

Copyright © 2022, Oracle and/or its affiliates.

Disclaimer

This document contains proprietary information and is protected by copyright and other intellectual property laws. The document may not be modified or altered in any way. Except where your use constitutes "fair use" under copyright law, you may not use, share, download, upload, copy, print, display, perform, reproduce, publish, license, post, transmit, or distribute this document in whole or in part without the express authorization of Oracle.

The information contained in this document is subject to change without notice and is not warranted to be error-free. If you find any errors, please report them to us in writing.

Restricted Rights Notice

If this documentation is delivered to the United States Government or anyone using the documentation on behalf of the United States Government, the following notice is applicable:

U.S. GOVERNMENT END USERS: Oracle programs (including any operating system, integrated software, any programs embedded, installed or activated on delivered hardware, and modifications of such programs) and Oracle computer documentation or other Oracle data delivered to or accessed by U.S. Government end users are "commercial computer software" or "commercial computer software documentation" pursuant to the applicable Federal Acquisition Regulation and agency-specific supplemental regulations. As such, the use, reproduction, duplication, release, display, disclosure, modification, preparation of derivative works, and/or adaptation of i) Oracle programs (including any operating system, integrated software, any programs embedded, installed or activated on delivered hardware, and modifications of such programs), ii) Oracle computer documentation and/or iii) other Oracle data, is subject to the rights and limitations specified in the license contained in the applicable contract. The terms governing the U.S. Government's use of Oracle cloud services are defined by the applicable contract for such services. No other rights are granted to the U.S. Government.

Trademark Notice

Oracle and Java are registered trademarks of Oracle and/or its affiliates. Other names may be trademarks of their respective owners.

Intel and Intel Inside are trademarks or registered trademarks of Intel Corporation. All SPARC trademarks are used under license and are trademarks or registered trademarks of SPARC International, Inc. AMD, Epyc, and the AMD logo are trademarks or registered trademarks of Advanced Micro Devices. UNIX is a registered trademark of The Open Group.

Third-Party Content, Products, and Services Disclaimer

This documentation may provide access to or information about content, products, and services from third parties. Oracle Corporation and its affiliates are not responsible for and expressly disclaim all warranties of any kind with respect to third-party content, products, and services unless otherwise set forth in an applicable agreement between you and Oracle. Oracle Corporation and its affiliates will not be responsible for any loss, costs, or damages incurred due to your access to or use of third-party content, products, or services, except as set forth in an applicable agreement between you and Oracle.

Table of Contents

Cloud Native Fundamentals	17
Cloud Native Overview	18
What is Cloud Native?	19
Why Cloud Native?	24
Cloud-Native, Cloud-Enabled, and Cloud-Based Applications	25
Cloud-Native, Cloud-Enabled, and Cloud-Based Applications	26
Cloud-Native Versus Cloud-Based Applications	2 7
Key pillars of Cloud Native Development	28
What is CNCF?	29
Key pillars of Cloud Native Development	31
Cloud Native Services for OCI	32
Benefits and Challenges of Cloud Native Development	33
Benefits of Cloud Native Development	34
Challenges of Cloud Native Development	35
Microservices Architecture: Overview	36
OCI DevOps Journey	37
What are microservices?	38
Microservice Architecture: Sample E-Commerce Application	39
Microservices Versus Mnolithic Architectures	
Communication Mechanism in a Microservices Architecture	
Design Methodology of Microservices	43
12-Factor Methodology for Developing Microservices-based Applications	
Microservices Designs: Benefits	
Microservices Designs: Drawbacks	46

OCI Code Editor Overview	47
OCI Code Editor Introduction	48
Code Editor Features	50
Container-based Application Development	59
Introduction to Containerization	60
What is containerization?	61
Containerization: Benefits	62
Docker: Introduction	63
When to Use Docker Containers	
Docker Components	65
Docker Components	
Virtual Machines Versus Containers	67
Basic Docker Commands	68
Demo: Docker Basic Commands	69
Demo: Docker Basic Commands	
Working with Docker Images	71
Dockerfile	72
Basic Docker Commands	73
Demo: Working with Docker Images	
Demo: Working with Docker Images and Repository Oracle Cloud Infrastructure Registry OCIR: Introduction	
Oracle Cloud Infrastructure Registry OCIR: Introduction	76
Introducing Oracle Cloud Infrastructure Registry (OCIR)	
Container Registry Concepts	
Terminology: Summary	
Managing Oracle Cloud Infrastructure Registry (OCIR)	81
Managing OCIR	82

Managing Repository	83
Managing Images	84
Managing Security	
Preparing for Container Registry	88
Demo: Managing OCIR	89
OCIR Images Concepts	
Open Container Initiative (OCI)	
OCI Image Layout	
Anatomy of an Image	
Viewing Image Layers in OCIR	
Putting It All Together	98
Demo: Managing OCIR	99
Cloud Native DevOps with Managed Kubernetes	100
DevOps: Overview	101
A DevOps Story	102
A DevOps Story: Challenges	
A DevOps Story: Turning Point	104
DevOps Definition	106
Why DevOps Matters	107
DevOps Life Cycle	108
DevOps Life Cycle and CI/CD	109
The "Continuous" Paradigm	110
Benefits of DevOps	111
OCI DevOps Service	112
OCI DevOps as a Service	
DevOps as a Service: Benefits	115

OCI DevOps CI/CD	116
CI/CD Overview	117
OCI DevOps	1 1 O
CI/CD in OCI DevOps	119
OCI DevOps	120
Introduction to Kubernetes	121
Challenges in Containerization	
Scenario	123
Kubernetes: Introduction	127
Container Orchestration	133
Introduction to OKE	
Container Engine for Kubernetes (OKE): Overview	135
Container Engine for Kubernetes: When and Why	136
Components of a Cluster	137
Node Pools	138
Supported Shapes and Operating Systems	139
Supported Kubernetes Versions	140
Version Drift in Control Plane Nodes and Worker Nodes	141
Prerequisite to Create an OKE Cluster	142
Prerequisite to Create an OKE Cluster	
Network Resource Configuration for Cluster Creation and Deployment	
Network Resource Configuration for Cluster Creation and Deployment	145
Required Policies	149
Creating OKE Cluster on OCI	
Creating OKE Cluster on OCI	151
Trigger a Build	152

Demo: Creating an OKE Cluster	153
Demo: Creating OKE Cluster on OCI	154
Setting Up Cluster Access	155
Kubeconfig File: Overview	156
Kubeconfig File: Overview	158
Kubeconfig Files: Notes	159
Kubectl Tool	160
Setting Up Cluster Access	
Demo: Setting Up Cluster Access	162
Demo: Setting Up Cluster Access	
Deploying an Application to OKE	
Deploy a Python Flask Application	165
Key Tasks	166
Demo: Deploying an Application to OKE	167
Demo: Deploying an Application to OKE	
Serverless Functions and API Management	169
Overview of Serverless Functions	170
Agenda	
Functions	
Oracle Functions	, -
How does it work?	
Functions Pricing	175
Functions == Polyglot Containers	
Functions Integrations	177
Triggers	
Functions Triggers	

Events Service	180
Notifications Service	181
Service Connector Hub	
API Gateway	183
Use Cases	184
Common Use Cases	185
Use Case 1: Enforce Corporate Security Policies and Governance Rules	186
Use Case 2: Ingest Access Logs in Security Incident Management	187
Use Case 3: High Volume ETL Solution	188
Use Case 4: Resize Virtual Machine	189
Use Case 5: Functions as API Backends to Extend Oracle Sales Cloud	190
Concepts	191
Functions Concepts	192
"fn init" Generates Boilerplate Hello World Function	193
fn deploy	
Functions Configuration	
Functions Observability	198
Using Other Services	199
Demo: Functions QuickStart on Cloud Shell	200
Demo: Creating a Function from a custom Dockerfile	
Introduction to API Management	202
Agenda	203
Introduction	204
What is an API?	205
Elements of an API	
What is an API Gateway?	210

Oracle Cloud Infrastructure API Gateway	211
Networking and Security Policies	213
Networking	214
Policies	015
Creating an API	
Prototyping an API	217
Create and Prototype an API	219
Demo	220
Validating API Requests	221
Path Routing	222
Path Parameters	223
Wildcards	225
Authorizing Requests	226
Generic OAuth Flow	227
JWT Validation in API Gateway	228
Using Context Variables	000
Context	230
Transforming API Requests and Responses	231
Transforming Requests	232
Transforming Responses	233
API Gateway: Dynamic Authentication	234
Overview of API Authorization	
Dynamic Authentication	236
Demo	007
API Gateway: Dynamic Routing	238
Dynamic Authentication	239

Demo	240
Monitoring APIs	241
Monitoring	242
OCI Streaming and Event Services	243
Introduction	244
Messaging Service Options	245
What is Apache Kafka?	246
However,	247
Introducing the OCI Streaming Service (OSS)	248
OCI Streaming: Cloud Native	249
OCI Streaming: Kafka Compatibility	250
OCI Streaming: Kafka MirrorMaker	251
Summary	252
Features	253
OSS Security: Provides End-to-End Encryption	254
OSS Security: Fully Integrated with OCI IAM	255
OSS Security: Private Endpoints and OCI Vault Support	256
OSS Reliability: Resilient to Failures	
OSS Integration: OCI Services and Third-Party Products	258
Integration with Oracle Functions	259
Integration with Object Storage	260
Integration with OCI Logging	
Integration with Notifications	262
Integration with Oracle GoldenGate	
Integration with Third-Party Products	264
OCI Streaming and Kafka Connect Ecosystem	

Summary	266
Fundamentals	267
OCI Streaming: Key Concepts	268
OCI Streaming: Conceptual Architecture	269
Benefits of OCI Streaming vs. Kafka	270
Creating Streams	274
OCI Streaming SDKs	
Stream Archiving	277
Service Connector Hub	279
Metrics	280
Summary	281
Use Cases	282
Streaming Usage	
Use Case Categories	284
Use Case 1: Oracle DB Change Data Capture Logs	285
Use Case 2: Publish Blockchain Events	286
Use Case 3: Analyze IoT Data	287
Use Case 4: Enterprise Data Warehousing	289
Use Case 5: Real-Time Log Analytics with Third-Party SIEM Tools	291
Use Case 6: High-Throughput Message Bus	
Demo: Working with OCI Streams	
Working with OCI Streaming	294
Fundamental Concepts	295
Overview	296
Using Events vs. Explicit Polling	300
OCI Events Service Concepts	301

An Example of OCI Events Service in Action	302
Summary	303
Event Messages and Event Types	304
What is an Event?	
What does an Event look like?	306
Services That Produce Events	
OCI Service Event Types	
Summary	
Rule Actions	310
Rule Action Destinations	
Streaming Service	312
Rule Action Type: Streaming	314
Oracle Functions	315
Rule Action Type: Functions	317
Notifications Service	318
Rule Action Type: Notifications	000
Summary	321
Actions Demo	322
Working with Rules	323
What are Rules?	324
Typical Rule Design Workflow	325
Creating Rules	326
Configuring Rules in the OCI Console	327
Rule Design Considerations	328
Rule Metrics	330
Summary	331

Rules Demo	332
Events Use Cases	333
Example High-Level Use Cases	334
Automating Log Security Analysis	336
Event-Driven Infrastructure-as-Code	337
Automating Corporate Security Policy Checks	338
Triggering an OIC Integration via OCI Events	339
Integrating Oracle Cloud Guard with External Systems	
OCI Events with ERP Cloud, APEX and ORDS	341
Event-Driven Design Patterns	342
Testing & Securing Cloud Native Applications	
Cloud Native Testing Overview	344
Cloud Native Testing	345
Measures for Cloud Native Application	346
Cloud Native Testing Strategies	
Strategies for Testing Cloud Native Applications	348
Testing for Unknown Unknowns in Cloud Native	349
OCI Vault: Introduction	351
OCI Vault	352
Vaults	353
Keys	354
Master and Data Encryption Keys	355
Master Encryption Keys: Protection Modes	356
Wrapping Keys	357
Rotating Keys	2 = 0
Conclusion	359

OCI Vault: Integration with OCI Services	360
OCI Services Integration with Vault	361
Encryption Using Oracle-Managed Keys	362
Encryption Using Customer-Managed Keys	363
Example: OCI Object Storage Integration with Vault	
Conclusion	
OCI Vault: Secrets	366
What are Secrets?	
Secrets	368
Secret Rules	369
Using Secrets	370
Conclusion	374
Image Security	375
Container Image Signing	377
Use Image Digests Instead of Tags	378
Container Image Scanning	379
Viewing Scan Results	
Summary	381
Security for Oracle Functions	382
Understanding Limited Permissions Granted to Function Containers	383
OCI Certificates Integration	384
Using OCI Certificates with API Gateway	385
Custom Trust Store	386
Customizing Trust Stores for TLS Certificate Verification	
Customizing the Trust Store	388
Mutual TLS (mTLS) Support	389

Adding mTLSSupport to API Deployments Adding mTLS Support to API Deployments Monitoring & Troubleshooting Cloud Native Applications Overview	392 393 394
Adding mTLS Support to API Deployments Monitoring & Troubleshooting Cloud Native Applications	392 393 394 395
Monitoring & Troubleshooting Cloud Native Applications	393 394 395
Overview	395
Key Services	
Module Lessons and Demos	
Monitoring	405
Monitoring Service	406
Metrics	407
Alarms	408
Logging Service	409
OCI Logging Service	410
Log Groups	411
Logging Concepts	412
Types of Logs	413
Searching Logs	414
IAM Policies Required	416
Viewing Audit Log Events	415
Service Flow	417
Demo: Functions Metrics & Logs	
Metrics & Logs for Oracle Functions	419
Demo?	420
Options for Persistent Volumes (PV)	
Provisioning a PVC on a File System	427
Demo: API Gateway Metrics & Logs	431

Metrics & Logs for API Gateway	432
Demo?	433
Options for Persistent Volumes (PV)	439
Provisioning a PVC on a File System	
Demo: OKE Cluster Metrics & Logs	444
Metrics & Logs for OKE	
Application Log Management	
Application Performance Monitoring	448
Application Performance	
Features	450
Demo: Oracle Functions Tracing	454
Tracing Oracle Functions With The Application Performance Monitoring (APM) Service	455
Demo: Microservice Application Distributed Tracing	456
OCI Application Performance Monitoring Service (APM)	457
Distributed Tracing with APM Demo	459
Demo: Debugging Container Applications in OKE	460
Debugging OKE Cluster Applications with Rookout	