

全面解读Oracle数据库云

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数据库

Oracle 云端数据库

数据库备份

安全且受到保护的弹性云存储

MySQL

Oracle 云中的 MySQL 可满足您企业的需求

大数据

大数据云服务

NoSQL 数据库

通过云扩展您的数据

大数据 — 计算版

大数据让一切变简单

事件中心

云端的托管 Apache Kafka

- + Oracle 数据库云服务
- + Oracle 数据库 Exadata 云服务
- + Oracle 数据库 Exadata Express 云服务
- + Oracle 数据库方案云服务

cloud.oracle.com**最全面的数据管理
PaaS服务体系**

Oracle Cloud数据库云的差异化优势

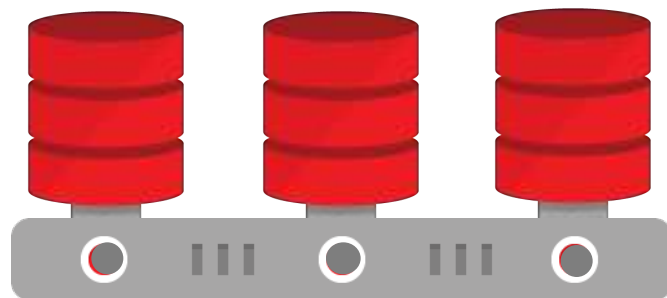
通过 自动化 & 简单化 的云服务提升 IT响应速度 & 成本效率

通过 全面性 & 开放性 的云服务提供 端到端解决方案

通过 自由选择 云服务的部署方式实现 IT便携移动 & 合规管理



自有数据中心



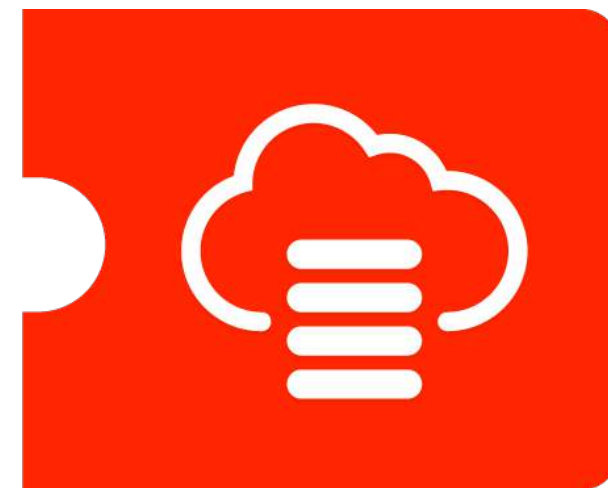
相同的标准

相同的架构

相同的软件

相同的技能

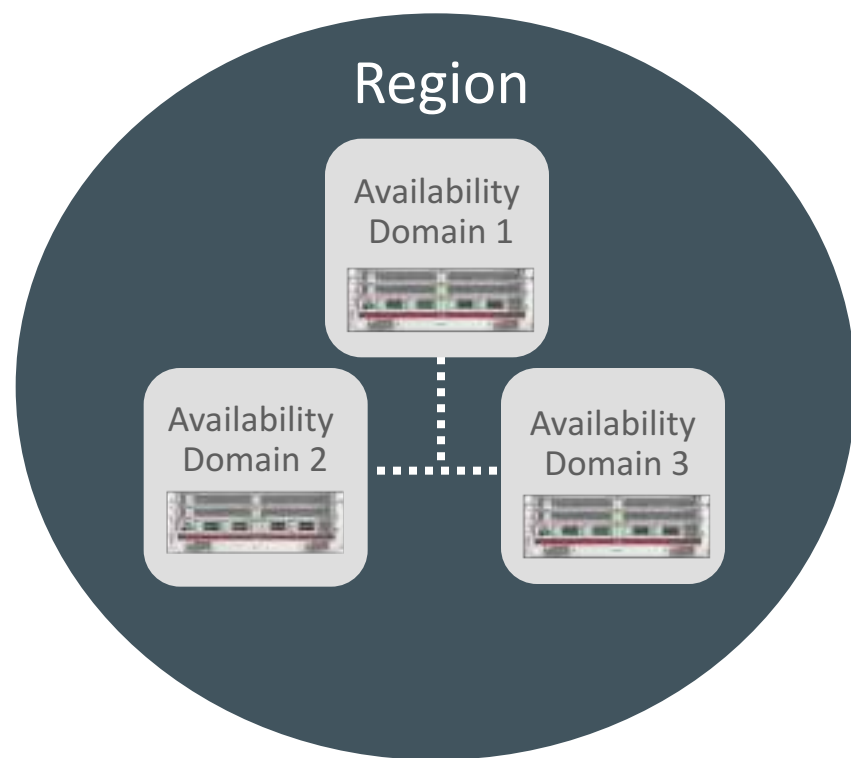
混合云



Oracle Cloud

Cloud 2016 IaaS: 新一代的数据库PaaS基础架构

快网、高可用、故障隔离 & 故障容错

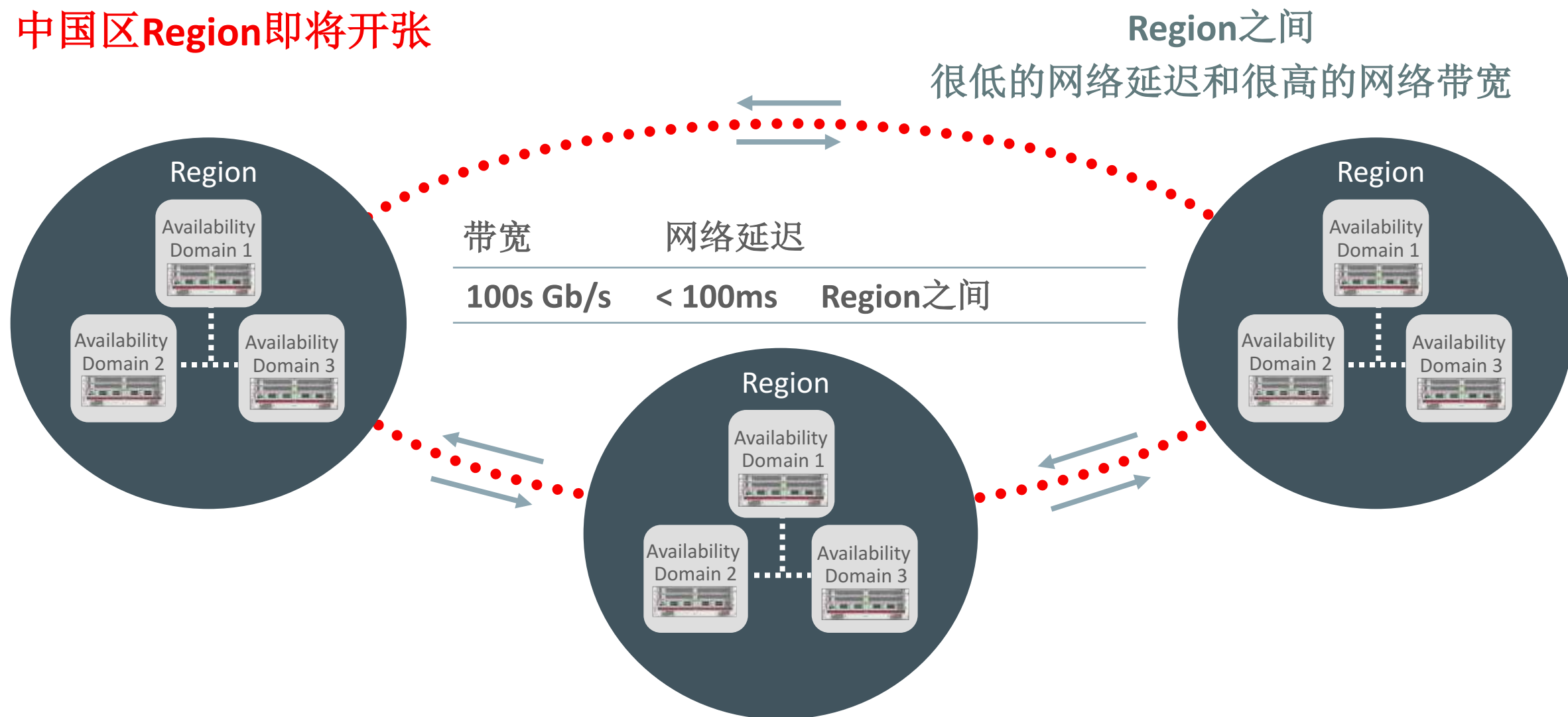


- 三个完全故障独立的availability domains
- AD之间超低的网络延迟和很高的带宽
- 为关键任务负载提供高可用的基础架构

带宽	网络延迟	
10 Gb/s	< 100μs	AD中的主机之间
1 Tb/s	< 5ms	Region中的AD之间

Cloud 2016 IaaS: 建设分布全球的Regions

中国区Region即将开张



Oracle Cloud数据库云的PaaS敏捷

部署速度更快、过程更简单、不需复杂IT技能

在云门户界面下通过可视化流程向导，只需执行五个步骤，就可以在1小时左右时间，获得一个完整的数据库部署



加速业务敏捷

5

个简单步骤就完成数据库的部署



1. 选择服务级别和计费周期
2. 选择数据库Version
3. 选择数据库Edition (e.g. SE, EE, HPE, XPE)
4. 提供几个简单的配置参数
5. 确认选择与输入后，提交



极为显著地降低了部署数据库和应用的时间、简化IT运维复杂性，从而加速你对市场的响应速度

3.7倍 更快的部署速度

完整部署包括：创建账户、部署和配置软件、启动负载均衡、配置公网IP、配置监控管理等

命令行操作

包括：给整个环境打补丁、备份和恢复、扩展(scale up & scale down)等

Oracle Cloud	Amazon Web Services	Oracle Cloud
8小时30分钟	7小时5分钟	1小时55分钟

Amazon Web Services	Oracle Cloud
307次	155次
	0



Services

[Create Service](#)

You don't have any services. After meeting the [prerequisites](#), use this button to create a service.

New to creating a service?

- [Watch a video](#)
- [Step through a tutorial](#)

► Service create and delete history



Cancel



Next >

Subscription Type

Select the service level and billing frequency for this Oracle Database Cloud Service instance.

Service Level

Oracle Database Cloud Service

- ☒ Oracle Database software pre-installed on Oracle Cloud Virtual Machine.
Database instances are created for you using configuration options provided in this wizard.
Additional cloud tooling is available for backup, recovery and patching.

Oracle Database Cloud Service - Virtual Image

- ☐ Oracle Database software pre-installed on an Oracle Cloud Virtual Machine.
Database instances are created by you manually or using DBCA.
No additional cloud tooling is available.

Billing Frequency

- ☐ **Hourly**
Pay for the number of hours used
- ☒ **Monthly**
Pay one low price for the entire month irrespective of the number of hours used

Software Release

Select the database release version for this Oracle Database Cloud Service instance.

Oracle Database 11g Release 2

- ☐ Oracle Database Version 11.2.0.4
Installed on Oracle Linux 6.6

Oracle Database 12c Release 1

- ☒ Oracle Database Version 12.1.0.2
Installed on Oracle Linux 6.6

[< Previous](#)

[Cancel](#)



[Next >](#)

Software Edition

Select the database edition for this Oracle Database Cloud Service instance.

Standard Edition [\(Details\)](#)

- ☐ Oracle Database 12c Release 1
Installed on Oracle Linux 6.6

Enterprise Edition [\(Details\)](#)

- ☐ Oracle Database 12c Release 1
Installed on Oracle Linux 6.6

Enterprise Edition - High Performance [\(Details\)](#)

- ☐ Oracle Database 12c Release 1
Installed on Oracle Linux 6.6

Enterprise Edition - Extreme Performance [\(Details\)](#)

- ☒ Oracle Database 12c Release 1
Installed on Oracle Linux 6.6

Previous

Cancel

Subscription Release Edition **Details** Confirmation

Next

Service Details

Provide details for this Oracle Database Cloud Service instance.



Service Configuration

* Service Name ?

Description ?

* Compute Shape ?

* Timezone ?

* SSH Public Key ?



Backup and Recovery Configuration

* Backup Destination ?

* Cloud Storage Container ?

* Cloud Storage Username

* Cloud Storage Password

Create Cloud Storage Container ☒ ?

Total Estimated Monthly Storage (GB) ?



Database Configuration

* Usable Database Storage (GB)

Total Data File Storage (GB)

* Administration Password ?

* Confirm Password ?

* DB Name (SID) ?

* PDB Name ?

* Character Set ?

* National Character Set ?

Database Clustering with RAC ☒ ?

Previous

Cancel



Create

Confirmation

Confirm your responses and create this Oracle Database Cloud Service instance.



Service Level: Oracle Database Cloud Service

Billing Frequency: Monthly

Software Release: Oracle Database 12c Release 1

Software Edition: Enterprise Edition - Extreme Performance

Service Name: db12cinstance

Description:

Compute Shape: OC2M - 2 OCPU, 30 GB RAM

Timezone: (UTC+08:00) China Standard Time(Asia/Shanghai)

Key: id_rsa.pub

Usable Database Storage: 50

Total Data File Storage: 116

DB Name (SID): ORCL

PDB Name: PDB1

Character Set: AL32UTF8 - Unicode Universal character set UTF-8 form 32-bit

National Character Set: AL16UTF16 - Unicode UTF-16 Universal character set

Standby Database with Data Guard: No

Disaster Recovery: No

Include GoldenGate: No

Database Clustering with RAC: Yes



Backup Destination: Both Cloud Storage and Local Storage

Username: ziyopi@139.com

Cloud Storage Container: Storage-cnoracleziyopi1/BKContainer



Summary

1

Services

2

OCPUs

30

GB
Memory

Storage

Public IPs

Services

Enter a full or partial service name



As of Nov 2, 2016 10:44:37 AM UTC



Create Service



db12cinstance

Status: In Progress

Version: 12.1.0.2

Edition: Enterprise Edition - Extreme
Performance

Submitted On: Nov 2, 2016 10:44:30 AM UTC

OCPUs: 2

Memory: 30 GB

Storage:

► Service create and delete history



Overview

2
Nodes

Administration

[View Patch Information](#)

[View available backups](#)

Summary

2

Nodes

4

OCPUs

60

GB

Memory

351

GB

Storage

▲ Nodes

As of Nov 2, 2016 10:46:10 AM UTC



db12cinstance1

Public IP:

SQL *Net Port: 1521

SID: ORCL1

PDB Name: PDB1

OCPUs: 2

Memory: 30 GB

Storage: 95 GB



db12cinstance2

Public IP:

SQL *Net Port: 1521

SID: ORCL2

PDB Name: PDB1

OCPUs: 2

Memory: 30 GB

Storage: 95 GB



▲ Additional Information

Identity Domain:	cnoracleziyopi1
Edition:	Enterprise Edition - Extreme Performance
Service Level:	Oracle Database Cloud Service
Subscription Type:	Monthly
show more	

► Activity

In-Progress Provisioning Messages

[Created Compute resources for Database Server...](#)

[Starting Compute resources...](#)



- Open EM Console
- Start
- Stop
- Restart
- Scale Up/Down
- SSH Access
- Access Rules

Overview

2
Nodes

Administration

0
Patches available

[View available backups](#)

Summary

2

Nodes

OC

60 GB

Memory

351 GB

Storage

Nodes

As of Nov 2, 2016 3:42:08 PM UTC



db12cinstance1

Public IP: 129.14

SQL *Net Port: 1521

OCPIUs: 2

7



db12cinstan

Public IP: 129.

Additional Information

Identity Domain:
Edition:
Service Level:
Subscription Type:
[show more](#)

Identity Domain: cnoracleziyopi1
Edition: Enterprise Edition - Extreme Performance
Service Level: Oracle Database Cloud Service
Subscription Type: Monthly
Connect String: (DESCRIPTION=(ADDRESS_LIST=(ADDRESS=(PROTOCOL=TCP)(HOST=db12cinstance1)(PORT=1521))(ADDRESS=(PROTOCOL=TCP)(HOST=db12cinstance2)(PORT=1521)))(LOAD_BALANCE=ON)(FAILOVER=ON))(CONNECT_DATA=(SERVICE_NAME=PDB1.cnoracleziyopi1.oraclecloud.internal)))
Created On: Nov 2, 2016 10:44:30 AM UTC
Created By: ziyopi@139.com
Container Name: ORCL
Backup Destination: Both Cloud Storage and Local Storage
Cloud Storage Container: Storage-cnoracleziyopi1/BKContainer
Timezone: China Standard Time
Character Set: AL32UTF8 - Unicode Universal character set UTF-8 form 32-bit
National Character Set: AL16UTF16 - Unicode UTF-16 Universal character set
Location: US006_Z52

Activity



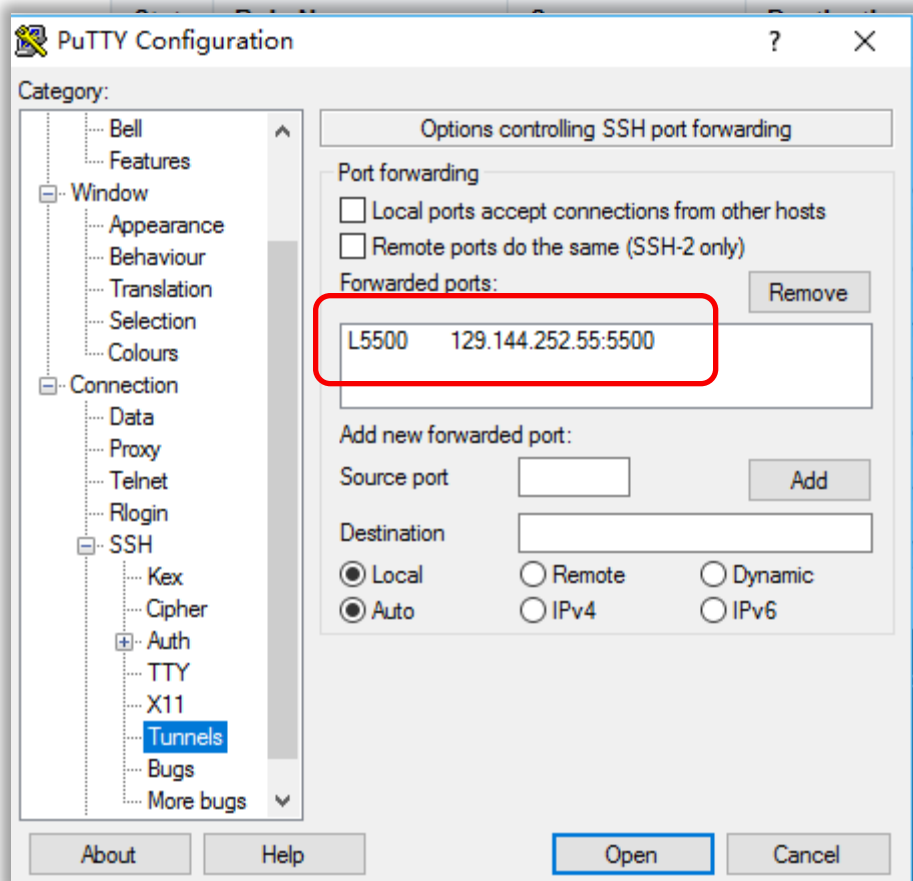
Access Rules

[Create Rule](#)

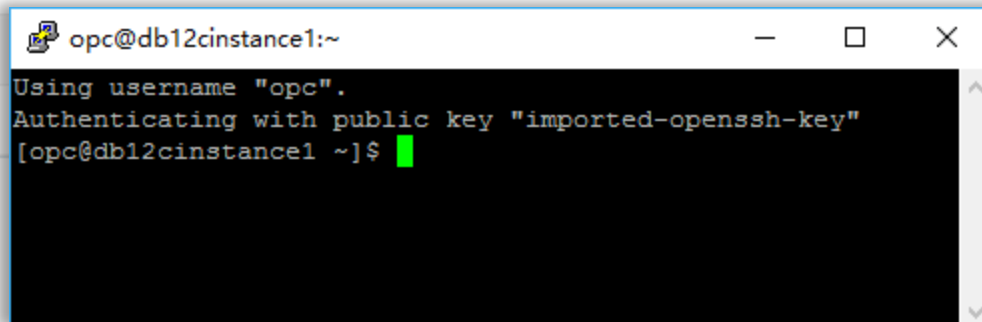
You can use access rules to control network access to service components. On this page, you can manage your access rules.

Results per page: 10

9 result(s) as of Nov 2, 2016 3:56:15 PM UTC



Ports	Protocol	Description	Rule Type	Actions
1522	TCP	Permit access for Oracle list...	DEFAULT	
1521	TCP	Permit access for SCAN list...	DEFAULT	
5500	TCP	Permit access to EM Express	DEFAULT	
1158	TCP	Permit access for Database...	DEFAULT	
6200	TCP	Permit access for RAC ONS	DEFAULT	
22	TCP	Permit ssh access to nodes	DEFAULT	
22	TCP	DO NOT MODIFY: Permit P...	SYSTEM	





► Oracle Database Cloud Service / db12cinstance



Open EM
Console

Start

EM Express - 数据库主目... X +

https://localhost:5500/em/shell#/dbhome/show_regions

ORACLE Enterprise Manager Database Express 12c

帮助 SYSTEM 注销

ORCL (12.1.0.2.0 CDB RAC)

配置 存储 安全 性能

db12cinstance1

数据库主目录

页刷新 24:17:05 GMT+0800 自动刷新 1分钟

状态

运行时间 4小时, 31分钟, 6秒

类型 RAC - 2实例启动

CDB (1个PDB)

版本 12.1.0.2.0 企业版

数据库名称 ORCL

平台名称 Linux x86 64-bit

归档程序 Started

性能

活动类 服务 实例 容器



资源

主机 CPU



活动的会话



内存



正在运行的作业

实例	容器名	所有者	名称	用时	已开始
没有正在运行的作业					

SQL 监视 - 过去的小时数 (最高 20)

状态	持续时间	类型	ID	用户	并行	数据库时间	SQL 文本
✓	0.5s	SQL	djabn1r6k20ru	SYSTEM@CDB\$ROOT	3	0.5s	-- SQL building XML for the jobs region select xmlelem...
✓	20.0ms	SQL	bj7w01s88bk8u	@CDB\$ROOT	3	19.4ms	insert into wrh\$_tablespace (dbid, con_dbid, snap_id, ...
✓	60.0ms	SQL	c8yhu3pmcddw	@CDB\$ROOT	3	62.5ms	insert into wrh\$_tablespace_stat (dbid, con_dbid, snap_id...



Overview

2

Nodes

Administration

0

Patches available

[View available backups](#)

Backup

Patching

As of Nov 2, 2016 4:02:14 PM UTC

Perform on demand backup and recovery operations. Recovery can be a point in time recovery using database tag, timestamp or system change number.

[Backup Now](#)

[Recover](#)

[Configure Backups](#)

Available Backups

No backups available.

Recovery History

No backups recovered.

Oracle Cloud数据库云的PaaS敏捷

部署速度更快、过程更简单、不需复杂IT技能

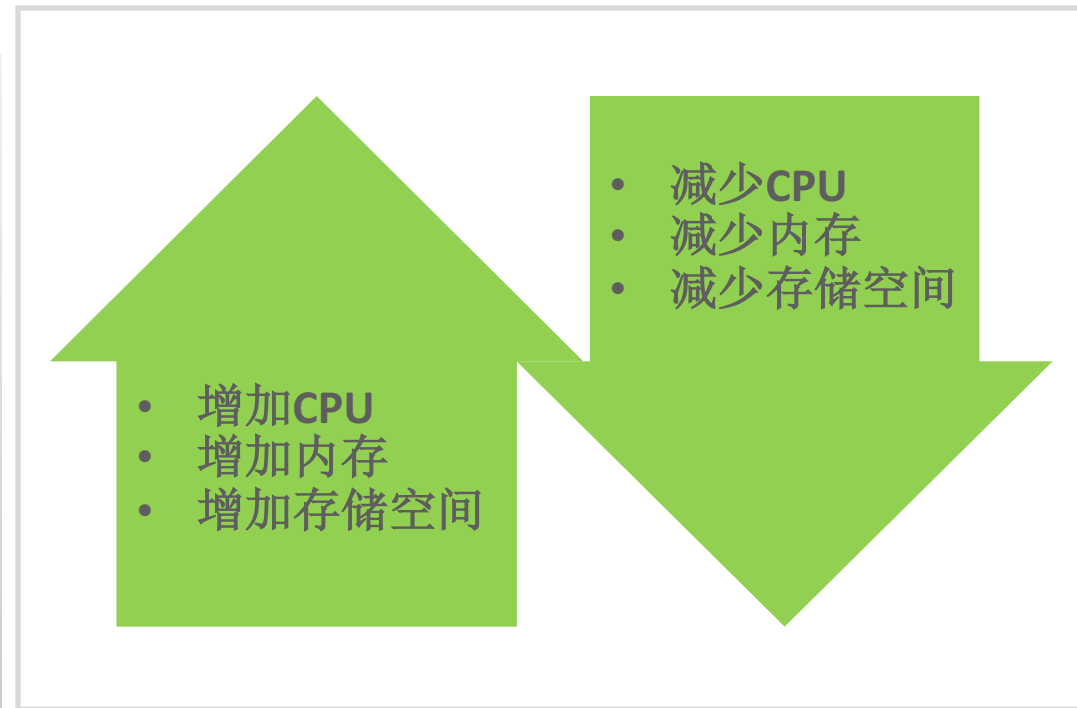


加速业务敏捷

极为显著地降低了部署数据库和应用的时间、简化IT运维复杂性，从而加速你对市场的响应速度

1

一键扩展



弹性伸缩



Overview

1
Node

Summary

1
Nodes

1
OCPUs

15 GB
Memory

150 GB
Storage

Nodes

As of Nov 2, 2016 4:29:49 PM UTC ↺

Administration

0

Patches available

0

Snapshots available

Scale Up/Down Service



db12cinstance2 is currently using compute shape OC1M. Specify new shape and/or additional storage for the service.

Note that the service will be unavailable during scale up/down operation.

New Compute Shape OC2M - 2 OCPU, 30 GB RAM ▾

Additional Storage (GB) 50

Add Storage to Extend Data Storage Volume ▾

Yes, Scale Up/Down Service

Cancel

OCPUs:

Memory:

Storage:

Start

Stop

Restart

Scale Up/Down

Activity



Oracle Database Cloud Service / db12cinstance2



Database Service scale up/down request is accepted.

Overview

1
Node

Scale Up/Down in progress...



Oracle Database Cloud Service / db12cinstance2

Overview

1
Node

Last scale up/down succeeded

Administration

0
Patches available

0
Snapshots available

Summary

1
Nodes

2
OCPUs

30 GB
Memory

200 GB
Storage

Nodes

As of Nov 2, 2016 5:28



db12cinstance2
Public IP: 129.144.150.158

SQL *Net Port: 1521
SID: ORCL
PDB Name: PDB1

OCPUs: 2
Memory: 30 GB
Storage: 200 GB

Additional Information

Identity Domain: cnoracleziyopi1
Edition: Enterprise Edition - Extreme Performance

Oracle Cloud数据库云的PaaS敏捷

部署速度更快、过程更简单、不需复杂IT技能

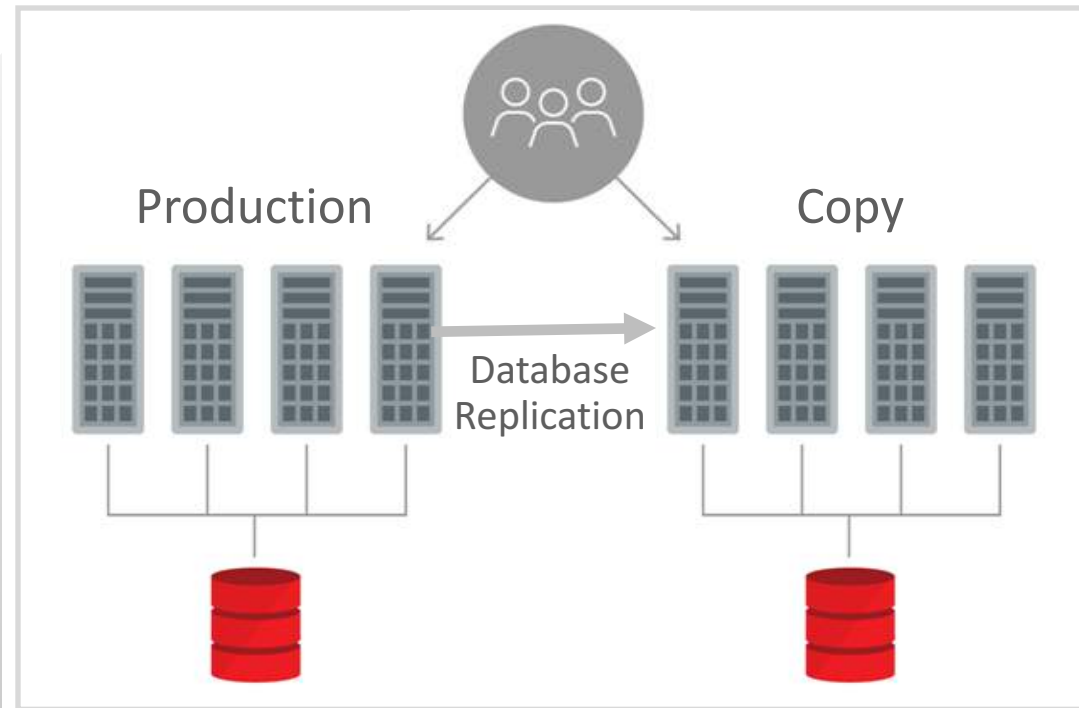
快

加速业务敏捷

极为显著地降低了部署数据库和应用的时间、简化IT运维复杂性，从而加速你对市场的响应速度

1

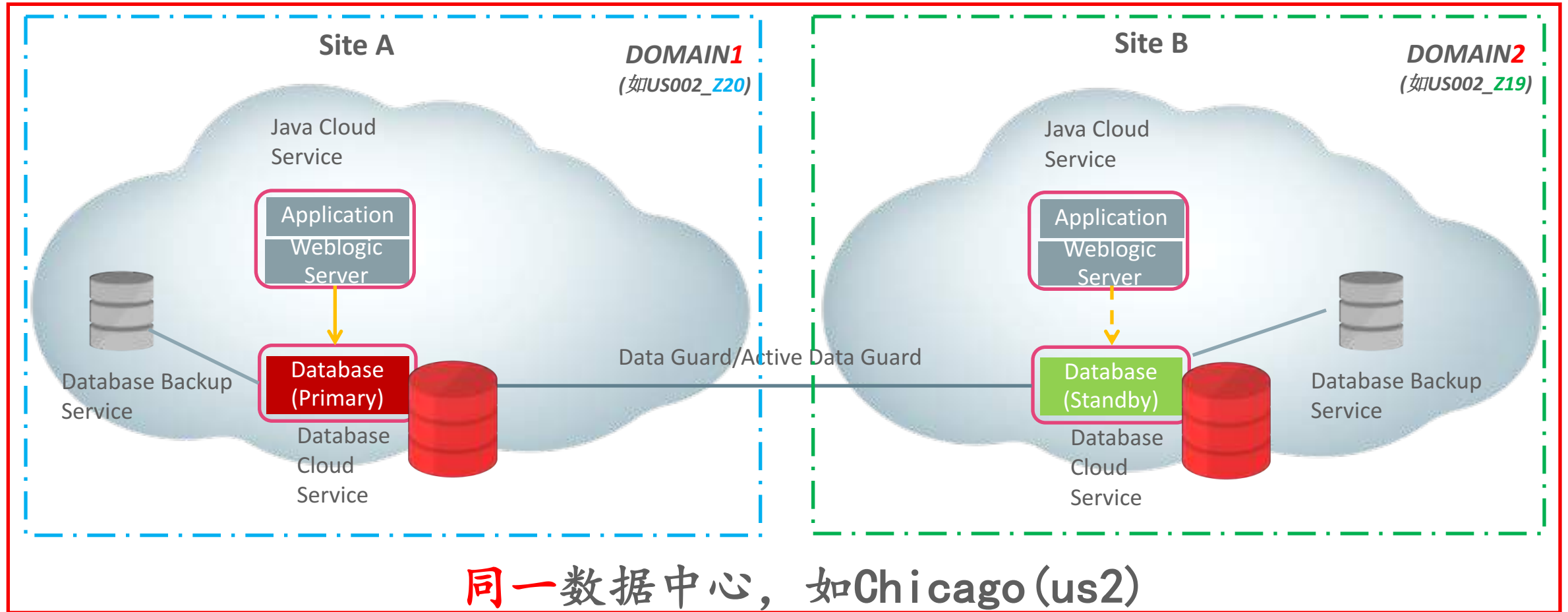
一“勾”
即有双活灾备



云中双活高可用架构

云中双活异地灾备架构

DG/ADG on OPC with High Availability Option



Using Oracle Data Guard in Database as a Service

High Availability模式

Service Details

Provide details for this Oracle Database Cloud Service instance.

Service Configuration

* Service Name

Description

* Shape

* Timezone

* SSH Public Key

Database Configuration

* Usable Database Storage (GB)

Total Data File Storage (GB)

* Administration Password

* Confirm Password

* DB Name (SID)

* PDB Name

Backup and Recovery Configuration

* Backup Destination

Total Estimated Monthly Storage (GB)

* Character Set

* National Character Set

Standby Database with Data Guard ☒

☒ High Availability

☐ Disaster Recovery

Include "Demos" PDB ☐

Primary和Standby上的Shape是相同的

Confirmation

Confirm your responses and create this Oracle Database Cloud Service instance.

Service Level: Oracle Database Cloud Service

Billing Frequency: Hourly

Software Release: Oracle Database 12c Release 1

Software Edition: Enterprise Edition - Extreme Performance

Service Name: ORCL

Description: ADG test

Shape: OC3 - 1 OCPU, 7.5 GB RAM

Timezone: (UTC+08:00) China Standard Time(Asia/Taipei)

Key: mykey.pub

Usable Database Storage: 25

Total Data File Storage: 88.5

DB Name (SID): ORCL

PDB Name: PDB1

Character Set: ZHS16GBK - GBK 16-bit Simplified Chinese

National Character Set: AL16UTF16 - Unicode UTF-16 Universal character set

Standby Database with Data Guard: Yes

Disaster Recovery: No

Include "Demos" PDB: No

Include GoldenGate: No

Database Clustering with RAC: No

Backup Destination: None

Using Oracle Data Guard in Database as a Service

High Availability模式



Oracle Database Cloud Service / ORCL

Overview

2 Nodes

Administration

1 Patches available

Summary

2	2	15 GB	374 GB
Nodes	OCPUs	Memory	Storage

Nodes

As of Sep 7, 2016 7:41:15 AM UTC

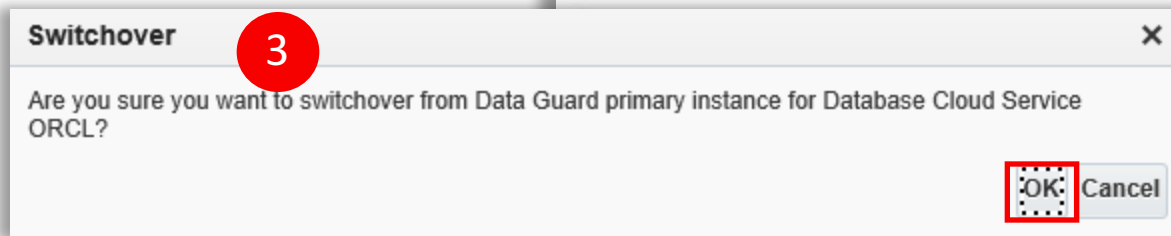
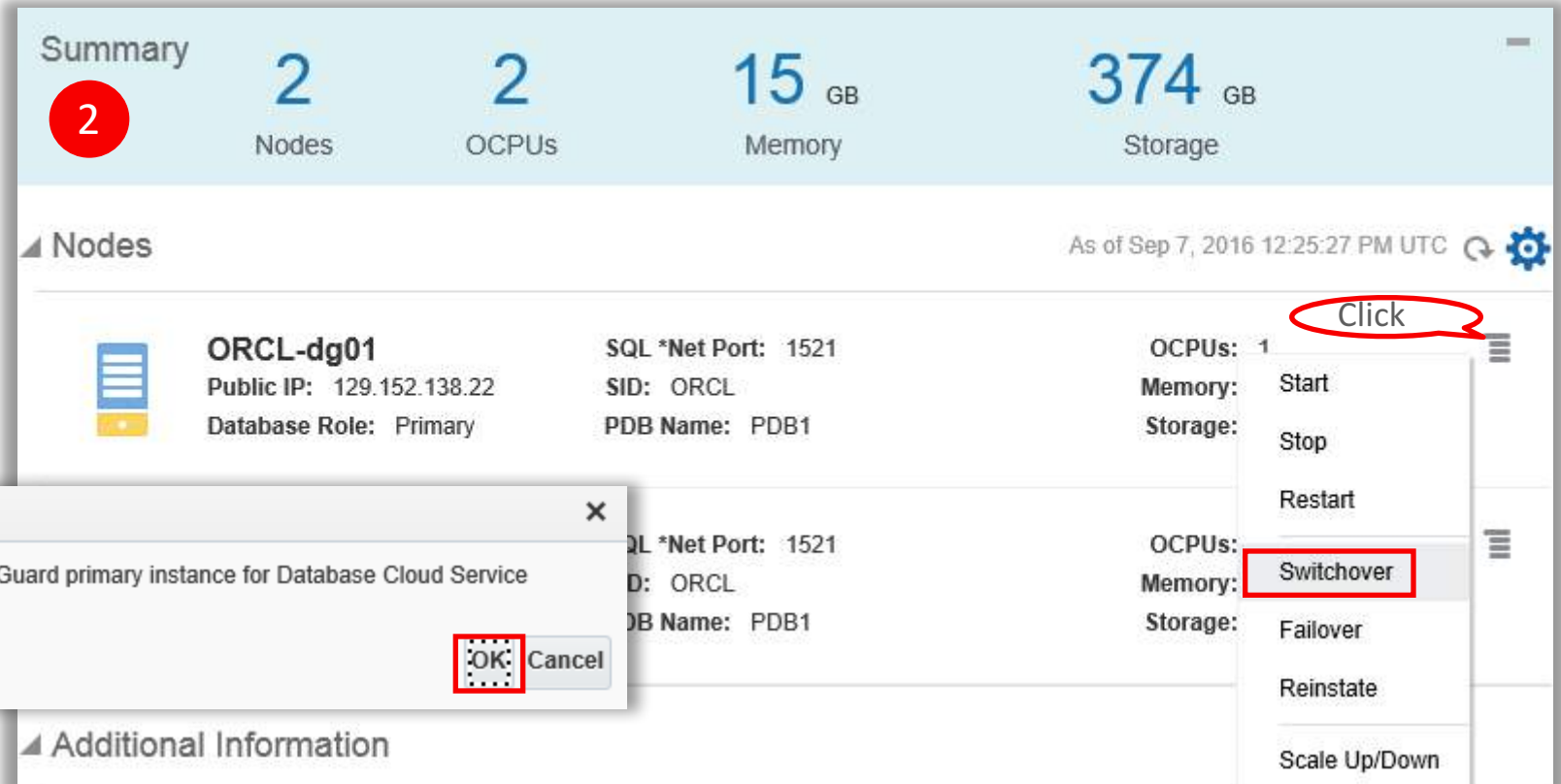
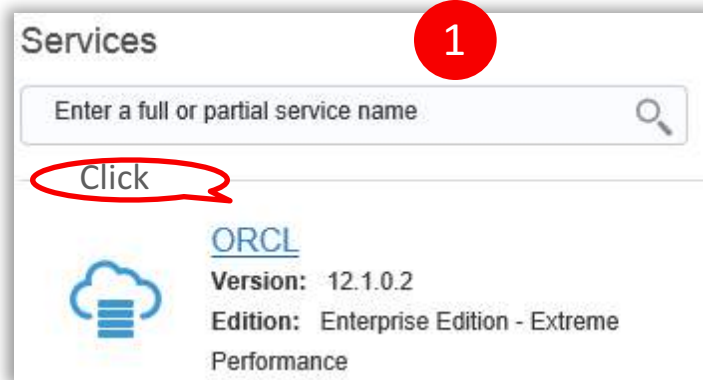
 ORCL-dg01 Public IP: 129.152.138.22 Database Role: Primary	SQL *Net Port: 1521 SID: ORCL PDB Name: PDB1	OCPUs: 1 Memory: 7.5 GB Storage: 187 GB
 ORCL-dg02 Public IP: 129.152.156.76 Database Role: Standby	SQL *Net Port: 1521 SID: ORCL PDB Name: PDB1	OCPUs: 1 Memory: 7.5 GB Storage: 187 GB

Using Oracle Data Guard in Database as a Service

High Availability模式

- SwitchOver

- 通过Oracle Database Cloud Service console执行一次SO, 让ORCL_02成为Primary, ORCL_01成为Standby



Using Oracle Data Guard in Database as a Service

High Availability模式

• SwitchOver

- 通过Oracle Database Cloud Service console执行一次SO, 让ORCL_02成为Primary, ORCL_01成为Standby

4

Oracle Database Cloud Service / ORCL

↓

系统进入维护维护状态，直到SO结束

ORCL
Status: Maintenance
Version: 12.1.0.2
Edition: Enterprise Edition - Extreme Performance

Summary

2	2	15 GB	374 GB
Nodes	OCPUs	Memory	Storage

Nodes

As of Sep 7, 2016 12:33:47 PM UTC

5

SO结束，角色互换

ORCL-dg01 Public IP: 129.152.138.22 Database Role: Standby	SQL *Net Port: 1521 SID: ORCL PDB Name: PDB1	OCPUs: 1 Memory: 7.5 GB Storage: 187 GB
ORCL-dg02 Public IP: 129.152.156.76 Database Role: Primary	SQL *Net Port: 1521 SID: ORCL PDB Name: PDB1	OCPUs: 1 Memory: 7.5 GB Storage: 187 GB

Activity

6

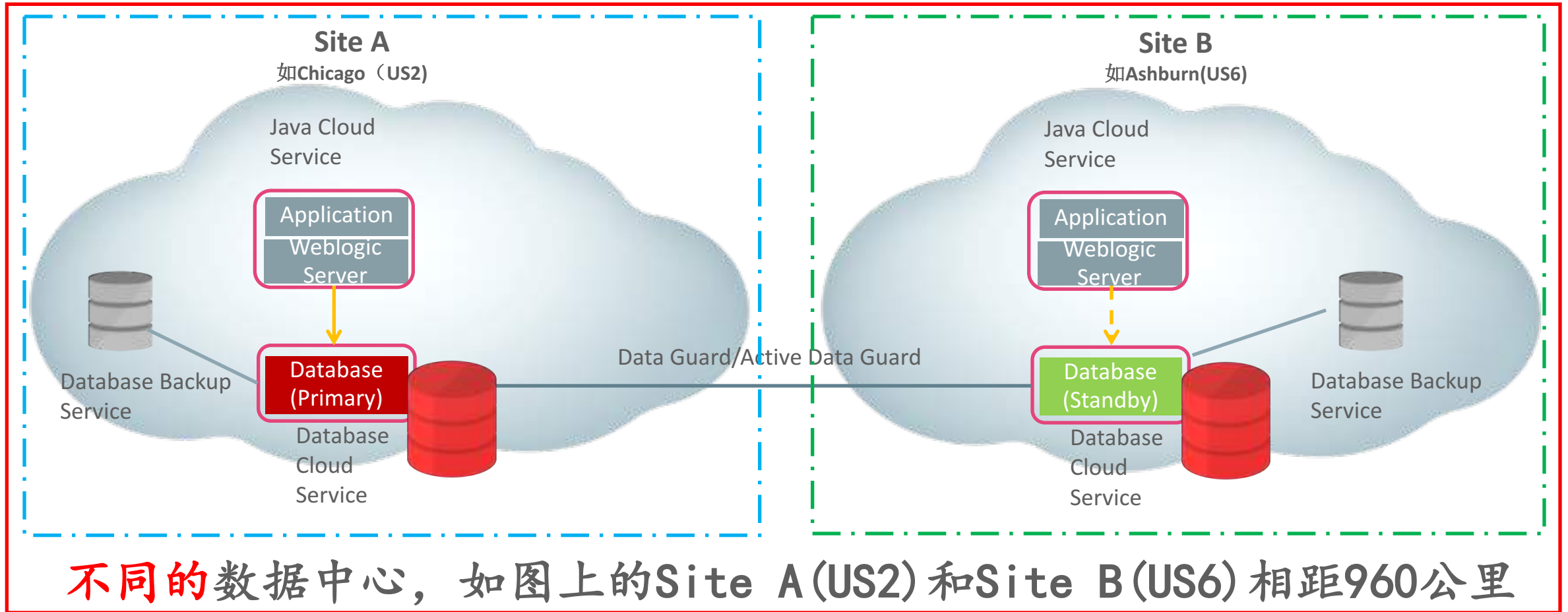
Activity Summary

Change Role Completed

Start Time: Sep 7, 2016 12:29:01 PM UTC
End Time: Sep 7, 2016 12:33:09 PM UTC

SO时间在4分钟多

DG/ADG on OPC with Disaster Recovery Option



Using Oracle Data Guard in Database as a Service

Disaster Recovery模式

Service Details

Provide details for this Oracle Database Cloud Service instance.



Service Configuration

* Service Name ?

Description ?

* Shape ?

* Timezone ?

* SSH Public Key ?



Backup and Recovery Configuration

* Backup Destination ?

Total Estimated Monthly Storage (GB) ?



Database Configuration

* Usable Database Storage (GB)

Total Data File Storage (GB)

* Administration Password ?

* Confirm Password ?

* DB Name (SID) ?

* PDB Name ?

* Character Set ?

* National Character Set ?

Standby Database with Data Guard ☒ ?

☐ High Availability

☒ Disaster Recovery

Include "Demos" PDB ☐ ?

Primary和Standby上的Shape是相同的

Confirmation

Confirm your responses and create this Oracle Database Cloud Service instance.



Service Level: Oracle Database Cloud Service

Billing Frequency: Hourly

Software Release: Oracle Database 12c Release 1

Software Edition: Enterprise Edition - Extreme Performance

Service Name: ORCL

Description: ADG DR mode test

Shape: OC3 - 1 OCPU, 7.5 GB RAM

Timezone: (UTC+08:00) China Standard Time(Asia/Taipei)

Key: mykey.pub

Usable Database Storage: 25

Total Data File Storage: 88.5

DB Name (SID): ORCL

PDB Name: PDB1

Character Set: AL32UTF8 - Unicode Universal character set UTF-8 form 32-bit

National Character Set: AL16UTF16 - Unicode UTF-16 Universal character set

Standby Database with Data Guard: Yes

Disaster Recovery: Yes

Include "Demos" PDB: No

Include GoldenGate: No

Database Clustering with RAC: No



Backup Destination: None

在云中快速开发新业务

基于Oracle数据库，使用Oracle Application Express (APEX)快速开发WEB应用



加速业务敏捷

极为显著地降低了部署数据库和应用的时间、简化IT运维复杂性，从而加速你对市场的响应速度



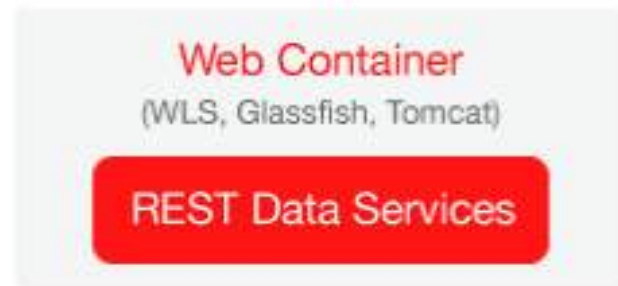
数据库数据的可视化开发和维护，封装数据库服务为RESTful API服务



不需要安装额外的开发工具，只要有浏览器就可以完成开发



快速开发桌面或移动终端访问的WEB应用



在云中快速开发新业务

支持所有的Oracle数据库开发特性



APEX全部支持

SQL and PL/SQL	✓
Java in the Database	✓
Analytics	✓
Text	✓
Regular Expressions	✓
Spatial	✓
Pattern Matching	✓
Database XML	✓
Database JSON	✓
AQ	✓



► Oracle Database Cloud Service / db12cinstance2

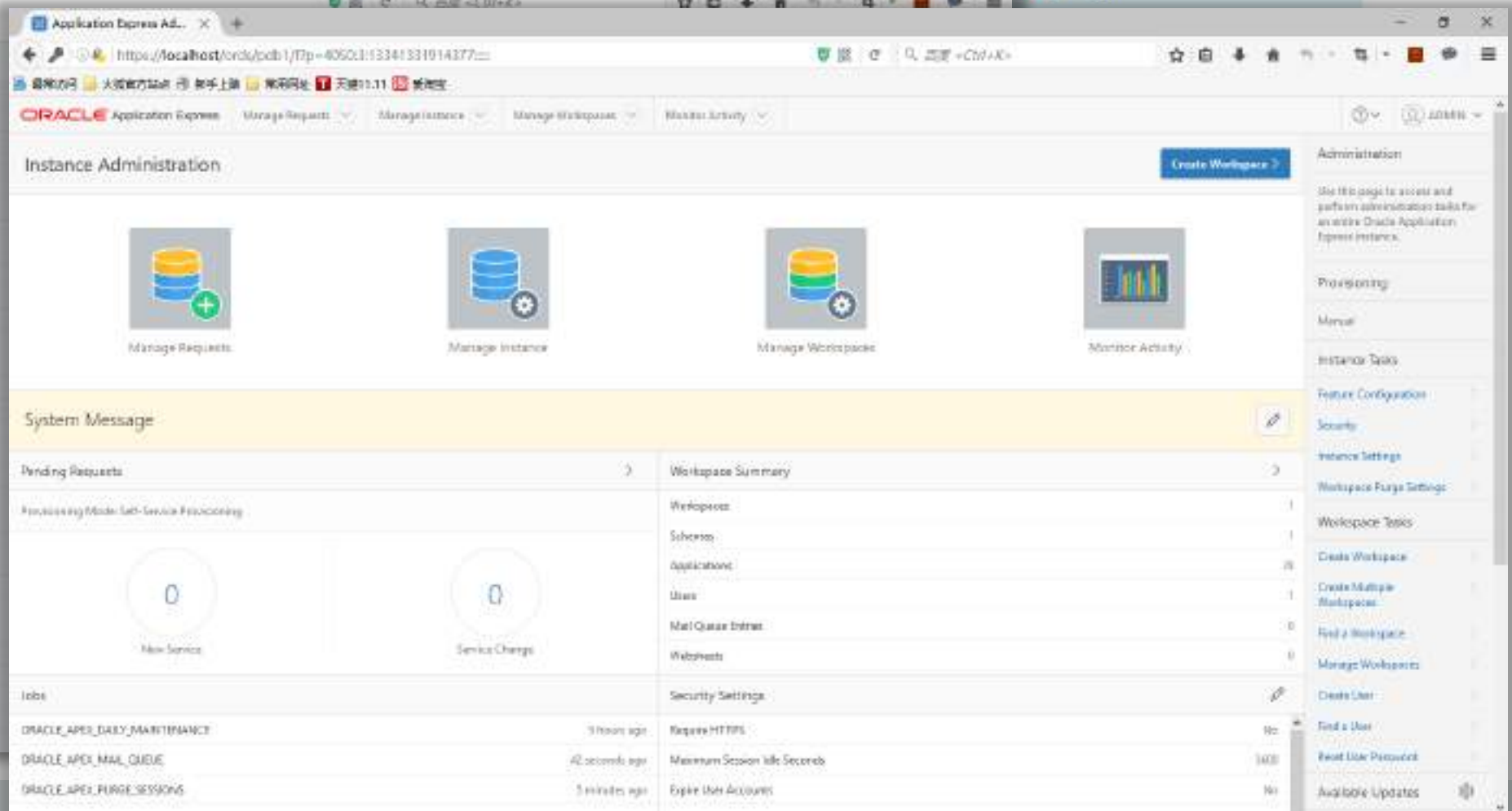
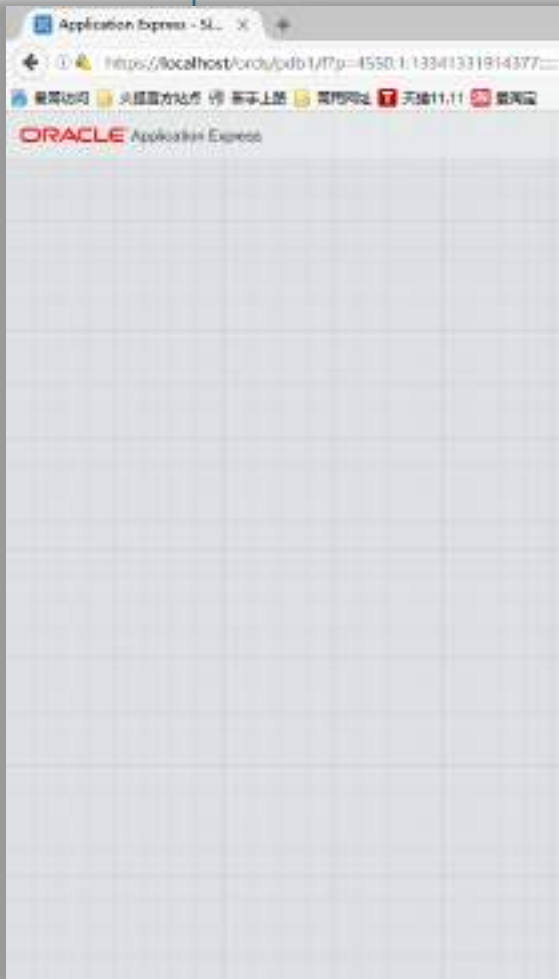


- Open DBaaS Monitor Console
- Open Application Express Console
- Open EM Console

Overview

Summary

150 GB





在云中快速开发新业务

敏捷业务：快速上线、快速服务提供

原型应用从设计到上线只需几分钟



开发



自定义



上线



本地

- 安装Oracle Express Edition (XE) or 其他版本在笔记本电脑上
- 升级到你想要的版本
- 可以完全脱离网络运行



On-Premise

- IT部门可以作为特色运行
- IT部门可以用作服务提供
- 面向应用开发部门
- 面向数据分析部门



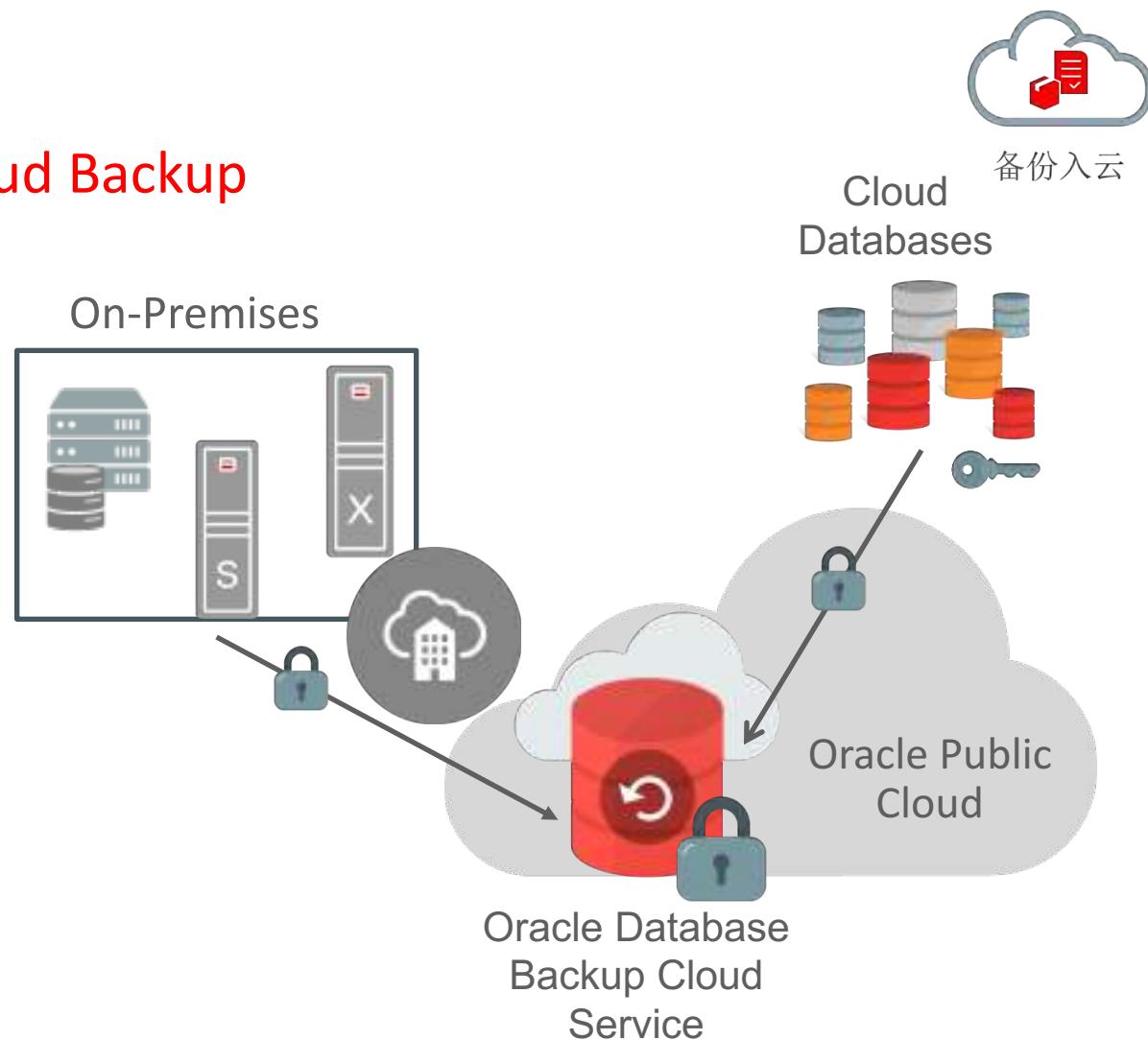
Cloud

- 部署互联网应用
- 用于快速的应用开发，用户培训
- 原型设计以及观点认证
- 咨询公司客户开发/业务拓展
- 服务模块提供

数据库备份入云

Offsite Backups with Simple and Low Cost Cloud Backup

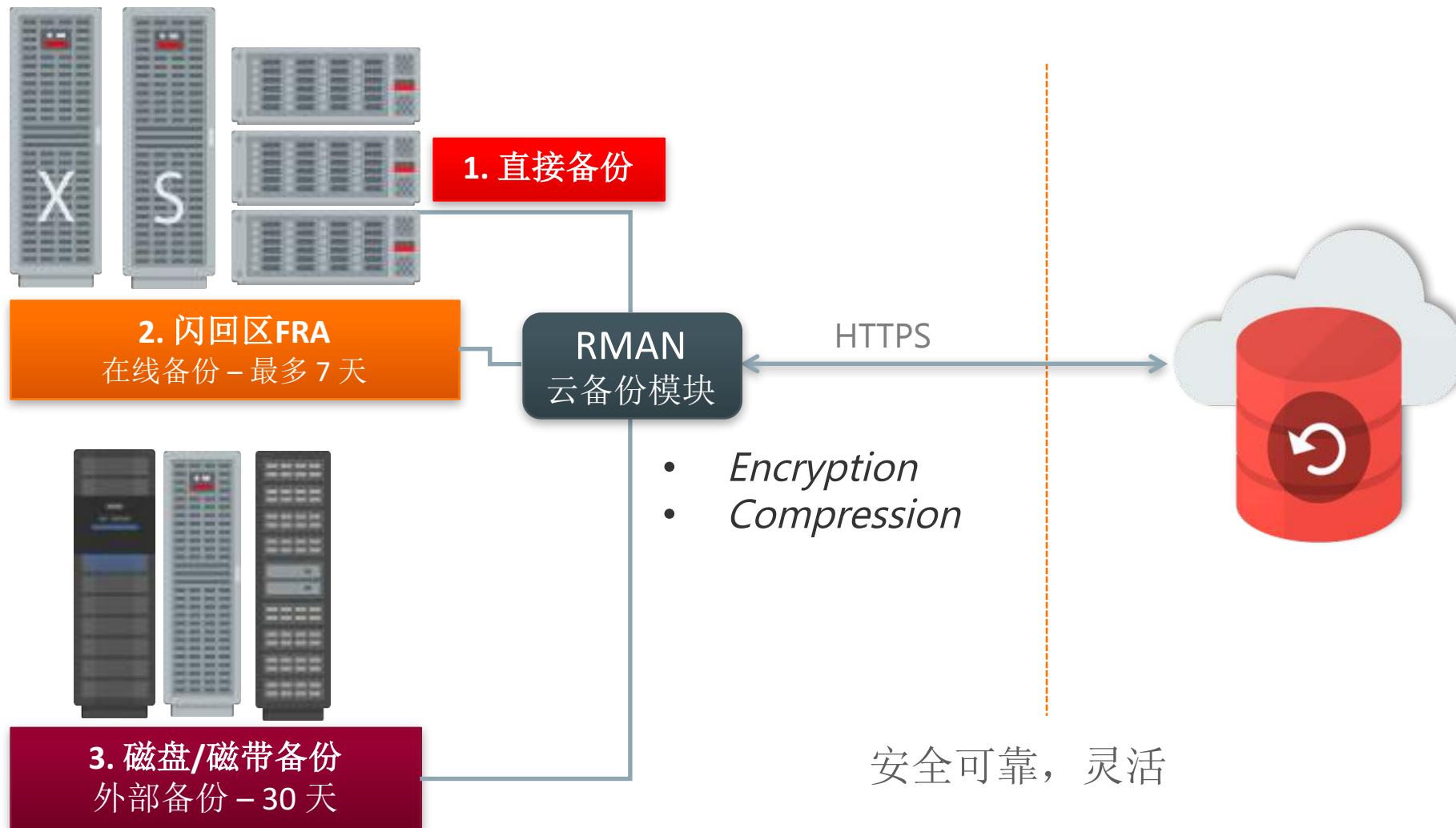
- Oracle数据库备份云服务将企业内部数据库或者云中数据库服务备份到Oracle公有云
- 采用低成本的、弹性的云存储进行数据库备份(10.2 及以上版本)
- 端到端的企业级数据加密、压缩和保护
 - 客户端: 数据使用保存在本地客户端的密钥加密, 可以选择压缩和安全传输
 - 云端: 加密数据采用3路镜像方式保护每一次的写入



https://cloud.oracle.com/database_backup

Oracle数据库备份云服务——数据库备份到云中

与本地RMAN备份一样的RMAN云备份



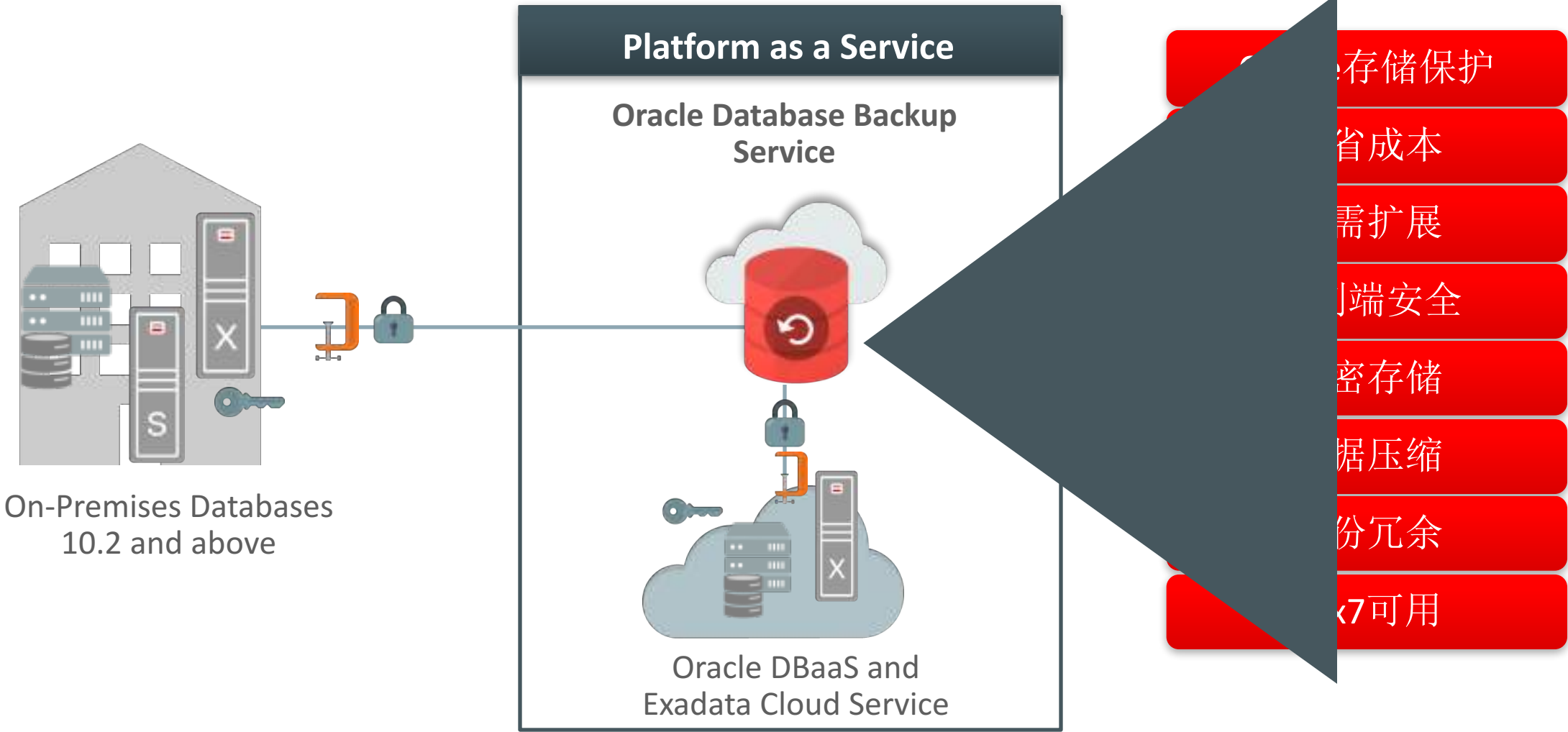
云备份 离线备份 – 数天到数年			
	云备份层次级别		
数据库类型	第1级	第2级	第3级
非关键	X	X	
重要		X	X
核心			X

数据库云备份好处



备份入云

Offsite Cloud Storage for Oracle Database Backups



Oracle Database Exadata Cloud Service

- **Best Database:** Oracle with **all advanced options**
 - **100% compatible** with on-premises DBs for easy migration
- **Faster, high availability** DB cloud platform: **Exadata**
 - Scale-Out Compute, Scale-Out Intelligent Storage, InfiniBand, PCIe flash, DB Optimized Protocols
- All Benefits of Public Cloud
 - Fast, Elastic, Web Driven Provisioning
 - Oracle Experts Deploy and Manage Infrastructure
 - Subscription based with **online capacity bursting**



Oracle Database Exadata Cloud Service – Technical Specs

	X5-2 Full Rack		X5-2 Half Rack		X5-2 Quarter Rack	
Oracle Database Cloud Edition	Extreme Performance		Extreme Performance		Extreme Performance	
Configuration Option	Max	Min	Max	Min	Max	Min
Database Grid OCPUs	272	112	136	56	68	28
Total Memory (GB) (256GB per node)	Total 1,984 GB		Total 992 GB		Total 496 GB	
Raw Flash Capacity – High Capacity	76.8 TB		38.4 TB		19.2 TB	
Raw Storage Capacity – High Capacity	576 TB		288 TB		144 TB	
Usable Storage Capacity – High Capacity	168 TB		84 TB		42 TB	
Storage Servers	12		6		3	

- Includes non-metered storage, storage dimensions are fixed
- Memory is fixed at 248 GB per node or VM
- Minimum calculation is based on 40% of cores per node
- High Redundancy (triple-mirroring) is required

Exadata Express Cloud Service

Simple to Use, Lower Cost Database Cloud Service

- Oracle Enterprise Edition including all DB options
- Runs on Exadata in Oracle Cloud
- Fully managed by Oracle
- Low cost, starting at \$175 per month



Oracle MySQL Cloud Service

The World's Most Popular Open Source Database in the Oracle Cloud



Oracle MySQL Cloud Service enables you to rapidly, securely and cost-effectively develop & deploy modern applications powered by the World's Most Popular Open Source Database

即将到来： Oracle Database 12c Release 2 for the Cloud

- Multitenant
 - Agility with online clones, refresh and online relocate
 - Lowest cost with 4096 PDBs
 - SaaS application containers
- Sharding
 - Elastic scalability with native sharding for global-scale apps
- In-Memory
 - Column-store on Active Data Guard
 - Increased performance (up to 60x faster than 12.1)

