An Oracle White Paper
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Oracle Enterprise Manager Cloud Control 12c: Complete, Integrated and Business-Driven Cloud Management

ORACLE ENTERPRISE MANAGER 12c

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Executive Overview

Cloud computing is often defined as "a style of computing in which massively scalable IT-related capabilities are provided 'as a service' using Internet technologies to multiple customers." Over the years, the benefits of cloud have become more pronounced and several IT organizations have started embracing the model for their own data centers. Maximizing the cloud, however, requires thorough understanding of IT and its business drivers. Oracle Enterprise Manager 12^{c} is a path-breaking, transformational technology that comes with a comprehensive set of features and best practices that help IT transform into true, enterprise grade cloud that delivers on business needs.

Introduction

Modern enterprises face intense competitive pressures. Their customers have more options than ever. Enterprises must deliver new services and constantly innovate to stay ahead of the competition. However, enterprise IT is often the bottleneck. Provisioning infrastructure for new projects takes days and weeks, instead of hours. This severely limits enterprise agility. Users, such as Developers or QA Engineers, need rapid access to development and testing platforms, without the overhead of being gated by IT Administrators.

To address these challenges, most IT organizations are exploring the benefits of cloud computing within their own datacenter. Whether it is faster provisioning, on demand access, agile resource scheduling based on policies, or chargeback rules to ensure business accountability and more control over the environment, IT must move from reactive to a proactive and predictive approach for data center management. Enterprise clouds cater to these needs.

Enterprise Manager, Oracle's flagship product for systems management provides industry's most complete solution for cloud management. It offers a single, integrated console for testing, deploying, operating, monitoring, diagnosing, and troubleshooting, today's complex IT environments. It offers a simple, scalable solution for running Oracle stack, from applications to disk, in cloud environments. It manages everything in your datacenter - from the hypervisor to the operating system, database, and application tier.

While Oracle Enterprise Manager offers a broad range of capabilities out-of-box, it is an extensible platform; while customers get comprehensive management for Oracle technology, there are connectors and plug-ins to integrate with third-party systems. The plug-ins can manage third party IT components such as Cisco and Juniper firewall and Netapp storage, while the connectors enable Enterprise Manager to share information with other management systems like IBM Tivoli, CA Unicenter and HP Openview.

'Cloud, Cloud everywhere and not a drop to drink'

The C-word is everywhere. Today, the bustle associated with the term "cloud" has reached a crescendo. Every IT vendor has latched on to the cloud promise. Traditional Systems Management vendors are no exceptions. However, in most cases, cloud is treated as a technology fashion, the newest buzzword in the ever changing landscape of enterprise technology. Therefore, rather than treating it as a lucrative technology, let us delve into what really makes a cloud, more so an enterprise grade one, and why existing solutions fall short of addressing that market. As per the definition by National Institute of Standards and Technology (NIST), cloud is expected to have certain characteristics.

- On-demand self-service
- Resource pooling
- Rapid elasticity
- Measured Service
- Service Models

This definition implies that cloud is not a simple self-service layer on top of existing IT automation. Resources must be pooled and modeled in an optimal way, before they are offered for self-service consumption. The self-service aspect must be backed by comprehensive mechanisms for managing elasticity. Finally, resources must be metered, to enable a pay-per-user paradigm, just like the ones you are familiar with in any subscription-based service, be it cellular minutes, or streaming digital media. However, existing approaches to cloud have been by and large incomplete, often focusing on the self-service aspect without paying any attention to the resource modeling, elasticity and metering aspects.

Oracle's cloud management solution is built from the ground up to take into account all these characteristics and delivers a holistic solution for enterprises. Furthermore, while it recognizes that cloud is the next logical next step towards achieving greater automation with lower cost, it also considers the *transformational* aspects of cloud. This means:

- Cloud planning has to be modeled into the data center consolidation strategy and not invoked as an afterthought. It may or may not entail server virtualization. While server virtualization offers a simple way of abstracting physical resources, it does create scalability as well as manageability challenges.
- Cloud should not just become a platform for providing compute capacity, independent of business context. Rather, it should be driven by business and dynamically adapt to business needs. This necessitates business application provisioning and monitoring to be integrated as opposed to being merely supplemental.
- Cloud has to cater to all personas of an Enterprise, right from IT users to business users to Lines of Business sponsors.
- Cloud needs to be Complete, Unified and Automated. It needs to have complete coverage of the lifecycle phases (discussed later) and needs to be delivered through a single tool rather than via multiple point tools and interfaces. Multi-console solutions in a cloud environment often fail to keep pace with each other leading to complex synchronization and reconciliation problems.

'Thinking beyond the **V**'

Server virtualization is neither a necessary, nor a sufficient condition for operating a cloud. While server virtualization does offer hardware consolidation, OS-level isolation and simplified OS provisioning via templates (*aka* appliances), it does not deliver a complete cloud solution. Even as a consolidation strategy, server virtualization has limited benefits that taper out after the initial deployment, and over time, creates challenges such as server sprawl and administrative overheads. It also burdens DBAs and platform administrators with the requirement to manage VMs, which typically need a System Administrator's skills.

Cloud can be delivered in the form of discrete services such as OS infrastructure (IaaS), as well as runtime Platforms (PaaS), such as databases (DBaaS) or Middleware (MWaaS). In addition, one can also offer tailored services for Testing (TaaS) or deliver packaged software as services (SaaS). Server virtualization is well suited to deliver IaaS, but falls short of delivering higher order services, such as DBaaS.

Multiple architectural choices: Oracle offers a variety of architectural choices to the cloud provider to support all the aforementioned service types, in both virtual and physical environments. One can deploy multi-tier applications on virtualized servers or can deploy databases and applications on pre-created platforms, whether physical or virtual. Even within the realm of virtualization, Oracle offers choices! You can choose virtualization based on Oracle VM for x86, Oracle VM for Sparc, or Solaris Containers. Within database as a service itself, Enterprise Manager 12c provides architectural choices such as consolidating at the server or cluster level and consolidating using schemas at the database level.

Enterprise Manager 12^c comes with a Service catalog rich with service templates for these different technologies. Using the solution, a cloud provider can create one or more of these services and characterize them on size (total CPU, Memory etc.), Quality of Service (QOS), version and other attributes that are collected during Enterprise Manager's discovery and collection process.

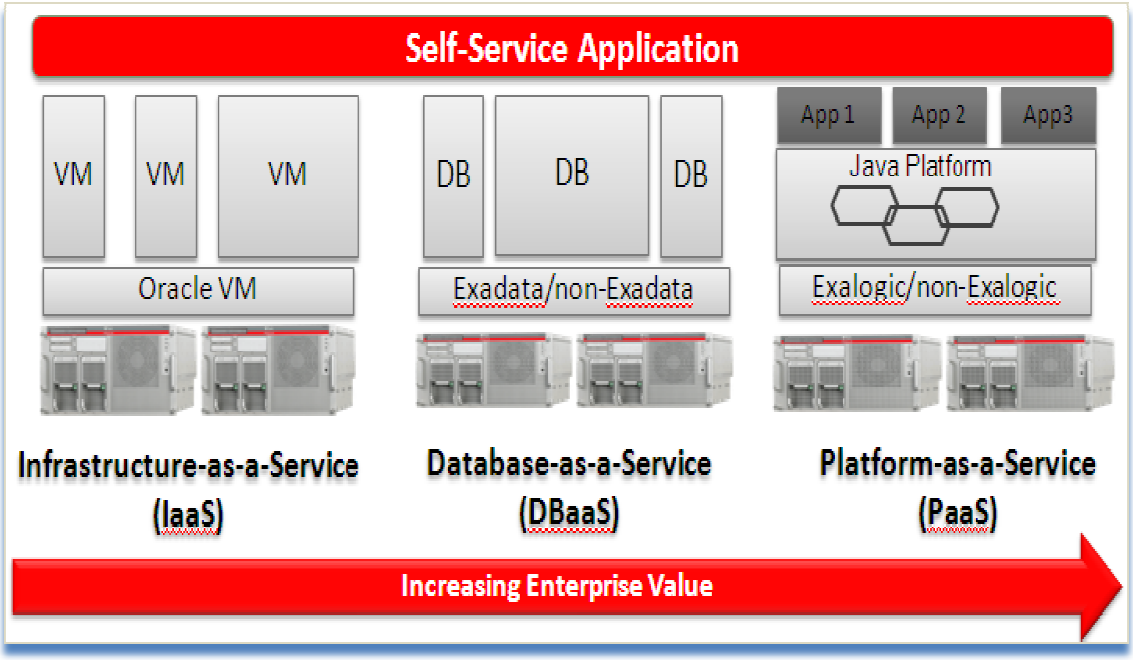


Figure 1: Various architectural choices mapped to cloud services

Complete coverage of the cloud lifecycle

Enterprise Manager 12c offers functionality that spans the entire lifecycle of a cloud, and for all service types that might be offered. Cloud projects typically start with extensive planning and once operational, enter a continuum of monitoring, management and optimization.

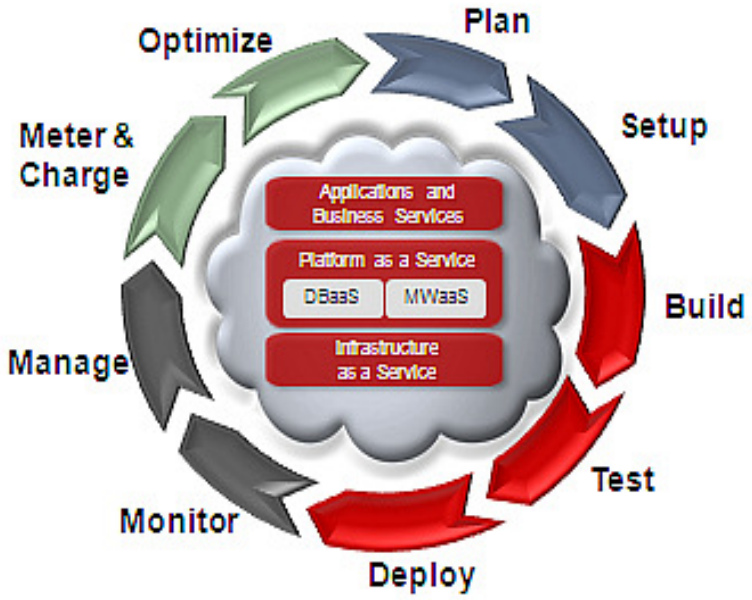


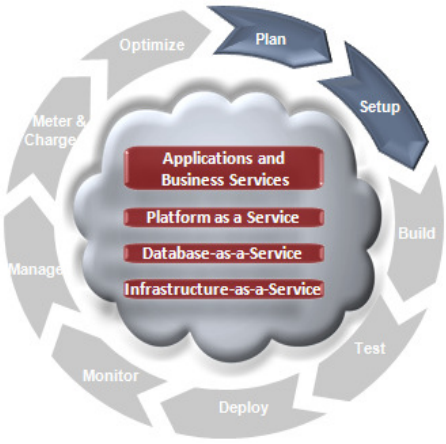
Figure 2: Cloud Lifecycle

Plan and Setup

Some cloud projects are Greenfield i.e. enterprises want to start fresh cloud projects with brand new hardware, new software and in some cases, even a new data center. Other projects are brownfield in nature. They are concerned with transforming existing assets into a cloud environment. It is therefore important to plan out the cloud deployment model, beginning with the discovery and baselining of existing assets. Enterprise Manager 12c provides automated discovery capabilities that can find existing assets and manage them. It also offers a Consolidation Planner, which can provide P2P, P2V, P2Exa advisories based upon both technical and functional constraints (such as production and test cannot be co-located).

Then comes setting up the cloud. This is a very significant part of the process, especially given that cloud is not about islands of automation on existing scripts. Enterprise Manager supports rich resource models for the cloud-right from storage to applications, for both physical and virtualized infrastructure, so that the enterprise can maximize the benefits of consolidation and cloud. Enterprise Manager 12c offers capabilities such as bare metal provisioning of Hypervisor, setting up of server and storage pools and grouping them into zones based on functional or QOS characteristics. Enterprise Manager also leverages Virtualization Storage Connect technology, where the cloud setup process integrates with best-of-breed storage technologies like Netapp, Hitachi, Fujitsu.

Oracle Enterprise Manager is industry's first solution that has the ability model not only infrastructure as a service (IaaS) but also platform as a service and database as a service clouds, from a single console. It allows Administrators to define standardized service templates for databases and middleware platforms, and publish these as services. Administrators can create different types of services depending upon the business needs. For example, Administrators may offer a database service based on different versions of Oracle middleware, but only the ones approved for use within the business.



Enterprise Manager also comes with a sophisticated framework to enable role-driven access control as well as the resource limits for the self-service users that consume the service. Integration with LDAP allows Enterprise manager to inherit enterprise roles. The resource limits are implemented with quotas that are tailored for the specific service type (IaaS, PaaS and DBaaS). This prevents rogue usage of a service while also preventing a few users from devouring majority of the resources in the cloud.

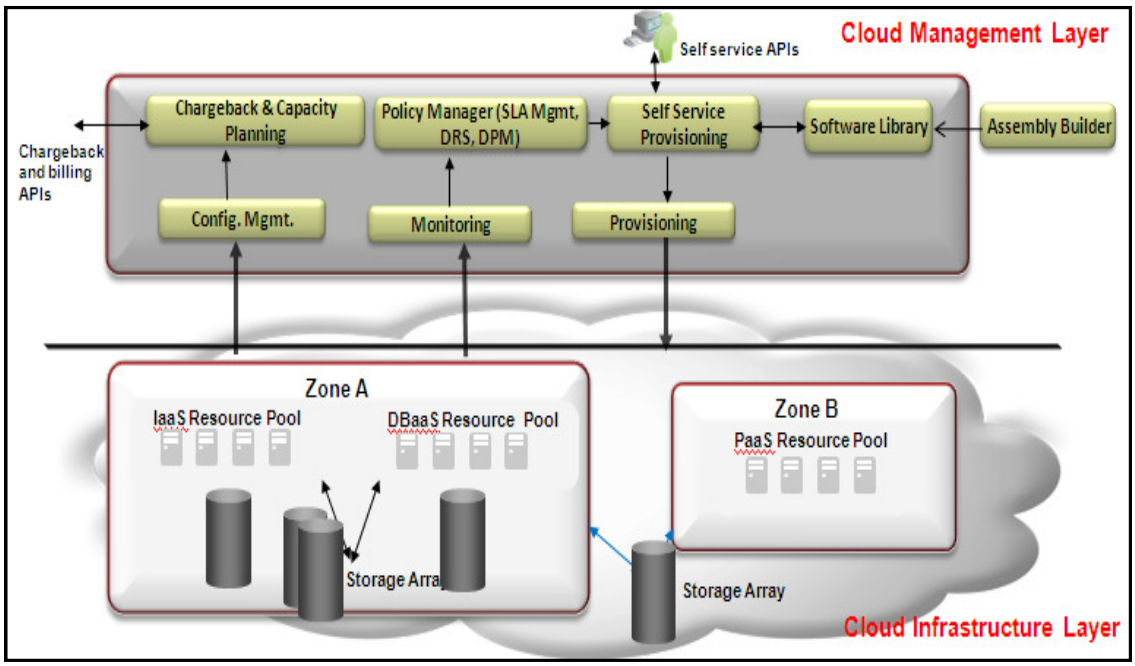


Figure 3: Cloud architecture

So, what do the Administrators need to do? As discussed before, the Administrators are in the business of cloud enablement, for which Enterprise Manager 12c ships with out-of-box roles such as cloud Administrator and Self-Service Administrator. Enterprise Manager 12c also provides out-of-box automation for these roles. The cloud Administrator can set up the cloud infrastructure, such as servers, storage and database pools, and group them into Zones. The Self-Service Administrator then defines access controls, quota, retirement policies and the charge plans with the service and releases the service in the self-service catalog.

Enterprise Manager12c also provides programmatic interfaces (EMCLI) for setting up the cloud. Integrators can use those to create a cloud and scale it up based on needs.

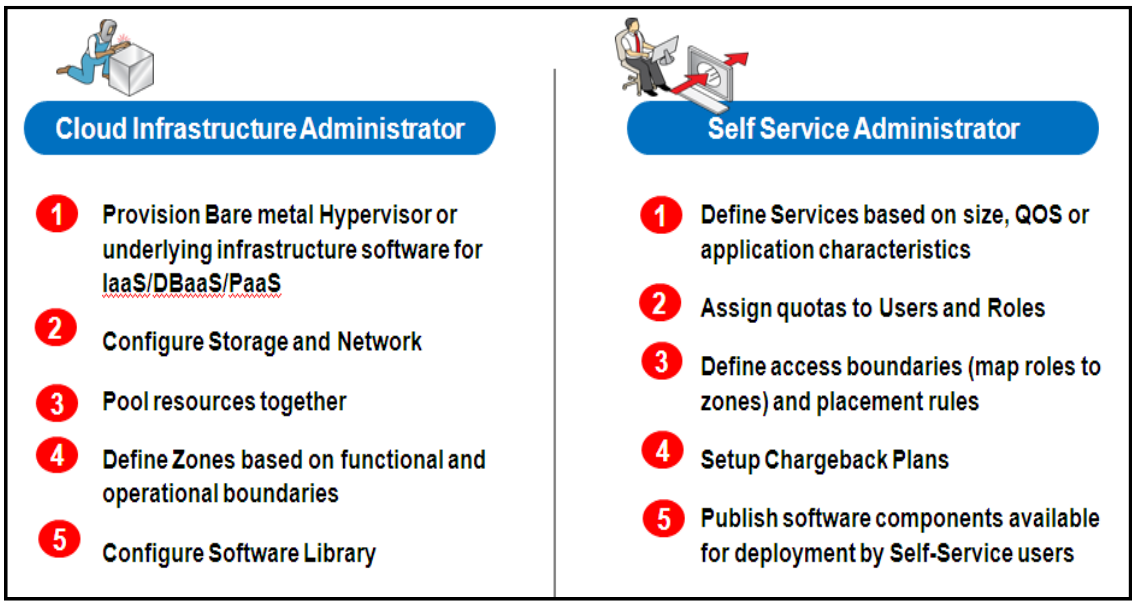


Figure 4: Enterprise Manager enabled cloud setup activities

Build, Test and Deploy

A sophisticated private cloud solution needs to cater to a variety of use cases:

- A developer or a project owner requiring a new application service with or without seed data
- QA requiring a full clone for intense load testing
- QA requiring to create multiple clones for functional testing on subset of data

The current release of Oracle Enterprise Manager Cloud Control 12c offers new capabilities and support for managing database cloud services in all the above cases. It comes with out-of-box capabilities for infrastructure as a service and platform as a service including database as a service. For infrastructure as a service, it can deploy VM templates or assemblies. For database as a service, it offers choices such as schema as a service for extreme database consolidation and database cloning through Snap Clone or RMAN Backups. These capabilities provide an optimum utilization of development and database resources, giving customers more flexibility and control in managing the database lifecycle.

One big consumer group of cloud is QA Engineers or Testers. They perform User Acceptance Tests (UAT) for various applications. To perform an UAT, they need to create copies of the production database. For intense testing, such as in pre-upgrade scenarios, they need a full updateable copy of the production data. There are other situations, such as in functional testing, they need to perform minimal updates to the data, but at the same time, need multiple functional copies. Enterprise Manager 12c supports both the scenarios. In the former case, it leverages RMAN backups to clone the data. In the latter case, it leverages the "Copy on Write" technology at the storage layer to perform Enterprise Manager 12c Snap Clone (or just Snap Clone). Currently, NAS technologies viz. Netapp and ZFS Storage Appliance are supported for Snap Clone. By using this technology, the entire data does not need to be cloned, but the new database can physically point to the source blocks within the same filer and only needs to allocate new blocks if there are updates to the cloned copy.

The following picture highlights the various use cases of DBaaS that Oracle Enterprise Manager addresses. While each of these has specific applicability, Oracle Enterprise Manager handles all these use cases comprehensively.

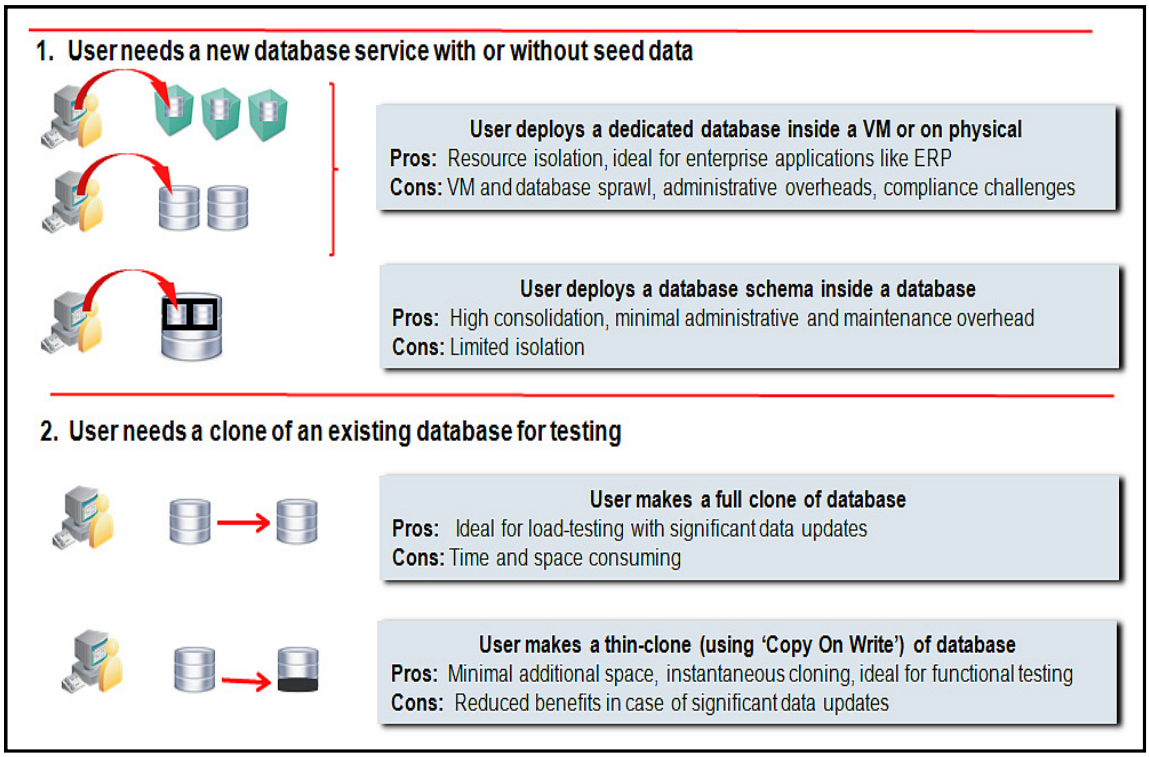
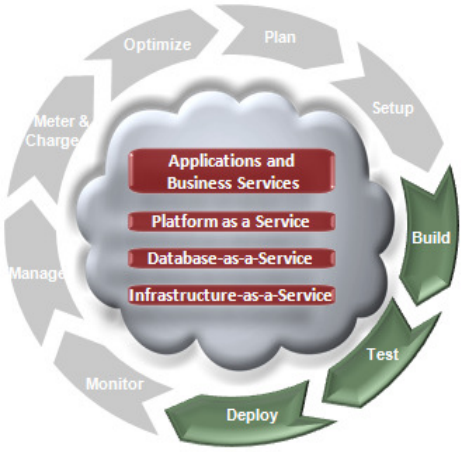


Figure 5: various use cases supported by Enterprise Manager's DBaaS

Deploying application in the cloud poses interesting challenges. The traditional model has been where one deploys various components of the application individually and then manually wires them together. The problem gets aggravated by other deployment constraints – such as different network segments for each application tier.



Oracle Enterprise Manager is unique in addressing this challenge. It leverages Oracle Virtual Assembly Builder (OVAB) to package the application and its relationships in a single metadata driven deployment unit. Using OVAB, application developers and architects can model the application topology graphically, define all dependencies and deployment constraints, and deliver the entire application in form of an application "assembly". The assembly can then be published to the centralized software library in Enterprise Manager, be made available to other users for self-service deployments. For users who simply want to deploy Java applications on a pre-existing platform, Enterprise Manager provides a simple, easy-to-use solution that provides the necessary

abstraction and simplicity to deploy an application, associate it with data sources and monitor its health.

Oracle Enterprise Manager 12c also includes a higher order service tailored for testing. Testing as a Service, a new cloud platform for delivering automated application testing services, includes a self-service solution that orchestrates the testing process end-to-end by automating provisioning of complete test labs (applications, test tools and assets comprising scripts and scenarios), execution of load and functional tests and rich application monitoring and diagnostics. It also includes a sophisticated chargeback facility and the ability to perform deeper diagnostics in context of testing.

Enterprise Manager 12c comes with an out-of-box yet customizable self-service Application that lets end-users deploy a wide range of these services. End users can choose to provision application assemblies, along with databases and platforms, all in on-demand fashion. . For each request, they can specify the amount of underlying resources (CPU, memory, etc) that they require for each component. Enterprise Manager automatically provisions the requested service and the appropriate resources.

Once you build an application, you need to test it. Enterprise Manager 12c carries a complete testing portfolio that allows users to test both application changes and the changes database or lower level. A very unique aspect of the testing solution is the ability to capture a production load and replay in a test environment, so that the results are predictable. The testing solution also leverages the deep diagnostic capabilities built into the technology layers and provides prescriptions for remediation.

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Thus, Enterprise Manager enables a layer of abstraction that hides the underlying complexities of the application from the end-user. This abstraction is delivered via a self-service interface, both in graphical (GUI) and programmatic (API) variants. Enterprise Manager cloud APIs are RESTFUL in nature.

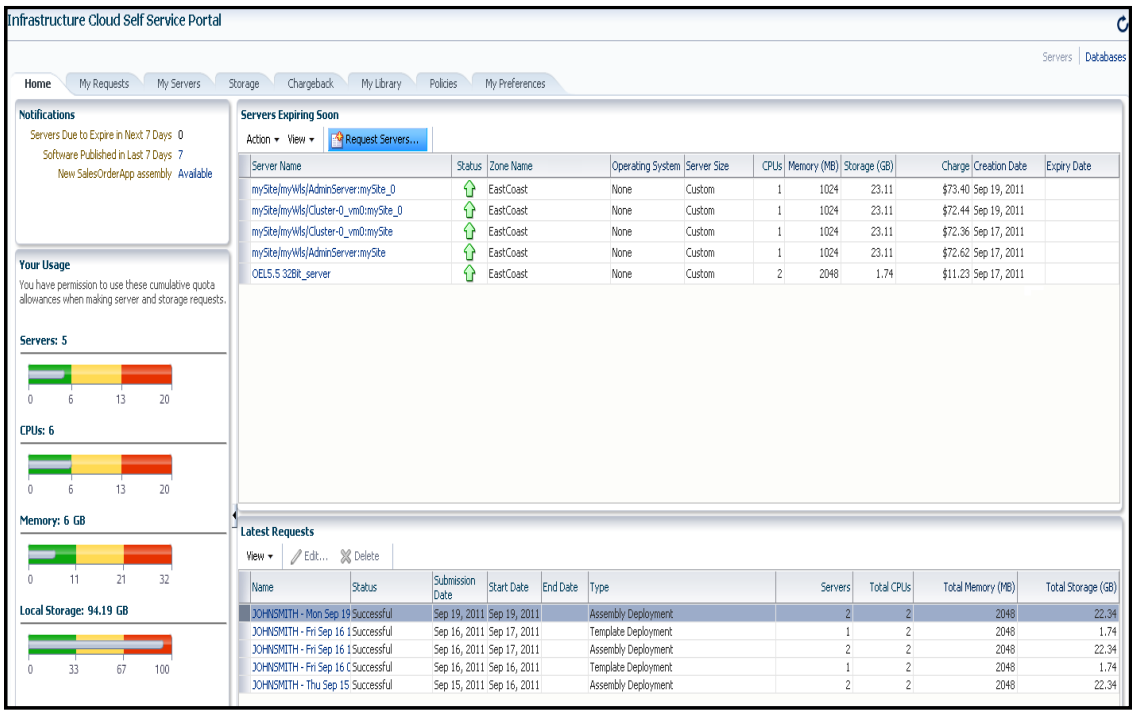


Figure 6: Out-of-box cloud self-service portal

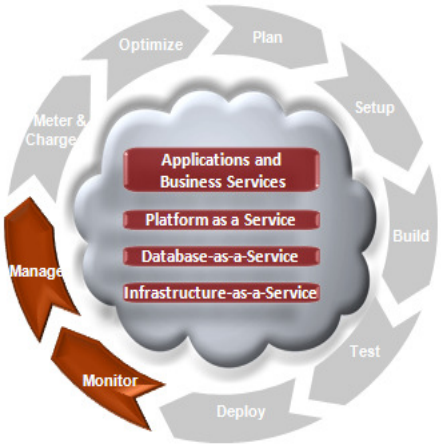
Monitor and Manage

Once a cloud has been commissioned, it has to be monitored and managed. Over the years, the industry has witnessed superficial service level monitoring and fragmented management of individual components. Enterprise Manager 12c fundamentally transforms this by following an *Application to Disk* paradigm, which a) monitors all components through a single pane of glass, and b) provides deep, out-of-box capabilities that are instrumented in the base product and proven to reduce problem resolution time by more than 50%. The ultimate manifestation of the *Application to Disk* Management paradigm comes in the form of management of engineered systems such as Exadata and Exalogic.

In a cloud the monitoring framework has to scale to thousands of servers, databases and middleware targets. Enterprise Manager 12c provides the ability to collate the targets into groups for better manageability. The new Administration Group feature lets administrators define monitoring settings, compliance standards and cloud policies through templates and also organize the each target in multiple hierarchies, such as Line of Business and Lifecycle status. Enterprise Manager 12c also comes with an in-built Incident Management system that can manage by exceptions. Administrators can review, suppress, escalate and remediate the events as needed, and also integrate it with ticketing systems.

Enterprise Manager 12c has the ability to define contractual Service Level Agreements (SLAs) that govern the contract between the application owner and the provider of the cloud. Administrators as well as users can also define management policies that automatically adjust the service resources to ensure that SLAs are met.

Also, while most tools focus only on the stack management aspects of cloud infrastructure, Enterprise Manager also provides user experience management and business transaction management. Bolstered by acquired technologies in these areas, Enterprise Manager is the leading solution for ensuring application performance in the cloud.



A management requirement often overlooked in the cloud context is that of Configuration Management. The agility and elasticity (such as VM Migration) in a cloud demand real-time discovery of and synchronization with fast changing system topologies, thereby rendering traditional Configuration Management deficient. Unlike these solutions, Enterprise Manager 12c Configuration Management capabilities are optimized for cloud environments. It can monitor vast numbers of configurations continuously, discover changes, measure drifts, pin-point configuration errors, as well as offer insight into system topologies, all within a single pane of glass!

Finally, the cloud management capabilities are also integrated with *My Oracle Support*. This integration delivers facilities such as Patch Advisories, Service Request Management, Knowledge Management right on-premise and in-context of the overall cloud.

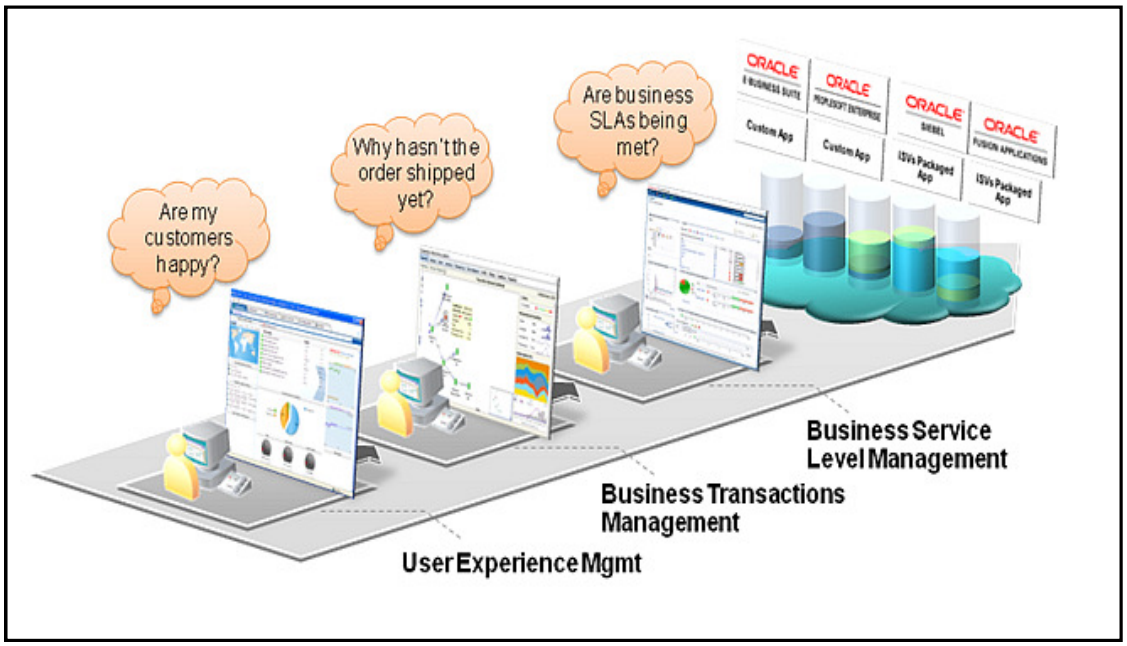
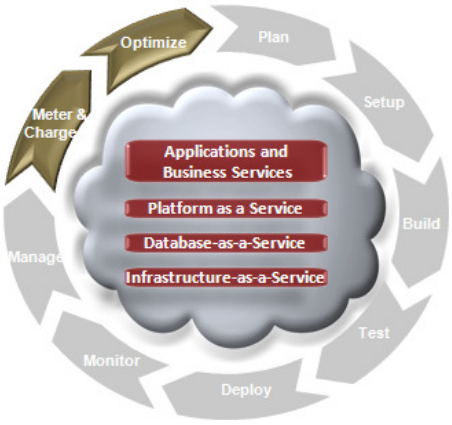


Figure 6: Business Driven Application Management

Meter, Charge and Optimize

Shared services and clouds bring some additional challenges for IT. As different tenants start sharing the same piece of platform or infrastructure, they need to be accountable for their respective usage, else a few individuals might consume majority of the resources. Also, the very ease of self-service provisioning may lead to over-consumption of resources, and result in a. To mitigate this, organizations must meter the usage and optionally chargeback [also known as showback] the tenants. Though money may not trade hands, this provides IT as well as the LOBs, cost transparency on an ongoing basis.



Enterprise manager 12^c is equipped with sophisticated and flexible Metering and Chargeback mechanisms. Unlike existing chargeback tools that solely focus on basic compute metrics like CPU, memory and storage usage, IT can define pricing models based on application usage, database usage and middleware-level metrics. Also, they can extend pricing models to account for fixed costs, configurations, administrative expenses, people costs, energy utilization or a combination of these. The chargeback application also supports latest and greatest database consolidation technologies, such as pluggable databases.

These capabilities enable enterprise to account for actual usage versus representative usage.

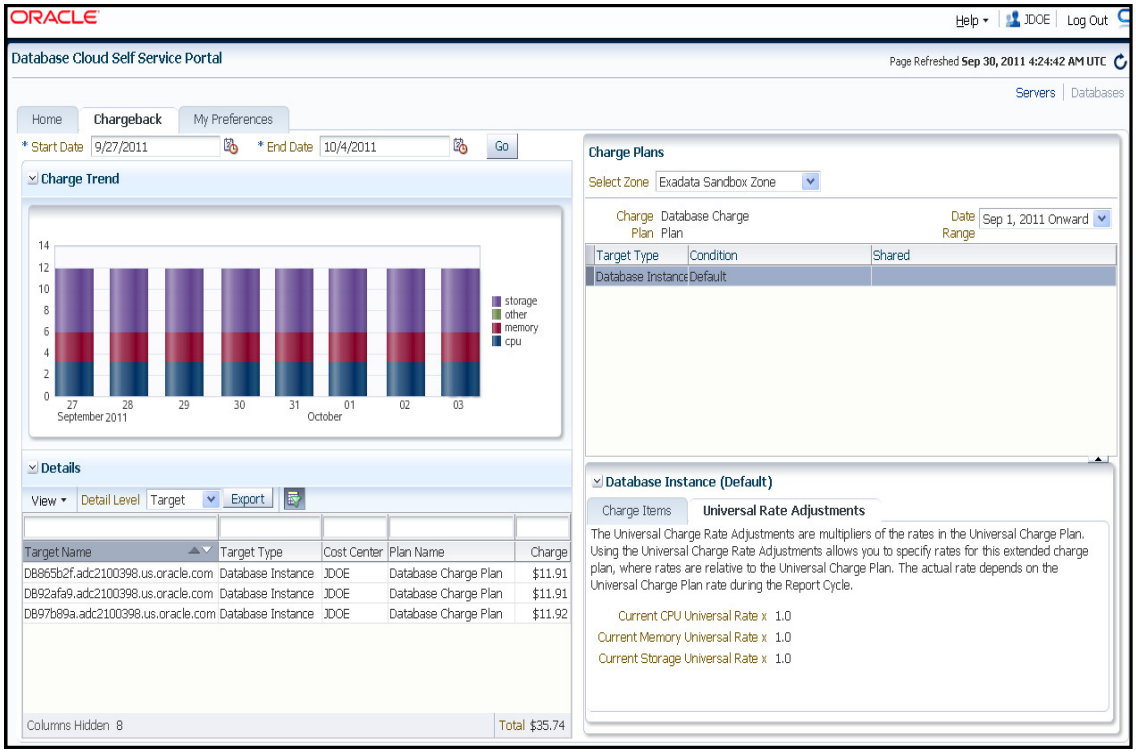


Figure 7: Chargeback reporting

cloud management also entails an ongoing optimization of resources as well processes to make sure the service levels are persistent. Enterprise Manager 12c is rich in features that help rediscover assets, re-evaluate the performance, rebalance the cloud, and fine tune the provisioning process. The tuning capabilities in the operating system, database and middleware layers aid in continuous optimization and subsequent improvement.

Conclusion: Business Value through IT Transformation

For IT to truly support the business – which is, after all, the purpose of enterprise cloud computing – it needs to transform itself into an organization that lets business users consume IT services on demand, reduces complexity in existing IT and manages IT from a business perspective.

Oracle enjoys the strategic advantage in its ability to fulfill the promise of cloud computing, given its industry leadership and its ability to offer the entire software and systems stack, ranging from infrastructure to development platforms, to databases and business applications, necessary to build, deploy and operate an enterprise cloud. The Oracle cloud stack and Oracle Enterprise Manager Cloud Control 12c deliver to all of the requirements through built-in manageability.

Experience Total Cloud Control, and transform both your business and IT together.

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