)	17.209 (49.17%)	4.523 (25.13%)	8.792 (58.61%)	4.621 (25.67%)	9.493 (63.29%)
ocsepp-nf-mediation/nf-mediation	0.306 (1.91%)	0.575 (3.59%)	0.130 (0.81%)	0.601 (3.75%)	0.134 (0.84%)	0.591 (3.69%)
ocsepp-ocpm-config/ config-server	0.004 (0.20%)	0.665 (33.25%)	0.004 (0.20%)	0.644 (32.18%)	0.004 (0.20%)	0.638 (31.88%)
ocsepp-performance/ perf-info	0.068 (1.70%)	0.263 (3.28%)	0.042 (1.05%)	0.262 (3.27%)	0.028 (0.70%)	0.261 (3.26%)
ocsepp-plmn-egress-gateway/ plmn-egress-gateway	5.225 (14.93%)	19.030 (54.37%)	4.374 (29.16%)	9.991 (66.61%)	4.298 (28.65%)	10.038 (66.92%)

Table 3-3 (Cont.) Resource Footprint

App/ Container	Site-1		Site-2	Site-3		
	CPU	Memory	CPU	Memory	CPU	Memory
ocsepp-plmn-ingress-gateway/ plmn-ingress-gateway	9.687 (27.68%)	19.276 (55.08%)	2.287 (15.25%)	7.357 (49.05%)	1.810 (12.07%)	7.370 (49.13%)
ocsepp-pn32c-svc/ pn32c-svc	0.009 (0.22%)	0.875 (21.88%)	0.008 (0.20%)	0.811 (20.26%)	0.008 (0.20%)	0.959 (23.97%)
ocsepp-pn32f-svc/ pn32f-svc	5.151 (14.72%)	8.717 (15.57%)	4.873 (32.49%)	4.770 (19.87%)	4.582 (30.55%)	4.993 (20.80%)
ocsepp-sepp-nrf-client-nfdiscovery/ nrf-client-nfdiscovery	0.007 (0.18%)	1.026 (25.66%)	0.007 (0.18%)	1.001 (25.02%)	0.018 (0.45%)	1.009 (25.22%)
ocsepp-sepp-nrf-client-nfmanagement/nrf-client-nfmanagement	0.008 (0.20%)	1.082 (27.05%)	0.026 (0.65%)	1.075 (26.88%)	0.010 (0.25%)	1.076 (26.90%)
TOTAL CPU/MEM USAGE	44.878	101.879	20.133	48.684	19.570	50.027

Note

- Mi- Megabytes
- Gi- Gigabytes
- m- millicores
- CPU Resource per container without unit is represented in cores

3.1.2 Traffic and Latency

The following tables describe the traffic and latency details:

Traffic Details

Table 3-4 Traffic Details

TPS	Site 1	Site 2	Site 3
PLMN-IGW-requests-rate	8468.683	1499.967	1472.633
CN32F-requests-rate	7755.933	1292.583	1292.600
N32-IGW-requests-rate	3476.700	3473.800	3475.417
N32-EGW-requests-rate	7756.100	1293.533	1292.317
PN32F-requests-rate	3174.883	3173.333	3173.850
PLMN-EGW-requests-rate	3880.850	3878.467	3878.550
Total TPS	5752.167	2435.167	2430.833

Latency Details

Table 3-5 Latency Details

NF Service Latency(In MilliSecond)	Site 1	Site 2	Site 3
Ingress Gateway(s)	0.056	0.056	0.056
Egress Gateway(s)	0.059	0.058	0.059
cn32f(s)	0.031	0.031	0.031
pn32f(s)	0.026	0.026	0.026

3.1.3 Results

The results are:

- **csepp_call success rate:** 99.801% (Failures are attributed as follows: 0.164% due to Global PLMN ingress rate limiting with a 428 error code, 0.032% due to a 406 error code related to Cat-3, 0.001% due to a 408 error code (timeout), and 0.001% due to a 404 error code.)
- **psepp_call success rate:** 99.951% (Failures are attributed as follows: 0.048% due to a 406 error code related to Cat-3.)
- **psepp2_call success rate:** 99.944% (Failures are attributed as follows: 0.055% due to a 406 error code related to Cat-3, and 0.001% due to a 404 error code.)
- **psepp3_call success rate:** 99.944% (Failures are attributed as follows: 0.055% due to a 406 error code related to Cat-3, and 0.001% due to a 404 error code.)
- **csepp_Avg_Latency_rate:** 64.778 ms
- **psepp1_Avg_Latency_rate:** 64.089 ms
- **psepp2_Avg_Latency_rate:** 63.986 ms
- **psepp3_Avg_Latency_rate:** 63.953 ms
- No pod restarts are observed
- Run with 50ms server delay
- Features enabled:
  - Topology Hiding

- Security Counter Measure features:
  - Cat-0 SBI Message Schema Validation Feature
  - Cat-1 NRF Service API Query Parameters Validation
  - Cat-1 Service API Validation Feature
  - Cat -2 Network ID Validation Feature
  - Cat-3 Previous Location Check Feature
  - Cat-3 Time Check for Roaming Subscribers
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