EM12c DBaaS Snap Clone Overview
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What is Snap Clone?

Snap Clone is a storage agnostic & self service approach to creating rapid & space efficient clones of large (~TB) databases.

**Storage Agnostic**
Supports ALL storage vendors (NAS & SAN)

**Self Service**
Empower the user to make adhoc clones

**Rapid**
Clone DBs in minutes not days/weeks

**Space Efficient**
Significantly reduce the storage footprint
Customer Scenarios with Snap Clone

Customer Scenario 1
[Telecom Industry]
- Prod DB = 12 TB
- Standby DB = 12 TB
- 7 Clones (7 * 2 GB of writable space) = 84 TB (14 GB)
- Total = 108 ~24 TB
- Time = days/weeks minutes

Customer Scenario 2
[Banking Industry]
- 5 Prod DB = 30 TB
- 5 Standby DB = 30 TB
- 5 Masked DB = 30 TB
- 6 Clones (6 * 5 * 2 GB of writable space) = 180 TB (60 GB)
- Total = 270 ~90 TB
- Time = days/weeks minutes

Over 99.97% Storage Savings and significant reduction in Time
Challenge 1: Lack of Automation

51% DBAs state dealing with manual tasks like provisioning & cloning of new databases for test/dev systems is too time consuming.

“Provisioning a database server takes us 4-5 days with involvement of different groups to create a system meeting enterprise standards. Need to roll out services on short order in matter of minutes and hours.”
# Current Database Provisioning Process

## Time Consuming and Inefficient

<table>
<thead>
<tr>
<th>Role</th>
<th>Task</th>
<th>Time Frame</th>
</tr>
</thead>
<tbody>
<tr>
<td>Developer</td>
<td>Request DB</td>
<td></td>
</tr>
<tr>
<td>Manager</td>
<td>Approval</td>
<td></td>
</tr>
<tr>
<td>DBA</td>
<td>Request HW and Storage</td>
<td></td>
</tr>
<tr>
<td>System Admin</td>
<td>Setup OS &amp; Network</td>
<td></td>
</tr>
<tr>
<td>Storage Admin</td>
<td>Allocate Storage</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Configure Cluster and create DB</td>
<td></td>
</tr>
</tbody>
</table>

... Days to Weeks ...

Get access to DB
Challenge 2: DBA Unfriendly Solutions

- Most point solutions or storage solutions are DBA unfriendly
  - Clone ‘Storage Volumes’ instead of ‘Databases’
  - No visibility into the database stack; difficult to triage performance issues
  - No way to track configuration or compliance / data security issues
  - Lack of lifecycle capabilities or lineage tracking

64% DBAs use RMAN scripts for cloning databases
Challenge 3: Low Rate of Refresh

- Archaic processes followed to conserve storage
  - Clones shared by multiple users and applications
  - Degraded performance due to increased sharing amongst users
  - All data changes have to be managed, this adds to OPEX

- Low rate of refresh
  - Fixed refresh cycle; no adhoc cloning requests
Recap of Challenges with Data Cloning

- Storage explosion
- Time Consuming
- Lack of Automation
- DBA Unfriendly Solutions
- Low Rate of Refresh
DBaaS “Snap Clone”
Database Cloning in Minutes

- **Features**
  - Rapid and space efficient cloning of large databases; versions 10g to 12c
  - Supports ALL storage vendors and configurations (SAN and NAS)
  - Integrated lifecycle management (lineage and association tracking)
  - “Rewind” capability to restore and access past data

- **Benefits**
  - Agile provisioning (minutes to clone TB sized database)
  - Over 90% storage savings (KBs of additional space for cloning TB sized database)
  - Reduced administrative overhead from integrated lifecycle management
Snap Clone: How it Works?

Scheduled or Manual Snapshots of the test master database, called Profiles

- Snap Clones can be created from any profile.
- Each user gets a personal read-write database clone

Test master is regularly refreshed with current data from production.
DBaaS “Snap Clone” Storage Options

- Storage Management Framework (SMF) plug-in:
  - Abstracts different storage vendors and technologies from DBAs
  - Analyze storage utilization and track lineage of clones

Software Solution [Vendor Agnostic]

Hardware Solution [Vendor Specific]

Upcoming: ASM support
## Comparison between Storage Options

<table>
<thead>
<tr>
<th>Vendors supported</th>
<th>Software Solution</th>
<th>Hardware Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><img src="emc.png" alt="EMC" /> <img src="hitachi.png" alt="HITACHI" /> <img src="ibm.png" alt="IBM" /> <img src="hp.png" alt="HP" /> ... and others</td>
<td><img src="solaris.png" alt="ORACLE SOLARIS ZFS File System" /> <img src="netapp.png" alt="NetApp" /></td>
</tr>
<tr>
<td>Pre-requisites</td>
<td>• Solaris 11 file system (ZFS) on physical or virtual server</td>
<td>• Network access, and credentials &amp; privileges to Storage appliance</td>
</tr>
</tbody>
</table>
| Storage Licenses | • Does NOT require storage licenses from vendor for snapshot and clone capabilities  
• Additional benefits include compression, deduplication, I/O caching, etc | • Need to license snapshot and clone capabilities* |
| High Availability | • Managed externally – Solaris clusters, hypervisor clustering | • Managed by the storage appliance |

*License for ZFSSA are included with snap clone
CloneDB using DNFS

- Ability to create thin databases from RMAN image copies
- Uses NFS v3 client embedded in database
- Supported configurations
  - Single instance databases
  - Note: Only file system support for this setup (No ASM)
- Supported Versions: 11.2.0.3+, 12.1

- Advantages
  - Easy to setup
  - No special storage software needed
  - Works on all platforms
  - Time efficient: Instantaneous cloning
  - Space efficient: Create multiple clones based on one backup
  - Uses dNFS to improve performance, high availability, and scalability of NFS storage
Deployment Scenarios

Continuous or Discrete Replication

<table>
<thead>
<tr>
<th>Replication Types:</th>
<th>Continuous</th>
<th>Discrete</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology</td>
<td>Data Guard, Golden Gate</td>
<td>RMAN, Snap Mirror, import/export …</td>
</tr>
<tr>
<td>Data Refresh</td>
<td>Automatic and instantaneous</td>
<td>Manual and at scheduled intervals</td>
</tr>
<tr>
<td>Masking and Subsetting</td>
<td>Not possible</td>
<td>At source (in production), or in place at test master</td>
</tr>
</tbody>
</table>

Snap Clones using Standby

Private backups (snapshots) for SSA user
Snap Clone Vs Competition

- Scale, Scale, Scale
  - Supports 1000s of clones
- Protects your existing investments
  - Choice between hardware and software solution
  - Use of trusted technologies like data guard for test master refresh
- Part of Enterprise Manager 12c
  - Oracle’s flagship management product for all your database needs
  - In sync with DB releases (support for PDBs on day 1)
  - Secure and role based access control; used by Fortune 1000 customers
  - Protection from unnecessary point tools; reduce TCO
Snap Clone with Oracle Engineered Systems

**Exadata**
- **Compute nodes** are used to run snap clone databases
- The storage is external to Exadata and served over **NFS**
- In case of ZS3 storage, all traffic over **infiniband**

**SuperCluster**
- Solaris **Zones or LDOMS** used to run snap clone databases
- Embedded ZS3-ES storage served over **infiniband**

**Oracle Virtual Compute Appliance**
- Oracle VMs used to run snap clone databases
- Embedded ZS3-ES storage served over **infiniband**
Self Service Provisioning and Service Catalog

- Out-of-box self service portal
- Catalog of different database configuration with varied datasets
- Resource quota based on role
- Integrated monitoring, snapshot/rollback, etc
DBaaS Metering and Chargeback

- **Flexible** metering and chargeback based on:
  - Configuration and monitoring information
  - Host, Database, DB Service, and PDB level
- **Automated rollup** using LDAP hierarchy
- **Out-of-box reporting** for business users (via BI Publisher)
- **Extend coverage via custom** charge items
- **APIs** for integration with billing systems
Lifecycle Management of Snap Clone Databases

Cloning the database is not enough, it needs to be managed and monitored like any other enterprise database!

- Every Snap Clone database has the following enabled:
  - Inventory tracking and trending (to prevent sprawl and uncontrolled growth)
  - Association tracking with clone master
  - Track configuration compliance
  - Track drift from golden configuration standards
    - 1-1, 1-n comparison
  - Patching Automation
    - Patch Advisories, pre-flight checks, rollouts, reporting
Snap Clone Analyzer

- **Overview Tab**
  - Storage summary and usage details
  - Snap Clone Storage Savings

- **Hierarchy Tab**
  - Track database lineage
    - Clone master
    - Snapshot Profile
    - Clone
    - Backup Snapshots
Snap Clone: Key Usage Scenarios

Snap Clone is most useful when creating clones of large databases (~TBs) for the following purposes:

- **Application upgrade testing**
  - Example: EBusiness Suite upgrade to R12

- **Functional testing**
  - Example: Test with production datasets

- **Agile development**
  - Example: Maintain parallel streams of development on same dataset

- **Data analysis and reporting**
  - Example: Analyze stock market trends on a daily basis

Oracle Development uses Snap Clone across 9000 environments for testing of products like EBS, Fusion, PeopleSoft, MOS, RDBMS, and EM.
Database as a Service in Action

**Dedicated Database**

**Pluggable Database**

**Full Clone**

**Database Schema**

**Pluggable Database**
Self-Service Portal APIs
Comprehensive RESTFUL APIs for Integration and Orchestration

- List Zones
- List Service Templates
- List Service Instances

- Request DBs
- Request PDBs
- Request Schemas
- Track request progress

- Delete Service
- Extend reservation

- Service Control (start/stop)
- Backup
- Restore
- Snapshot
- Get Chargeback info

DBaaS Portal & API
Licensing

- Snap Clone is licensed as part of the ‘Cloud Management Pack for Oracle Database’.
- This pack provides:
  - Database, schema, and pluggable database provisioning
  - Full clone and Snap Clones of databases
  - Out-of-the-box Self Service portal and Service catalog
  - Chargeback/showback, metering, quota, role based access
  - Lifecycle Management of cloud resources
  - APIs (RESTful and EMCLI) for all cloud operations
  - Rapid Start Kit for quick setup of EM12c DBaaS
Summary

- Snap Clone is a storage agnostic and self service approach to creating rapid and space efficient clones of large (~TB) databases
- Supports ALL storage vendors and configurations (NAS and SAN)
- Supports database version 10g to 12c
- It satisfies the needs of both IT (in terms of control and standardization) and the end users (in terms of flexibility)
- Reduces storage and administrative costs
References

- [Enterprise Manager Page on O.com](#)
- [Cloud Management Page on OTN](#)
- [Cloud Administration Guide (Documentation)](#)
- **MOS Note**: EM12c Recommended Plug-Ins and Patches for DBaaS (1549855.1)