Oracle Database Exadata Cloud Service

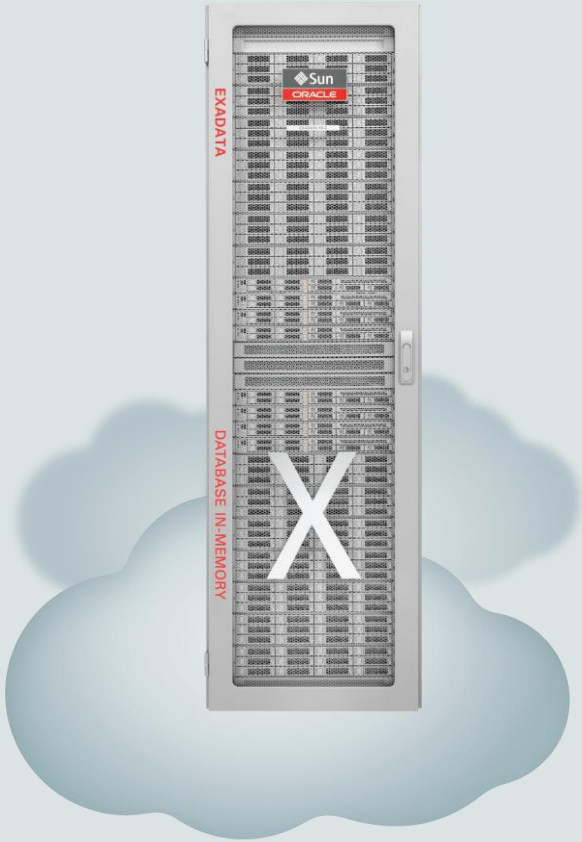
Technical Overview

Ashish Ray

Vice President of Product Management

Exadata, Recovery Appliance,

Maximum Availability Architecture (MAA)



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Safe Harbor Statement

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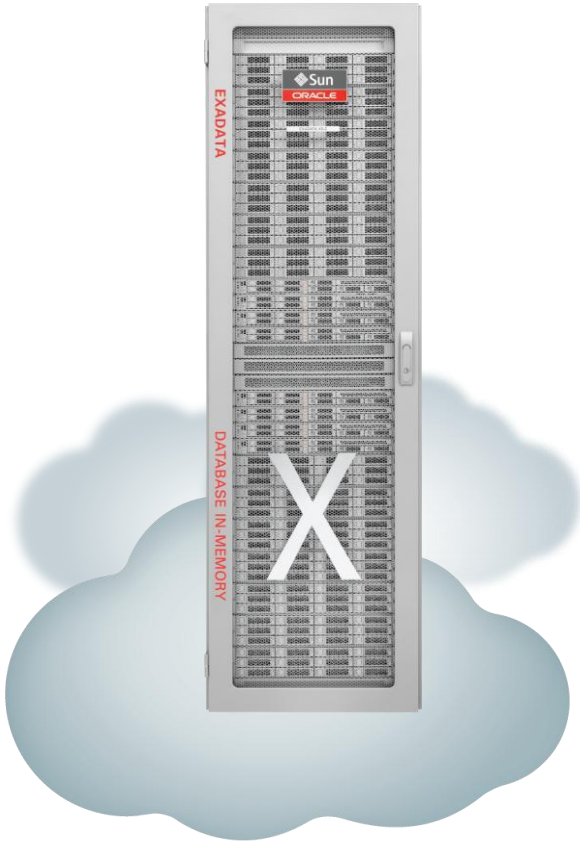
Exadata Cloud Service

1. Introduction
2. Service Details
3. Provisioning: Activation
4. Provisioning: Service Creation
5. Best Practices & Summary



Exadata Platform: A Quick Introduction

Exadata Vision

Dramatically Better Platform for All Database Workloads

- Ideal Database Hardware - Scale-out, database optimized compute, networking, and storage for fastest performance and lowest costs
- Smart System Software – specialized algorithms vastly improve all aspects of database processing: **OLTP, Analytics, Consolidation**
- Full-Stack Integration – Database-to-disk optimization, automation, testing, patching, and support to reduce operational costs

Identical On-Premises and Oracle Public Cloud

Exadata Cloud Service

Proven at Thousands of Critical Deployments since 2008

Half OLTP - Half Analytics - Many Mixed

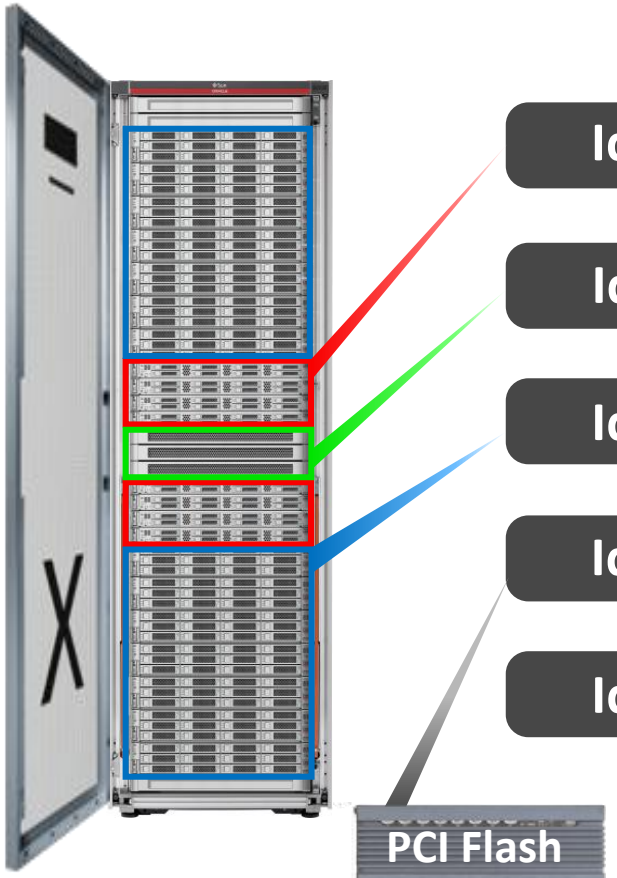
- **Petabyte Warehouses**
- **Online Financial Trading**
- **Business Applications**
  - SAP, Oracle, Siebel, PSFT, …
- **Massive DB Consolidation**
- **Public SaaS Clouds**
  - Oracle Fusion Apps, Sales*force*, SAS, …

4 OF THE TOP 5

BANKS, TELCOS, RETAILERS RUN EXADATA

Ideal Hardware Architecture for Database

Most Advanced - Highest Performance - Always Available - Starts Small, Scales Huge



Ideal Server Architecture	Scale-Out with Fastest CPUs
Ideal Network Architecture	Unified Ultra-fast InfiniBand
Ideal Storage Architecture	Scale-Out Servers + Database Offload
Ideal Flash Architecture	Ultra-fast NVMe PCIe Flash
Ideal Capacity Architecture	Tier PCIe Flash & High Capacity Disks

Smart System Software Highlights

Smart Analytics

- Move **queries to storage**, not storage to queries
- Automatically **offload and parallelize** queries across all storage servers
- **100X** faster analytics

Smart Storage

- **Hybrid Columnar Compression** reduces space usage by **10X**
- Database-aware **Flash Caching** gives speed of flash with capacity of disk

Smart OLTP

- **Special InfiniBand protocol** enables highest speed, lowest latency OLTP
- Ultra-fast transactions using DB optimized **flash logging** algorithms
- **Fault-tolerant In-Memory DB** by mirroring memory across servers

Smart Consolidation

- **Workload prioritization** from CPU to network to storage ensures QoS
- **4X** more Databases in same hardware

Exadata Advantages Increase Every Year

Dramatically Better Platform for All Database Workloads

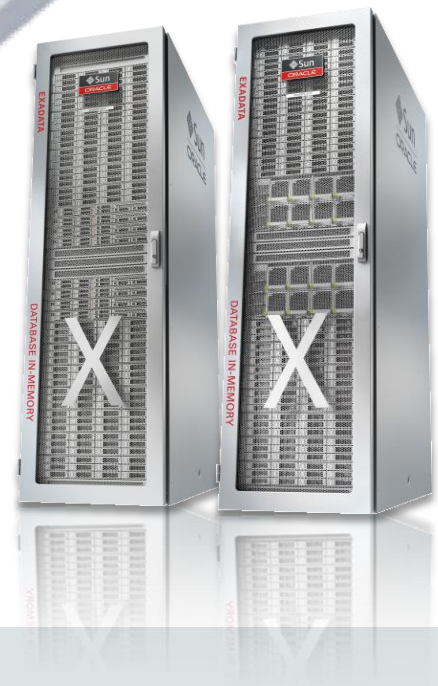
- **Exadata Cloud Service**
- In-Memory Columnar in Flash
- Smart Fusion Block Transfer
- In-Memory Fault Tolerance
- Direct-to-wire Protocol
- JSON and XML offload
- Instant failure detection
- Network Resource Management
- Multitenant Aware Resource Mgmt
- Prioritized File Recovery
- 3D V-NAND Flash

Smart Software

- IO Priorities
- Data Mining Offload
- Offload Decrypt on Scans
- Tiered Disk/ Flash
- Database Aware Flash Cache
- Storage Indexes
- Columnar Compression
- PCIe NVMe Flash
- Unified InfiniBand
- Smart Scan
- InfiniBand Scale-Out

Smart Hardware

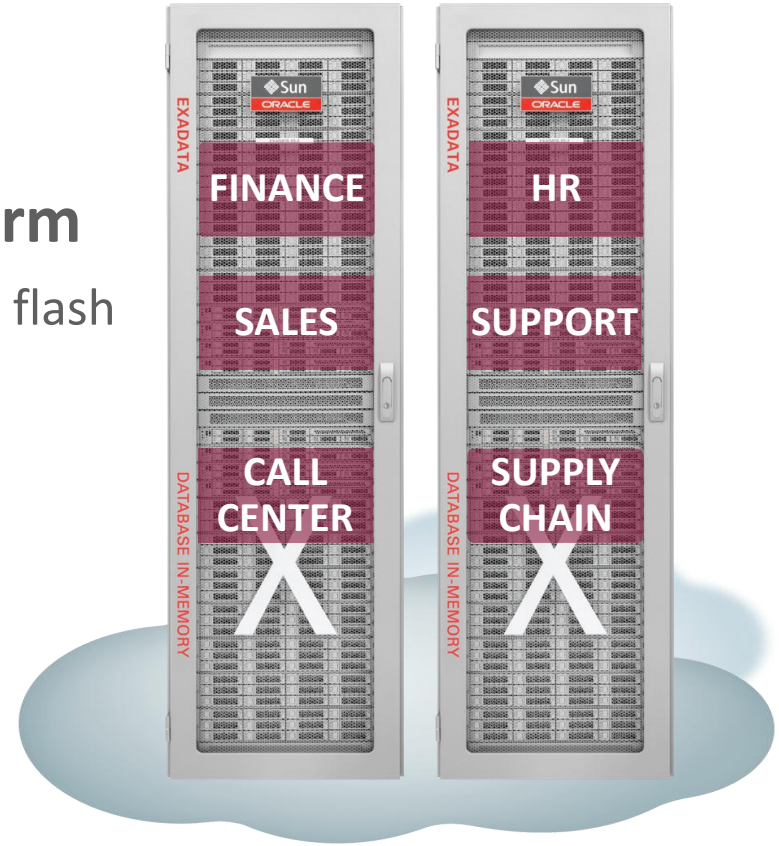
- DB Processors in Storage
- Scale-Out Storage
- Scale-Out Servers



Exadata Cloud Service

Oracle Database **Exadata Cloud Service**

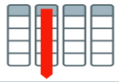
- **Full Oracle Database with all advanced options**
  - #1 database for mission critical OLTP and DW
- **On fastest and most available database cloud platform**
  - Scale-Out Compute, Scale-Out Intelligent Storage, InfiniBand, PCIe flash
  - **Complete Isolation** of tenants with no overprovisioning
- **All Benefits of Public Cloud**
  - **Fast, Elastic, Web Driven** Provisioning
  - **Oracle Experts Deploy and Manage** Infrastructure
  - **No Capex** Monthly Subscription



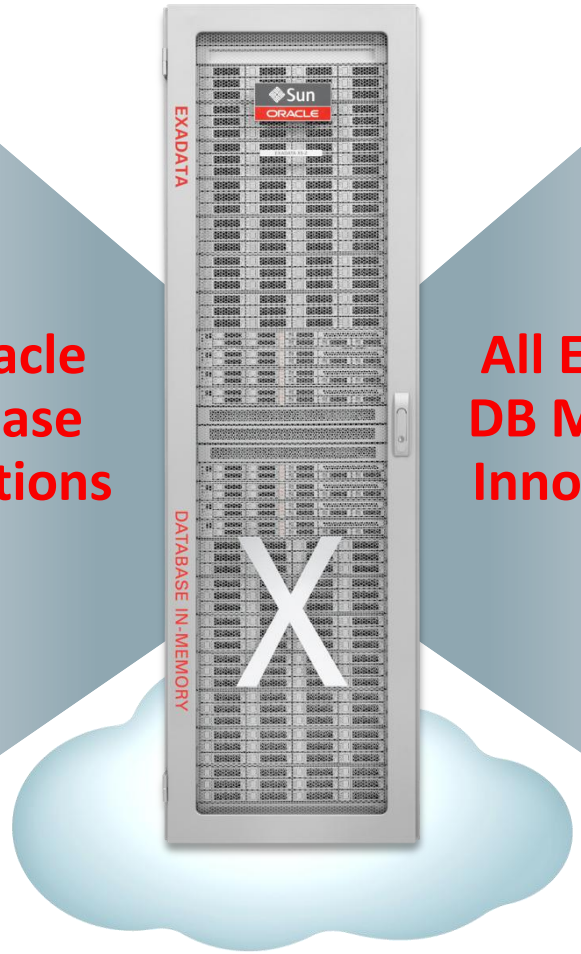
Best of On-Premises with Best of Cloud

Exadata Cloud: Compatible – Scalable – Available – Secure

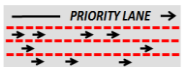
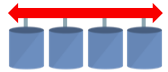
Decades of Database Innovation Proven at Millions of Mission-Critical Deployments

	Multitenant
	In-Memory DB
	Real Application Clusters
	Active Data Guard
	Partitioning
	Advanced Compression
	Advanced Security, Label Security, DB Vault
	Real Application Testing
	Advanced Analytics, Spatial and Graph
	Management Packs for Oracle Database

All Oracle Database Innovations



All Exadata DB Machine Innovations

Offload SQL to Storage	
InfiniBand Fabric	
Smart Flash Cache, Log	
Storage Indexes	
Columnar Flash Cache	
Hybrid Columnar Compression	
I/O Resource Management	
Network Resource Management	
In-Memory Fault Tolerance	
Exafusion Direct-to-Wire Protocol	

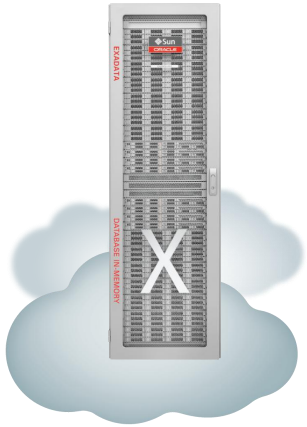
Easy Migration to the Cloud

- 100% Compatible with existing on-premises Databases
- Full portability across Hybrid Clouds

Use Cases

OLTP

Data Warehousing



In-Memory Analytics

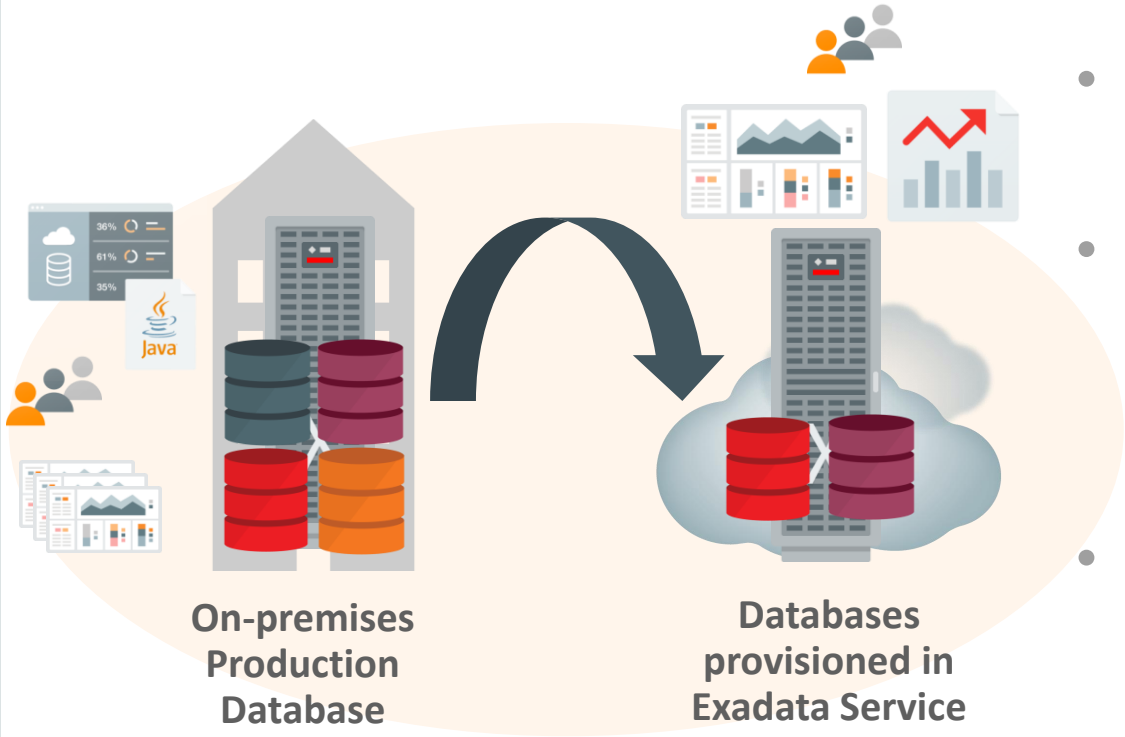
DB Consolidation

- Mission Critical Production Databases
  - Single large DB or Consolidate many
- Disaster Recovery and Reporting in the Cloud
- Test, Development, Certification, Try before Buy

Exadata Service enables extending Data Centers beyond today's physical limitations …

Example: Extending the Data Center

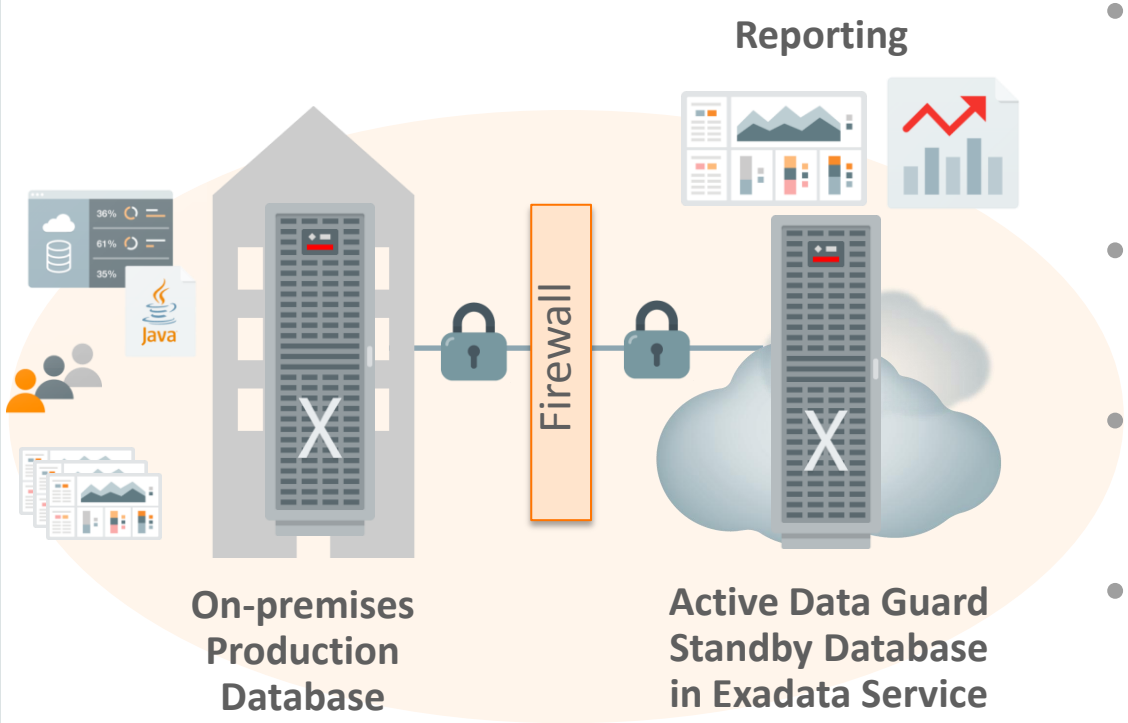
Test / Dev / Proof-of-Concept / Time-sensitive New Business Initiatives



- Eliminates need to maintain non-prod IT infrastructure
- Enables quick provisioning of production-alike databases to satisfy time-sensitive large-scale business demands (e.g. testing a marketing campaign, rolling out a new product launch, etc.)
- Exadata Service enables consolidation of multiple databases in one robust platform

Example: Extending the Data Center

Hybrid DR + Reporting



- Eliminates need to maintain DR infrastructure with elastic availability of DR site and standby database
- Off-site DR location satisfies compliance & regulatory requirements
- Active Data Guard standby database enables cloud-based reporting
- Exadata Service enables consolidation of multiple standby databases in one robust platform

Ref. *Disaster Recovery to the Oracle Public Cloud - Production on Premises, DR in the Cloud*

Full Stack in Cloud: Large Pharmaceutical Company

Goal

Gauge the readiness and ability to provide a new service offering to its R&D business unit

Challenge

Rapid deployment of Databases to its R&D users

IT can deploy Database quickly for other groups, but as it relates to R&D's specific requirements, deployments can take 2-3 months and cannot support the 3rd party tools which R&D needs to leverage

Solution

Exadata Cloud Service + Dedicated Compute Service targeted for R&D functions of analytics, testing, and certification workloads

Cloud offering more favorable due to reduced overall cost of ownership

This also fits within the company strategy of reducing CapEx and reducing space within the datacenters

App Modernization: Large Retailer

Goal

Rapid merchandising planning well ahead of the 2016 retail holiday season

Fast scaling and bursting, modern infrastructure acquisition with strong pressure to reduced capital spend

Reduce data center footprint across 3 distributed data centers

Produce a predictable spend model over a 10 year period

Challenge

Existing custom merchandising application for retail size profiling and optimization no longer able to address future business needs or capacity growth

Prevented timely analytics necessary to drive regular selection, purchase, and packaging of consumer product assortments for shipment to ~1000 stores and distribution centers

Solution

Deploying a modern retail analytics application across Oracle Compute Service and Exadata Cloud Service

Production deployment in Ashburn data center; non-production in Chicago data center

Exadata Cloud Service for both prod & non-prod backend db-s

Extensive Test/Dev modules on Oracle Compute Cloud and dbs consolidated across Exadata Cloud

Future plans to deploy cloud-to-cloud DR using Data Guard

Apps Example: Manufacturing Company

Goal

Migrate its on premises Oracle E-Business Suite mission critical applications into the cloud

Challenge

Aging hardware and a reduced budget has forced a re-evaluation of how and where to host the company's E-Business Suite

With the looming loss of hardware, test/dev/UAT instances are in jeopardy

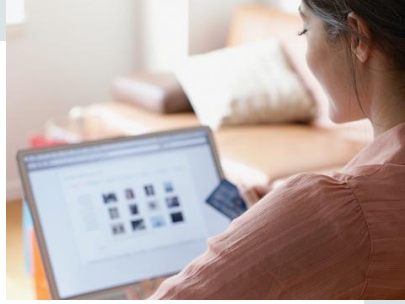
Solution

Exadata Cloud Service + Dedicated/Elastic Compute Service combined with the Oracle Cloud marketplace will allow this company to migrate their Oracle E-Business Suite into the cloud

Enable quick spin-up of test/dev/UAT instance with gold/pre-created templates

Reduce CapEx and enable business agility for time-to-market

Disaster Recovery Example: Retail Clothing Company



Goal

Quickly and easily create an off site disaster recovery instance with as little cost as possible

Challenge

Currently has no disaster recovery solution in place for off site failover in the case of a loss of the main data center

This off site solution must match their on premises Exadata solution so that they get the same level of performance

Solution

Exadata Cloud Service + Elastic Compute Service allows them to create an off site solution that mirrors production

Enables a scalable DR solution with significantly reduced total cost of ownership

Using Data Guard, the off site solution is in prefect sync with the local production database, leveraging the same DBA skills

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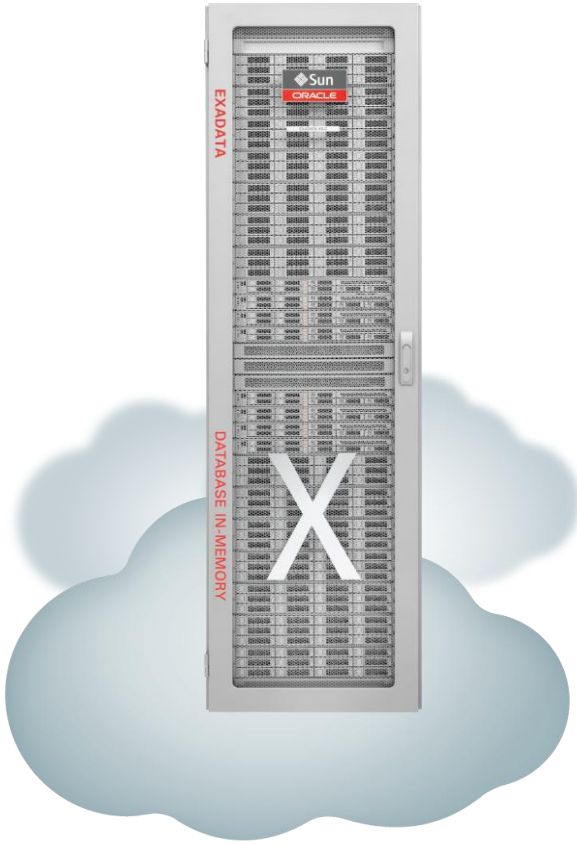


Service Overview

Allocation Unit: Quarter Rack	
OCPUs (min-max) [1]	16 - 68
Total Memory	1/2 TB
PCIe Flash	19.2 TB
Usable Storage[2]	42 TB
Max DB size[3]	16.8 - 33.6TB

- Customer requests Exadata Service on Oracle Cloud Portal
  - Provides system size; Database names, sizes, versions, etc.
  - Pricing is based on Database CPU Cores enabled
- Start with a minimal number of cores within a Quarter Rack
  - Minimum: 16 cores, enable additional cores on demand
  - Access to full 42 TB of storage, 900K IOPs
  - Can expand to 100s of Cores, 100s of TB storage, Millions of IOPs
- Exadata System automatically provisioned for customer
  - Assured hardware resources: no server or storage over-provisioning
- Databases requested by customer prebuilt and ready to run
  - Oracle Database and Exadata software includes all options and features
  - Oracle Database 11.2.0.4 or 12.1.0.2, Grid Infrastructure 12.1.0.2
  - Automation tools provided to backup, patch, upgrade, and add databases

1. *OCPU = Oracle CPU = 1 usable compute core*
2. *After high-redundancy mirroring, but before database compression*
3. *After provisioning DATA and RECO disk groups, actual space depends on space needed for local backups*

Available Service Offerings

	Metered	Non-metered
Minimum subscription duration	1 month	12 months
Use Case	Short-term projects e.g. Test/Dev, app certification, PoCs, trials, performance validation, etc.	Long-term subscriptions for production applications, on-going dev/test projects, application development, etc.
Funded by	Database PaaS pre-paid funds	Exadata Cloud Service subscriptions

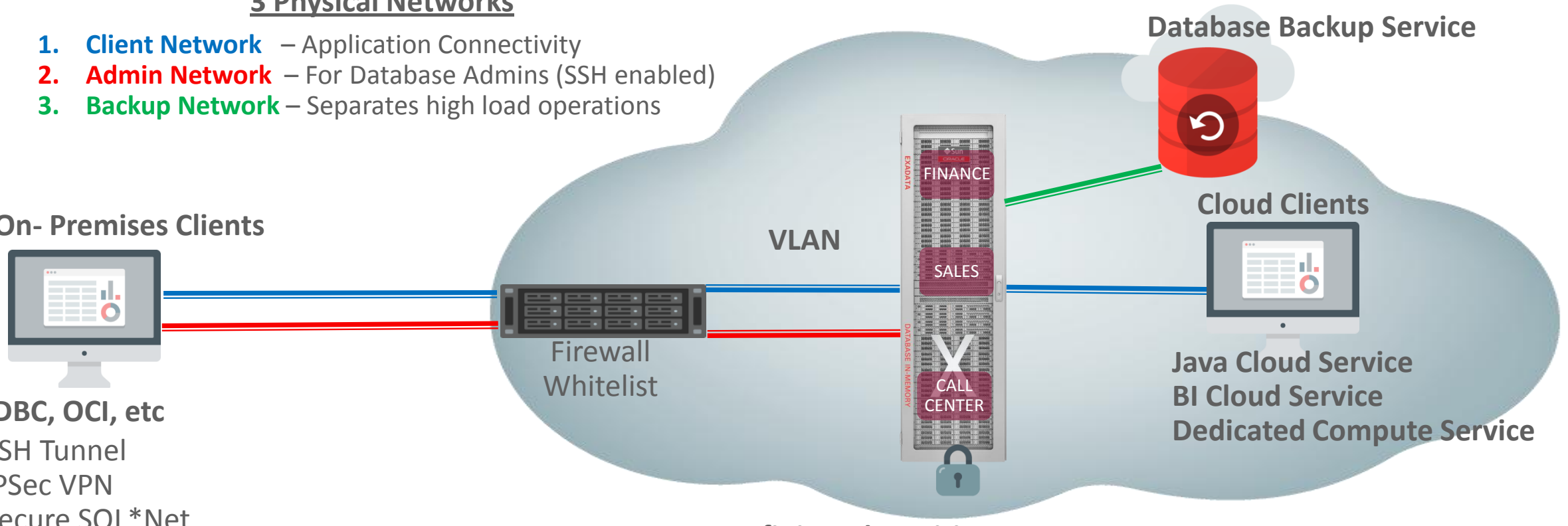
Management & Maintenance

- Customers control and manage software that directly affects their application
  - Database, OS, Clusterware
- Oracle manages underlying infrastructure
  - Facilities, servers, storage, storage software, networking, firmware, hypervisor, etc.
- Customers have administrator privileges for compute VMs and databases so they can configure and run the system as they like
  - Customers initiate automated patching script when it is convenient for them
  - Can be run rolling across nodes to avoid database downtime

Access and Security Model

3 Physical Networks

1. **Client Network** – Application Connectivity
2. **Admin Network** – For Database Admins (SSH enabled)
3. **Backup Network** – Separates high load operations



JDBC, OCI, etc

SSH Tunnel
IPSec VPN
Secure SQL*Net
FastConnect

InfiniBand partition per tenant

Databases encrypted by default

VM isolates hardware from tenant

High Availability

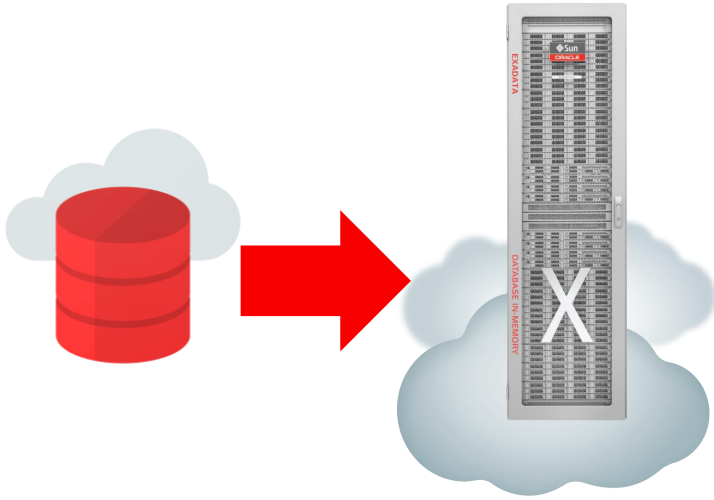
- All Exadata Maximum Availability Architecture features and practices
  - Full data protection, consistency, transactional isolation
  - Fully active RAC cluster
  - ASM High Redundancy
  - Redundant InfiniBand and Ethernet networks
  - Cloud to Cloud Standby Database using Active Data Guard on roadmap
- Decades of Database Availability technology and experience
  - Proven at 1000s of Banks, Telecoms, Retailers, Governments, etc.

Backup & Recovery

- Options:
  - Fast Recovery Area (FRA) on Exadata storage for local on-disk RMAN backups
    - Fastest backup and restore
  - RMAN backup to Oracle Database Backup Service
    - Lowest Cost
- Default Frequency:
  - Weekly level 0 backups + daily Incremental backups
- Can be configured at provisioning time

Options for Migrating Databases to Cloud

- 100% Oracle Database compatibility makes migration easy and low risk
- Logical Migration: allows reorganization and optimization
  - Data Pump, GoldenGate Replication
- Physical Migration: simplest, byte-to-byte copy
  - RMAN backup, Transportable technologies, Data Guard
  - Restore from backup on Oracle Public Cloud
- Data Movement Options:
  - Use public internet
  - Private high bandwidth virtual network (FastConnect)
  - Data Transfer Services
- MAA Migration Best Practices "Best Practices for Migrating to Exadata Database Machine"



Upsize / Expand

- All memory and storage enabled
- Enable additional cores online (e.g. 16 → 68 per Qtr Rack)
  - Requires symmetric distribution of additional cores across the Rack (e.g. add cores in multiples of 2 for a quarter rack, 4 for a half rack, 8 for a full rack)
- System expansion options: Quarter Rack → Half Rack → Full Rack
- Subscribe to a new system with the upsized configuration: same workflow as activating original rack
  1. Transfer data using RMAN or Data Guard
  2. Migrate client access by changing customer DNS to new system IP addresses
- Easy Expansion by individual DB or Storage server coming in later release
- De-provision old rack through “Delete Service” of original rack
  - Delete runs Secure Erase of storage cell using 7 pass option

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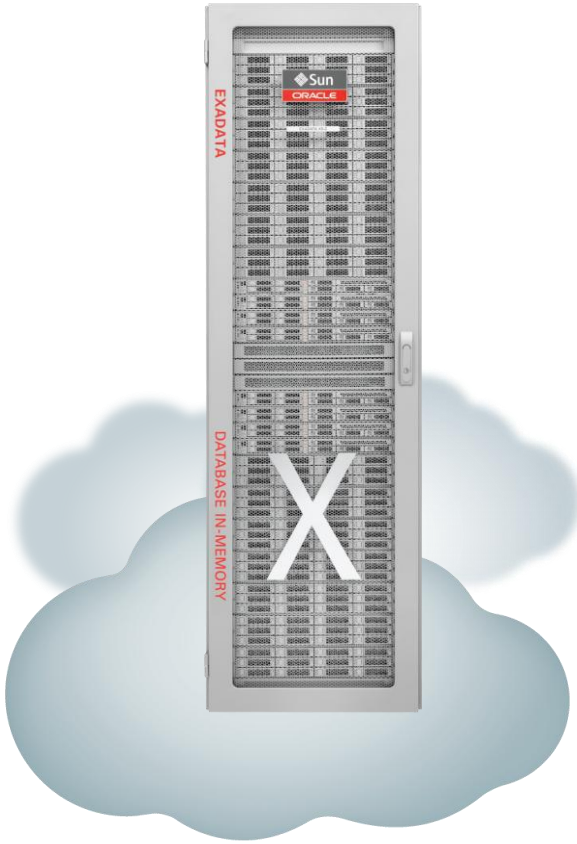


ORACLE Cloud

Hello Oracle Cloud User,

Thank you for subscribing to Exadata Cloud Service.

During the process of purchasing Oracle Cloud Services, you have been designated as the activator for this service.

Your next step is to activate the service by clicking Complete My Order. Follow the on-screen instructions to complete the activation.

Complete My Order

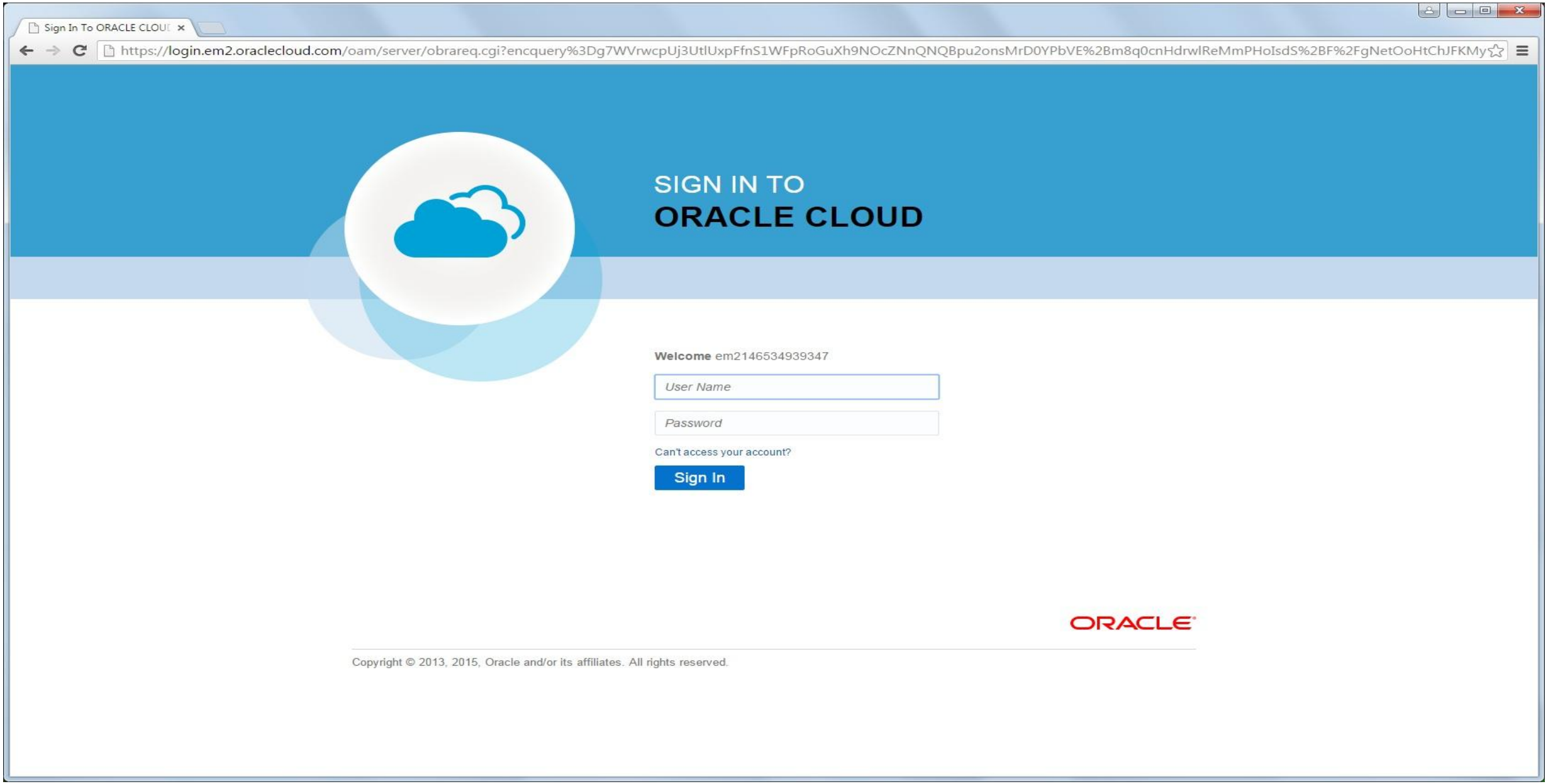
Subscription Details

Exadata Cloud Service

- **Subscription ID:** 500098623
- **Deployment Type:** Production
- **Data Region:** North America
- **Customer Account:** Urban Beans (US)

Order Details

- **Order ID:** 10296
- **Order Date:** Tuesday, October 13, 2015 9:25 PM PDT


Sign In To ORACLE CLOUD
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SIGN IN TO
ORACLE CLOUD
Welcome em2146534939347
User Name
Password
Can't access your account?
Sign In
ORACLE
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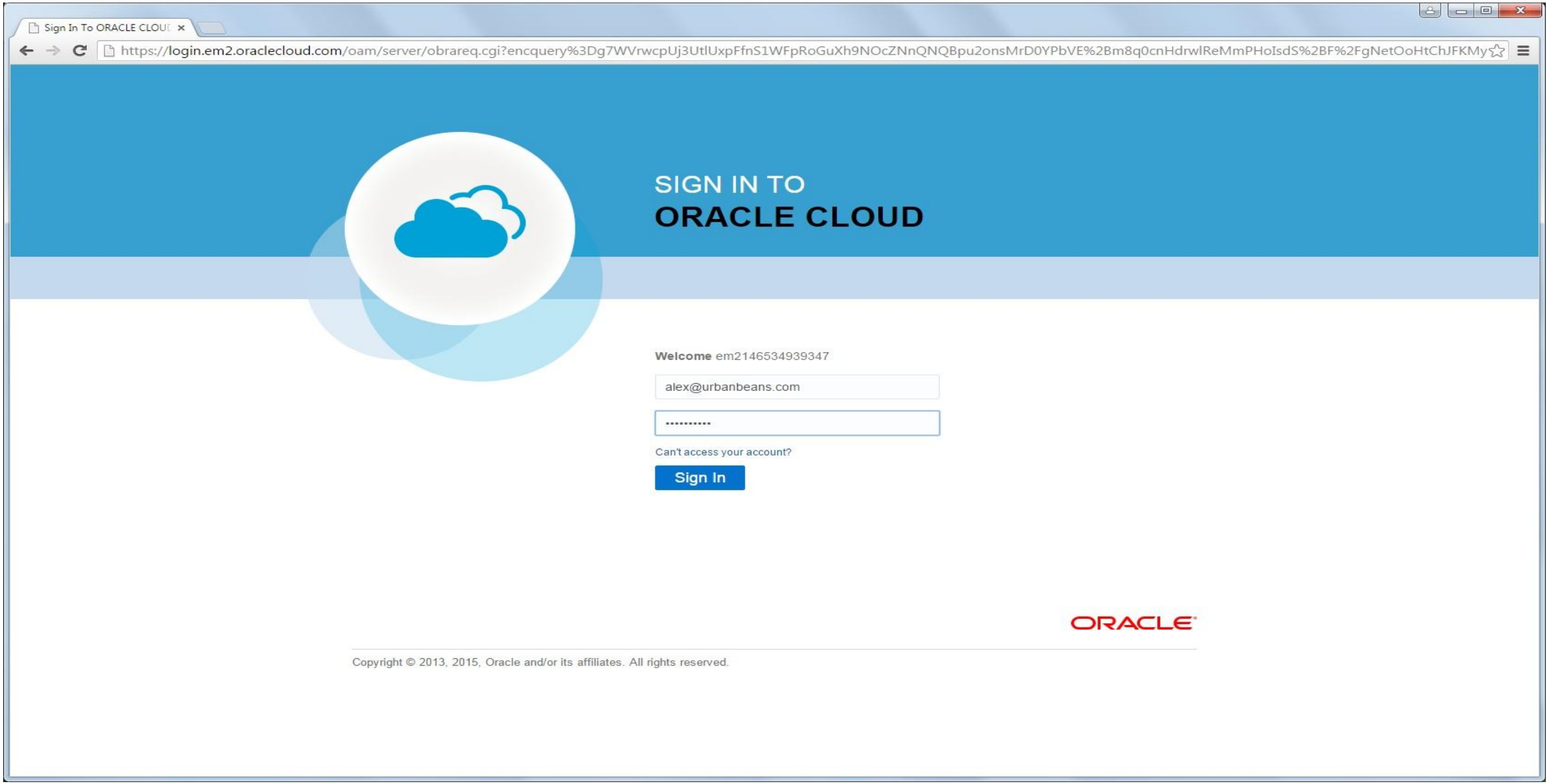

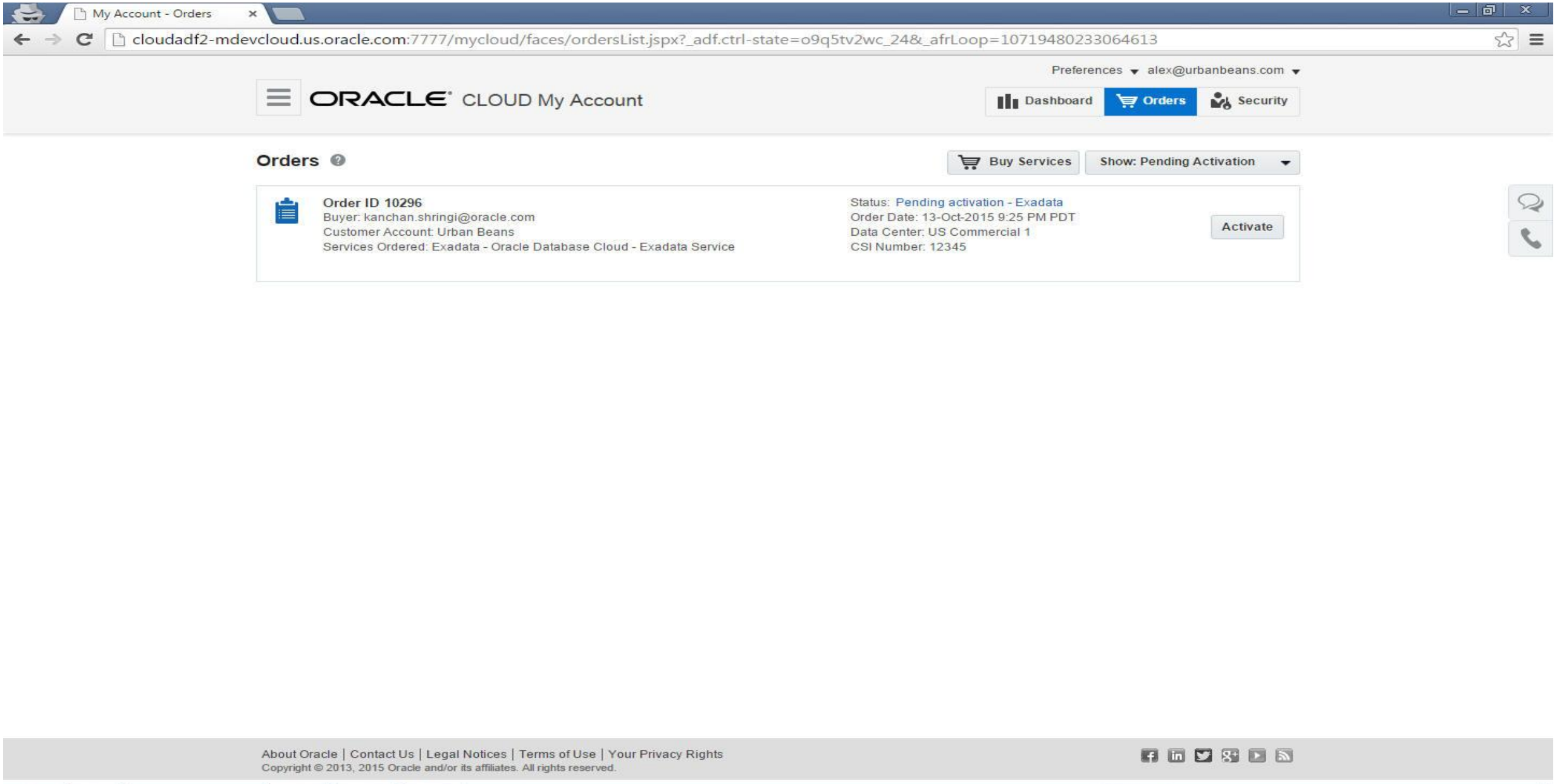

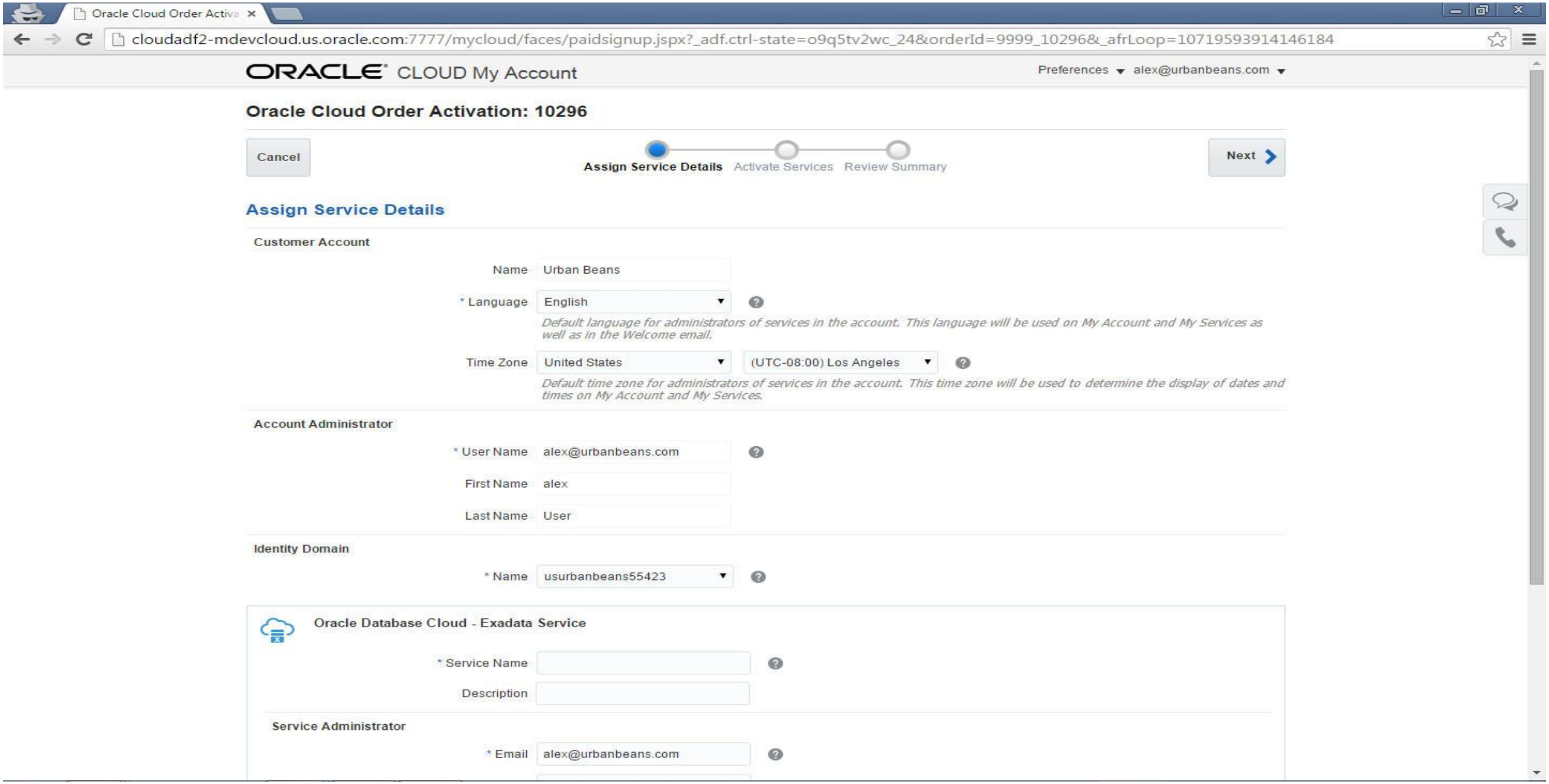

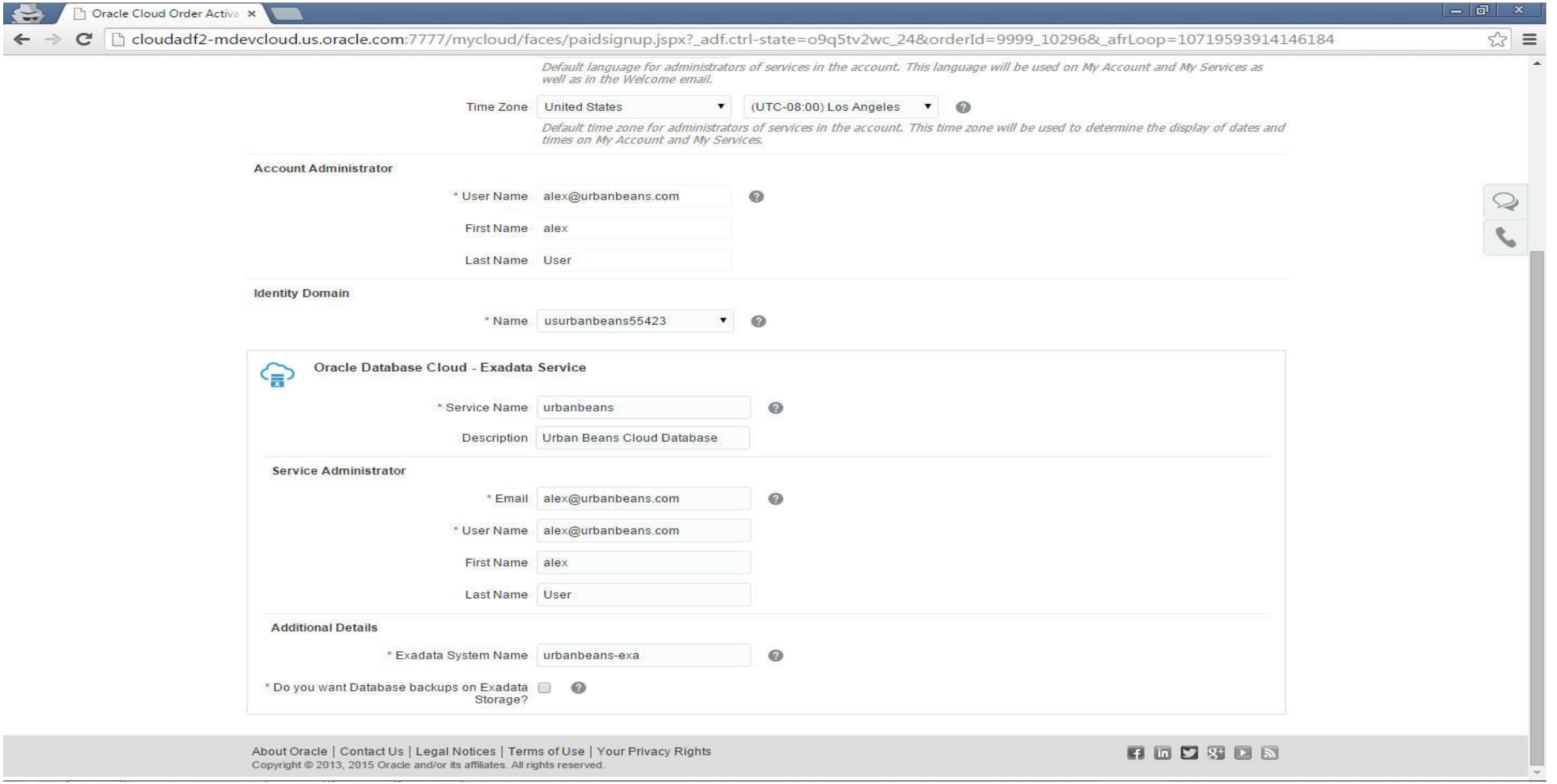

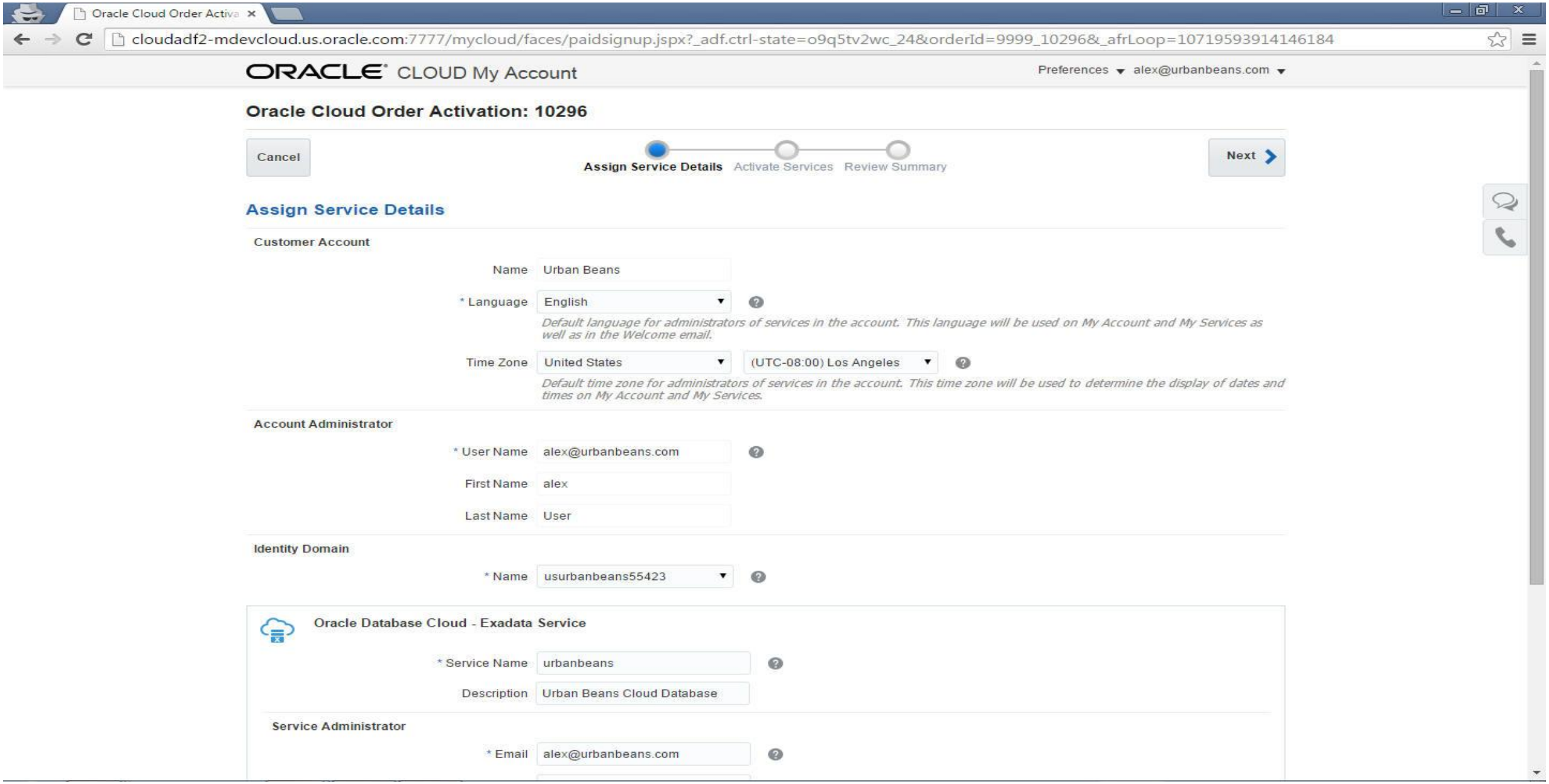

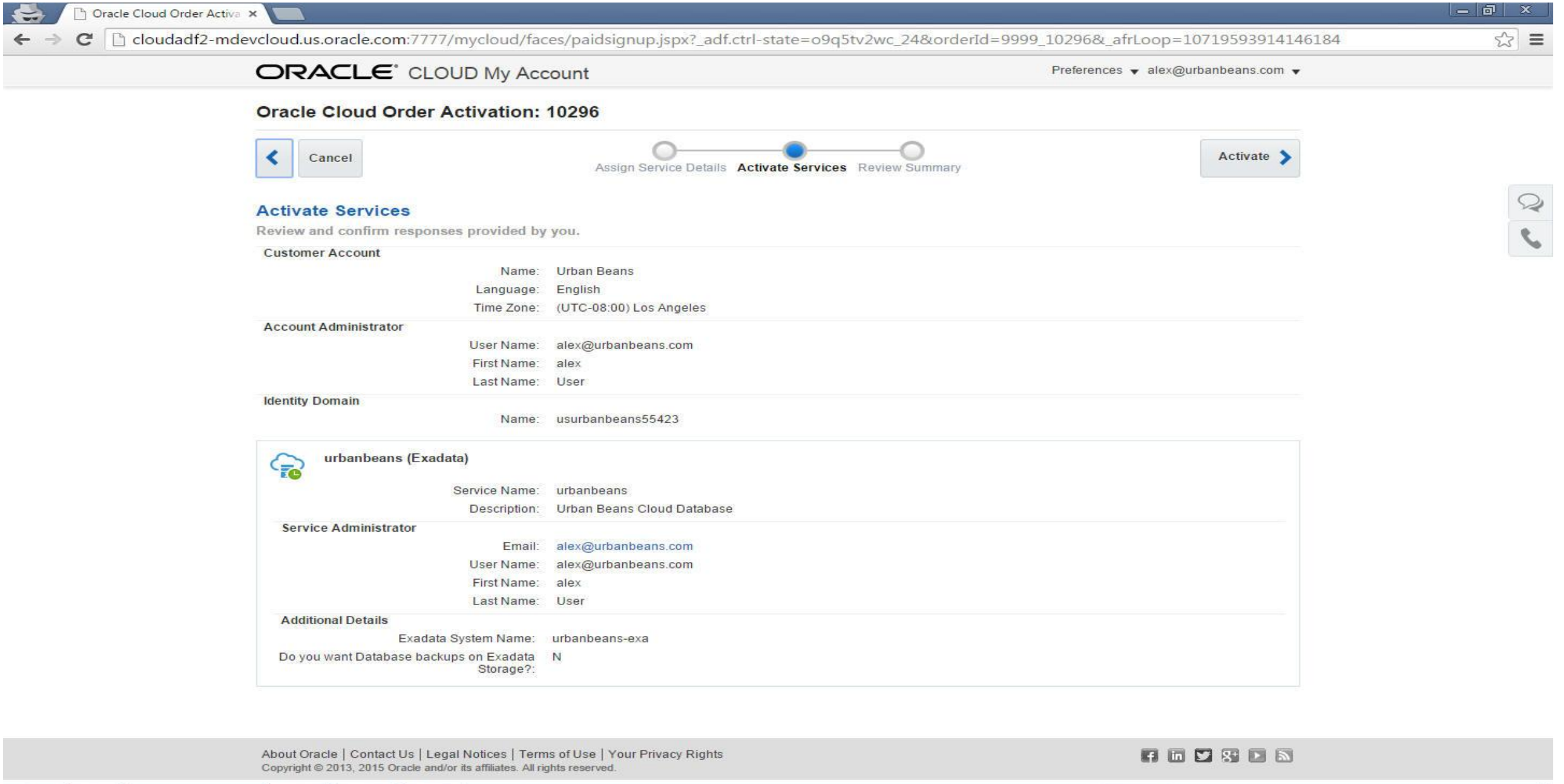

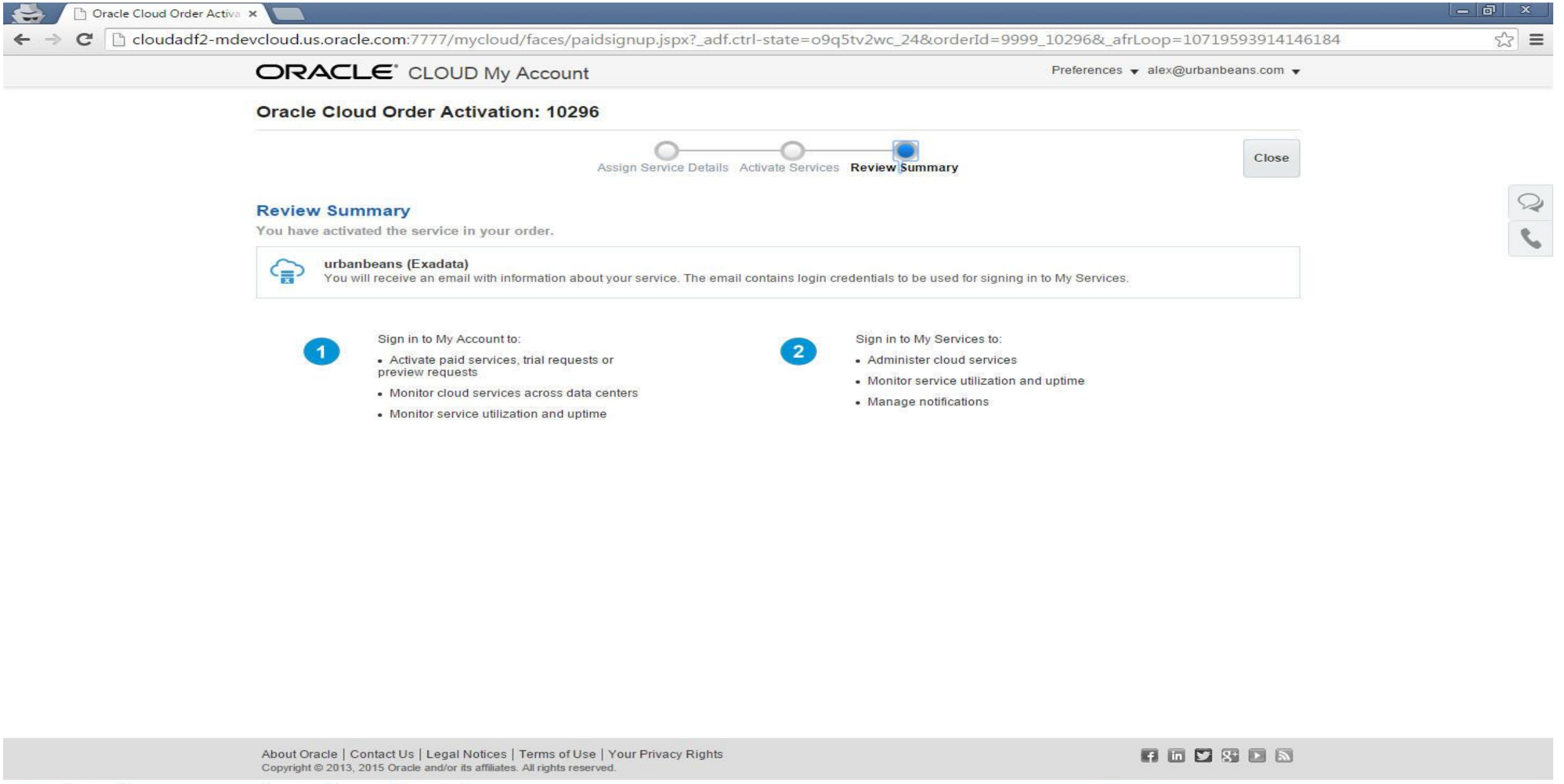

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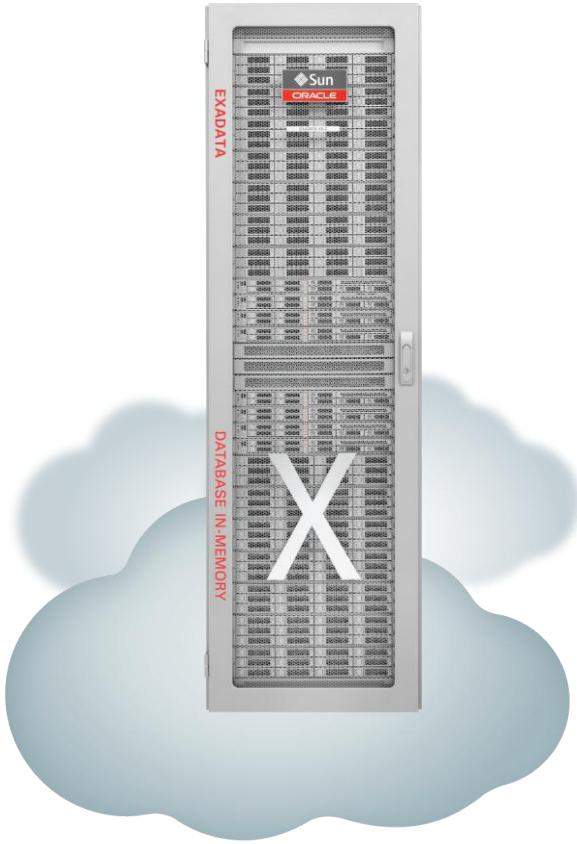
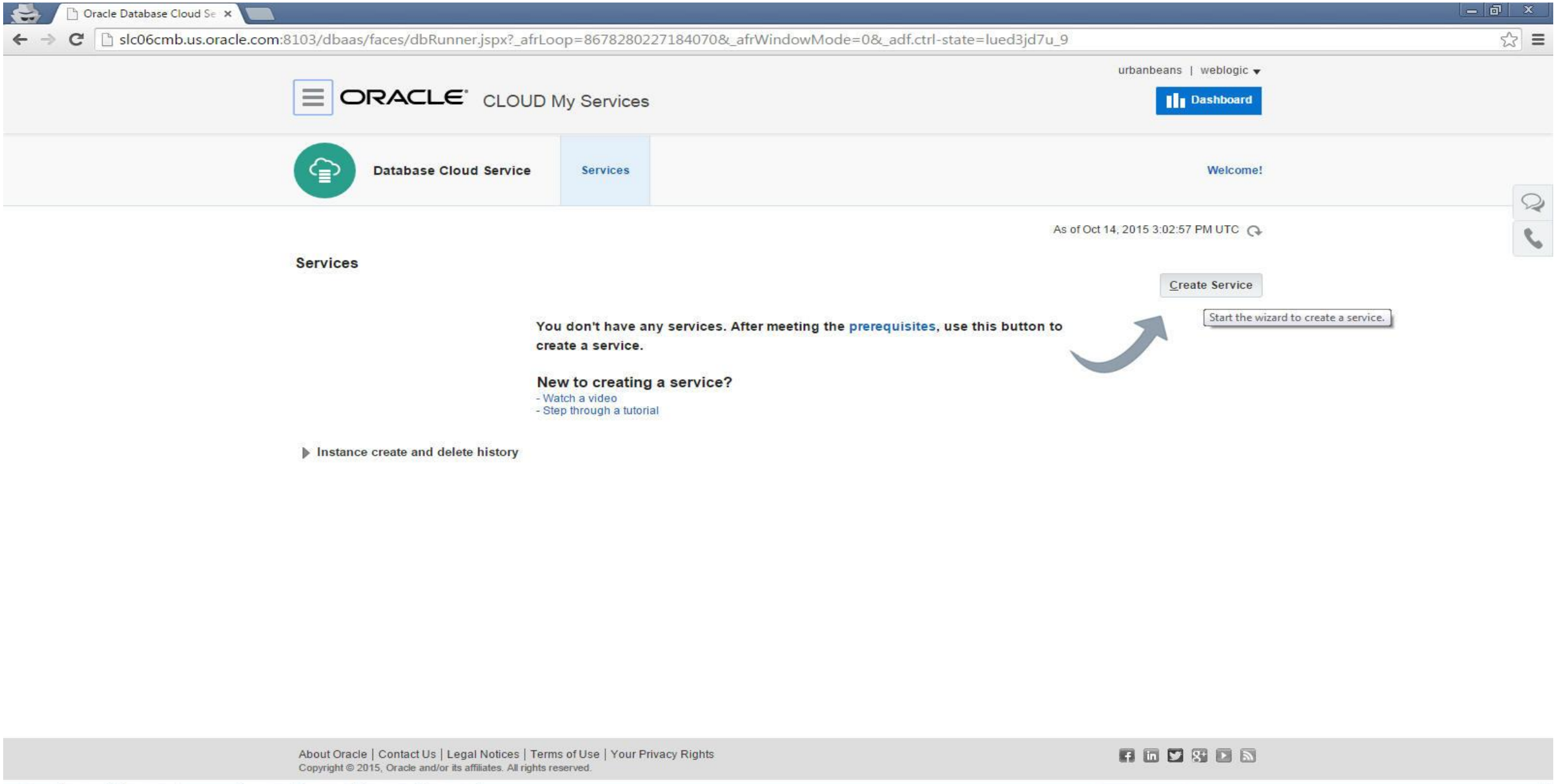
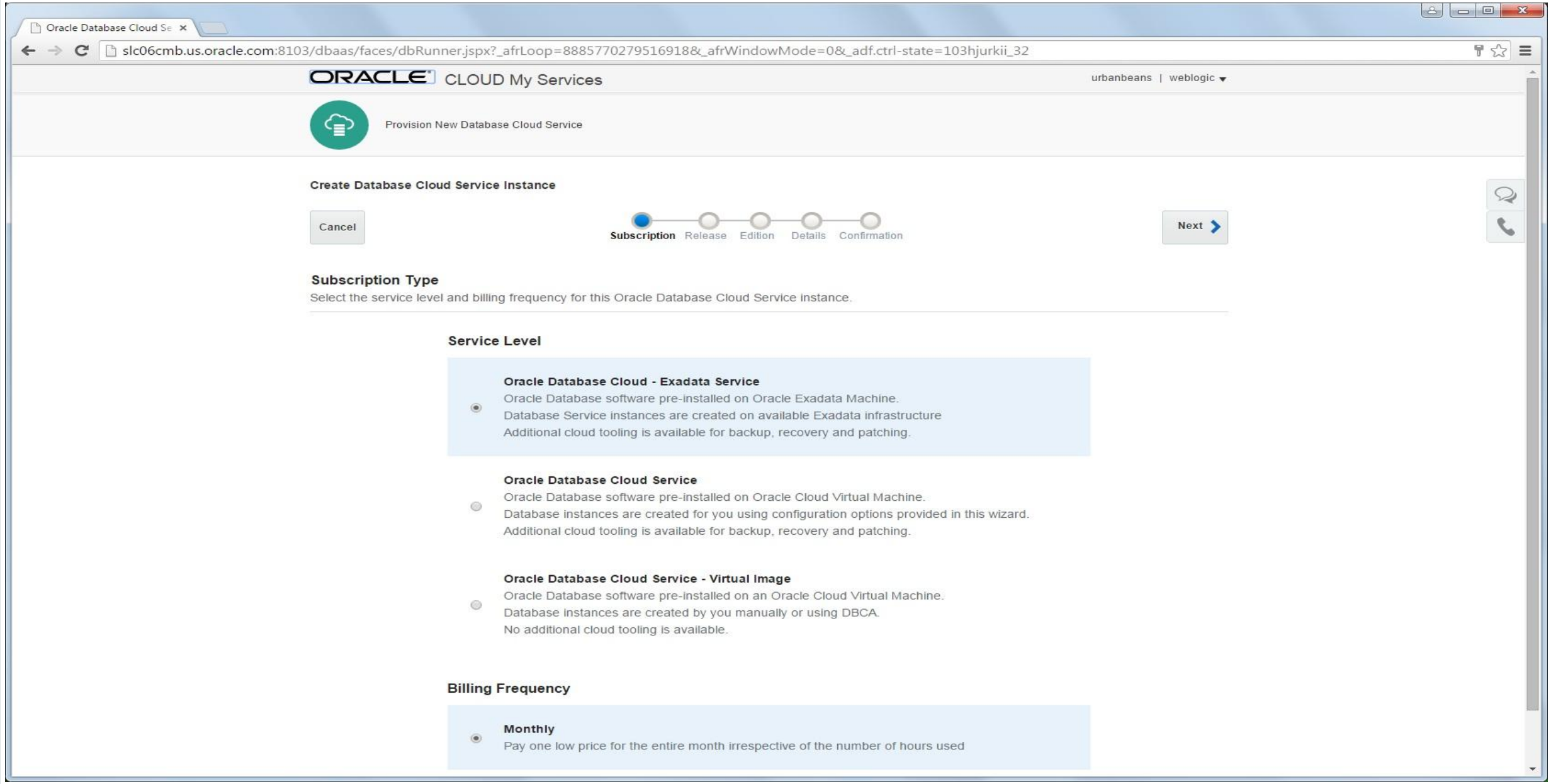
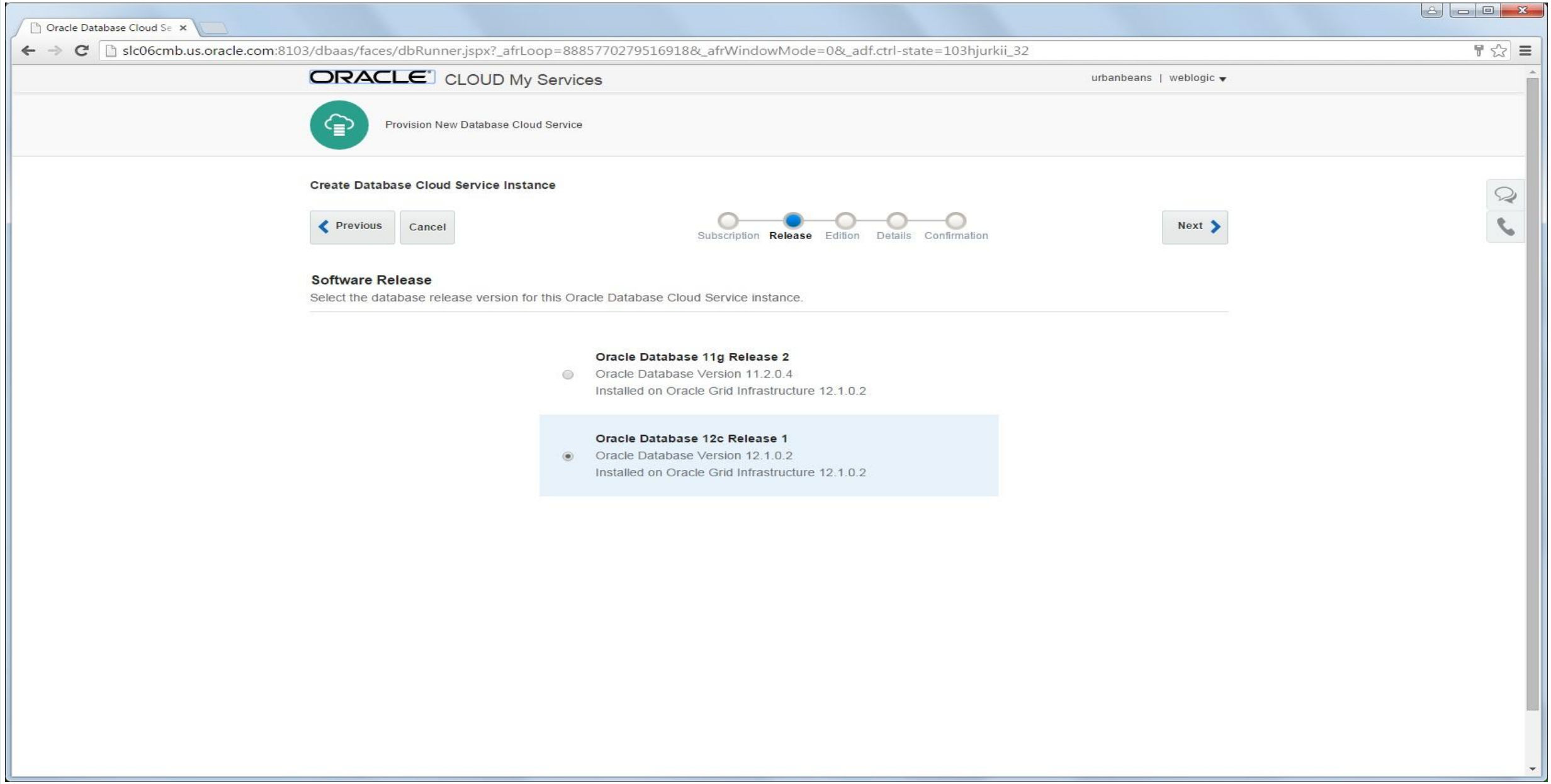
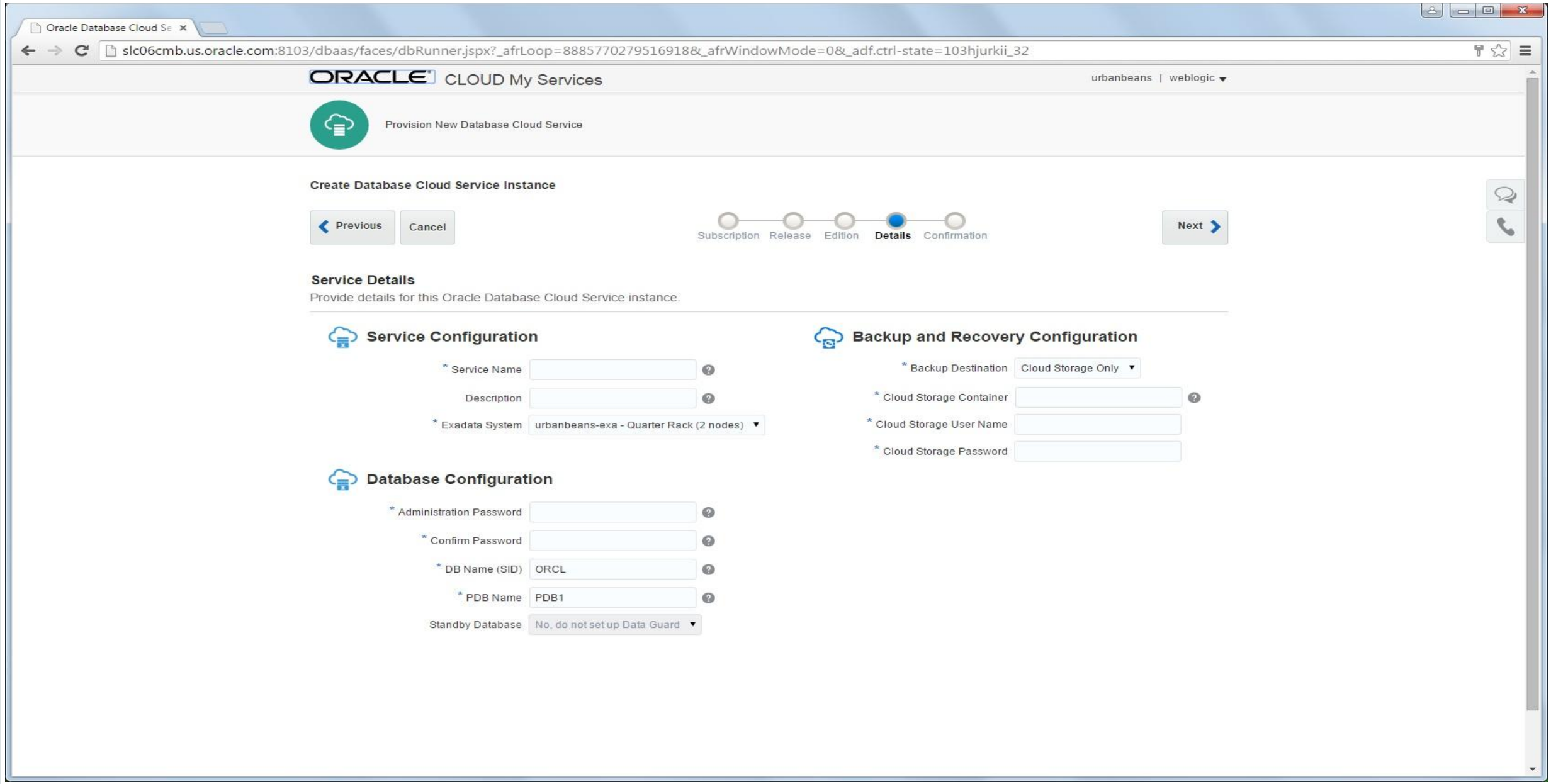
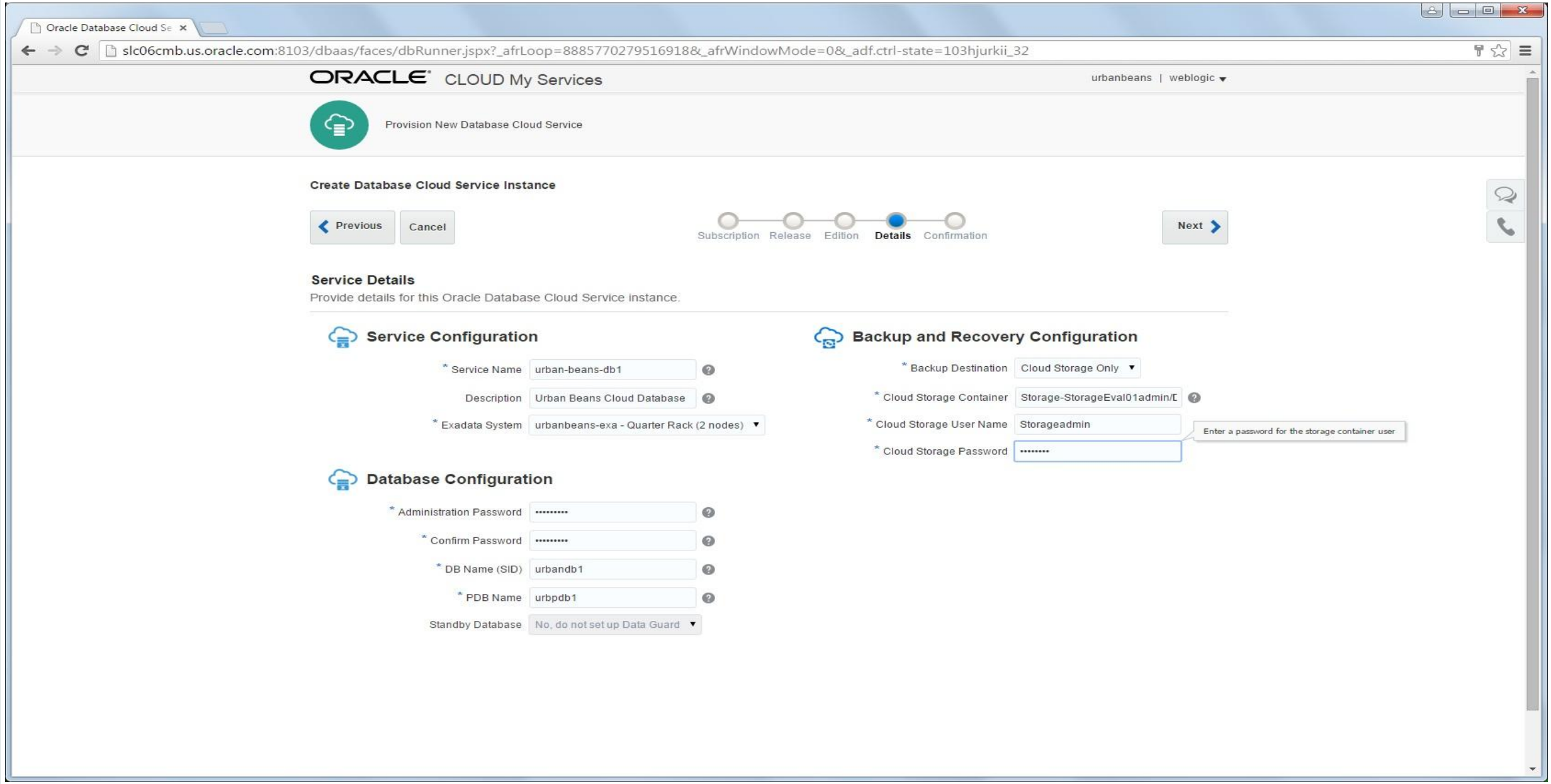


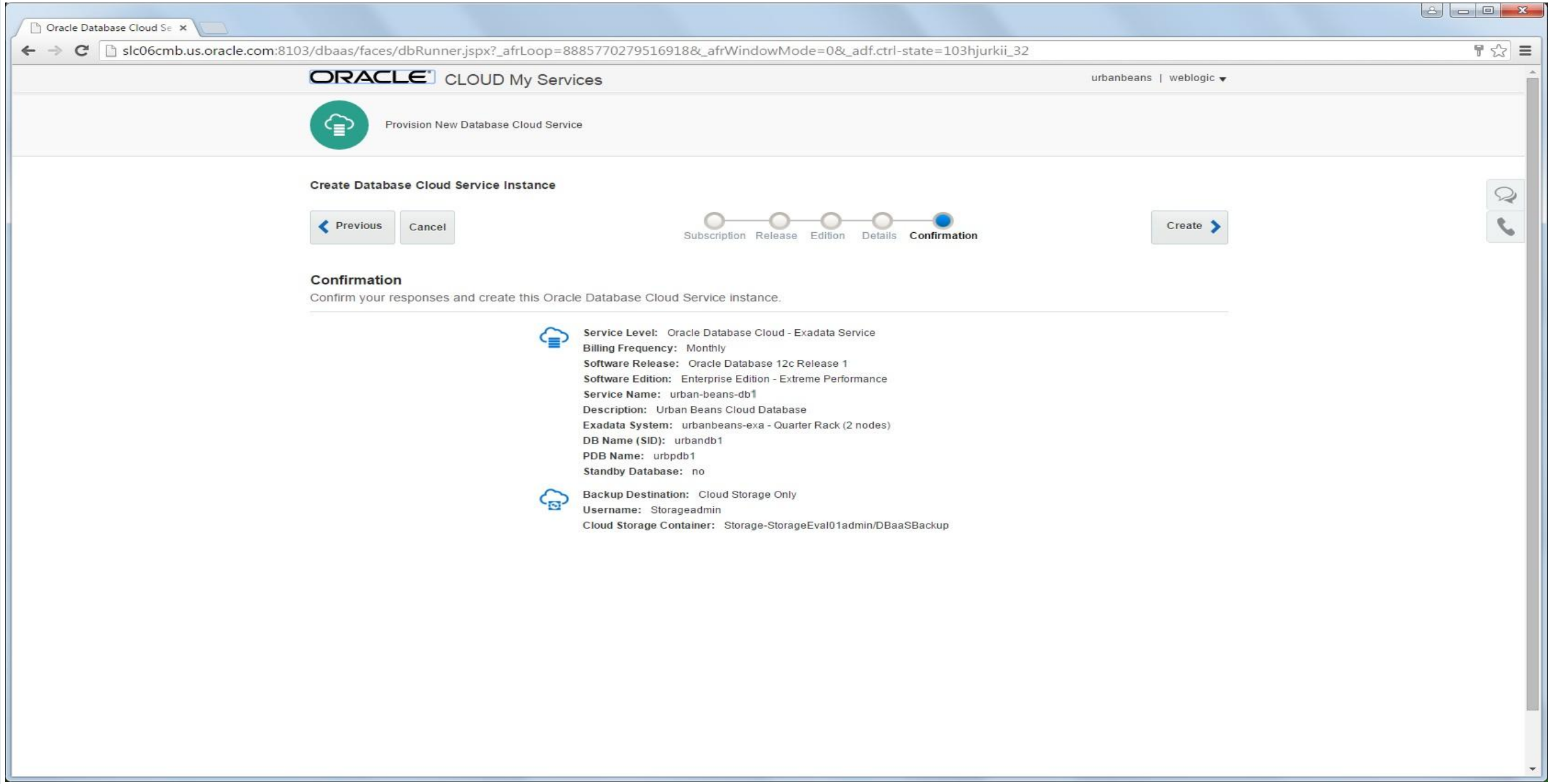


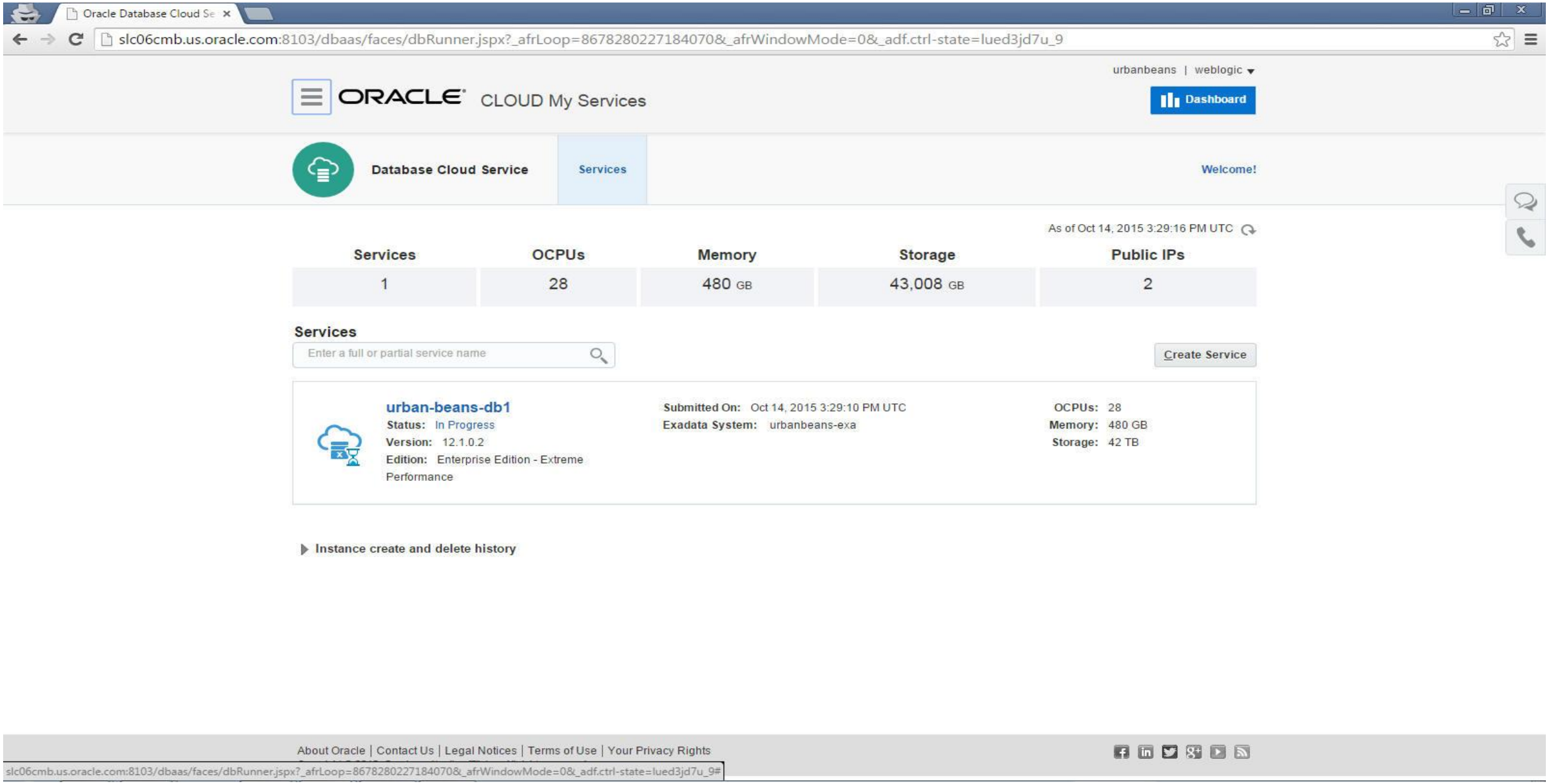


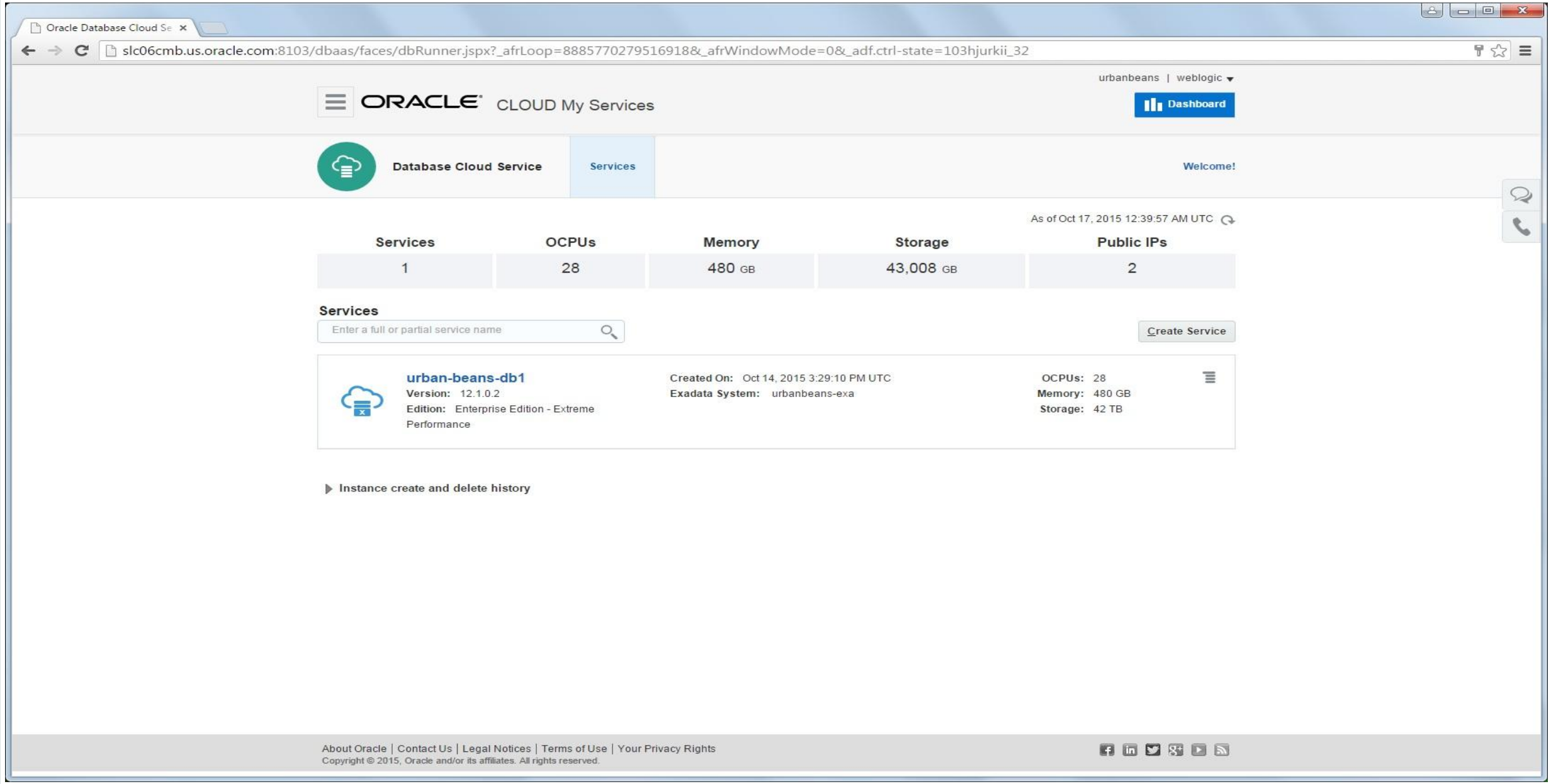


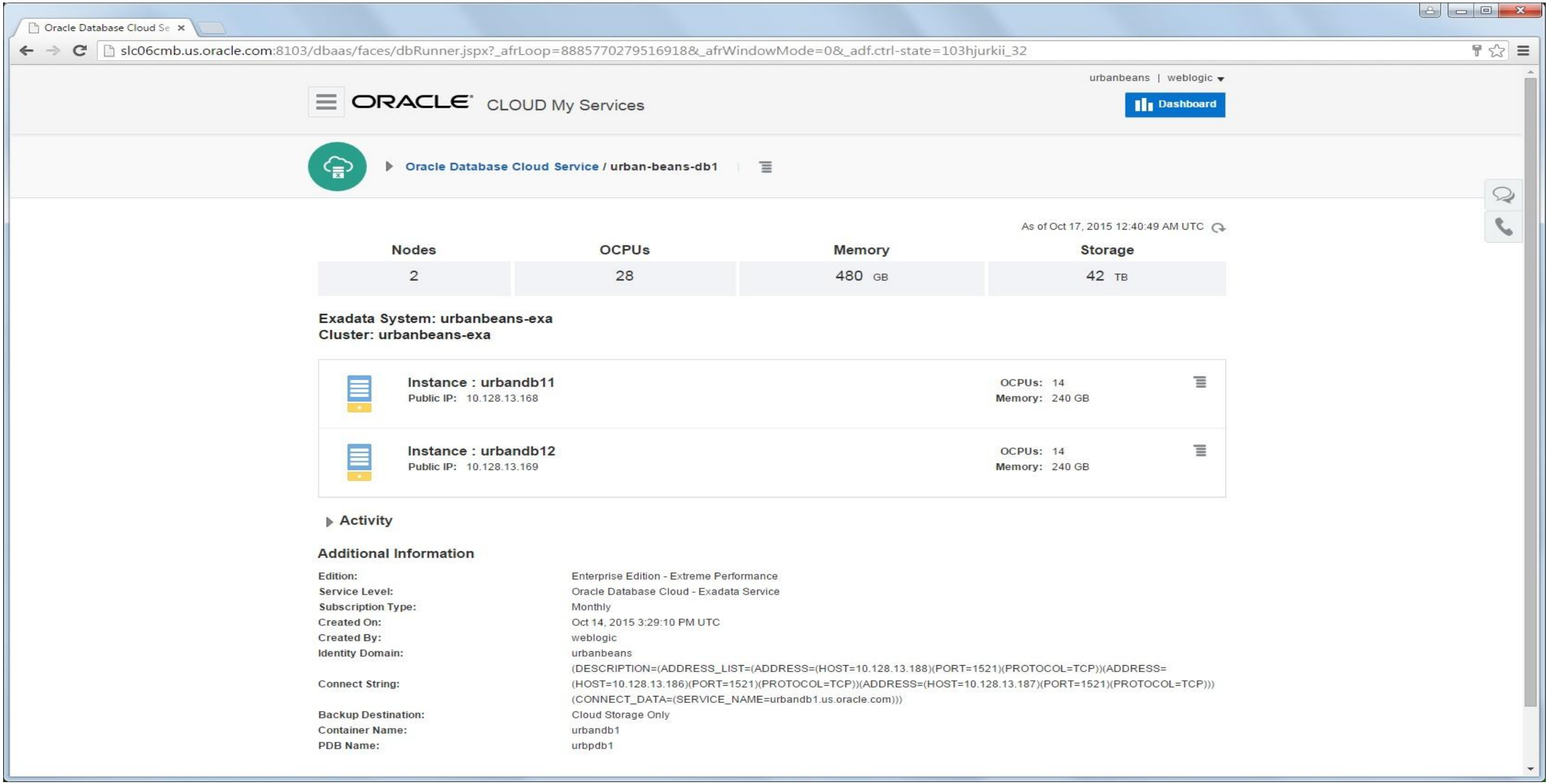






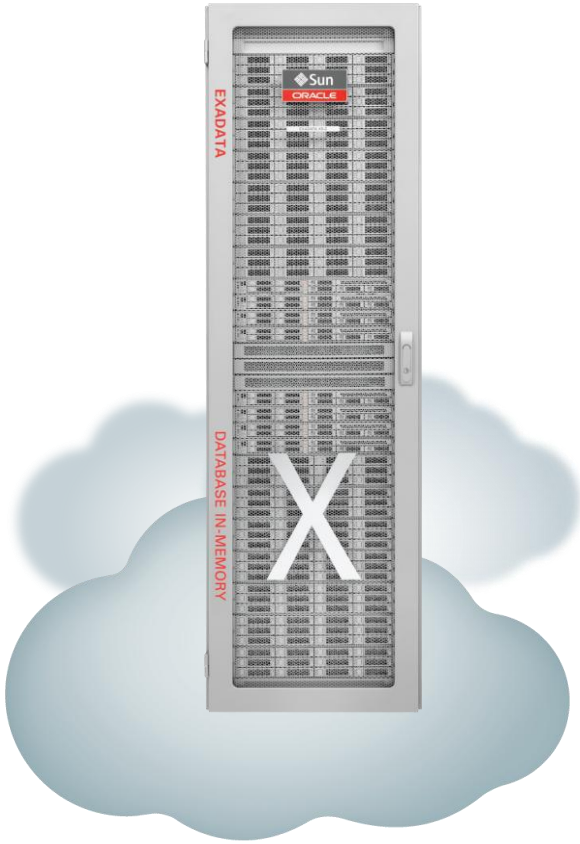






Exadata Cloud Service

1. Introduction
2. Service Details
3. Provisioning: Activation
4. Provisioning: Service Creation
5. Best Practices & Summary



Best Practices: Deploying Databases with Exadata Service

- Application latency
  - Deploy middle-tier on Oracle Dedicated Compute Service or Public Compute Service for low-latency connectivity
  - Use Fast Connect solutions to enable secured, low-latency connectivity from on-premises production / management applications
- Security
  - Enable least permissive rules during white-listing ingress IP addresses and enabling ports
- Patching and Validation
  - Oracle provides regular DB patchset updates and security patches when available
  - Keep database deployment patched to recommended levels
  - Patch automation tooling available to apply these patchset updates
  - Verify backup & recovery processes by regularly recovering databases from automated backups

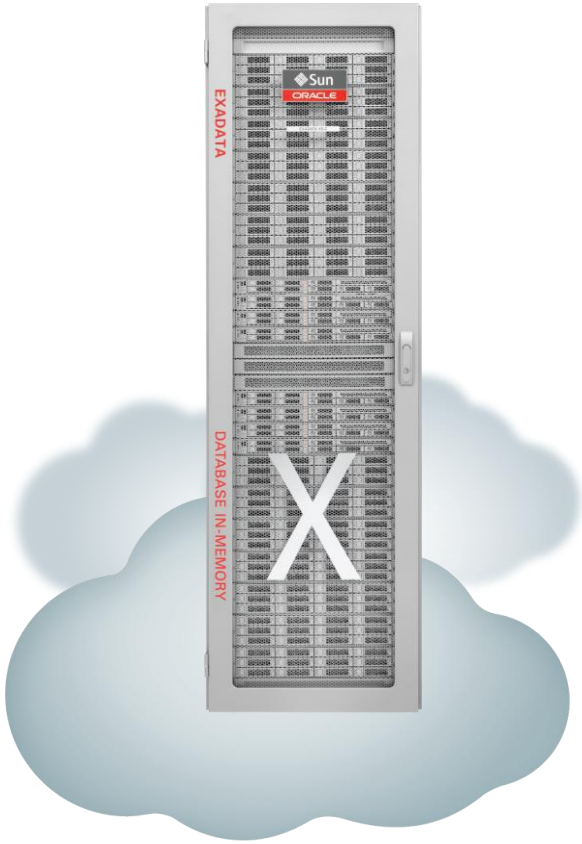
Summary: Oracle Database Exadata Cloud Service

Best Database on Best Cloud Platform

- **100% Compatibility (Hybrid Cloud)**
  - No application & data model changes
  - Data moves back and forth seamlessly
  - Run any infrastructure component in any location
- **All Database Workloads in one Unified Cloud Service**
  - Analytics, data warehousing, OLTP, consolidation, mixed-workloads
  - No need to use distinct cloud platforms for distinct workloads
- **Serious Infrastructure for Serious Databases**
  - Ideal Database hardware, not commodity servers and storage
  - Exadata unique innovations for performance, availability and security
  - Dedicated platform – no over-provisioning, noisy neighbors, etc.

For More Information

cloud.oracle.com/database



Integrated Cloud

Applications & Platform Services


ORACLE®