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Oracle Enterprise Transformation Solutions Series

Cloud Reference Architecture

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Executive Overview

Businesses have entered an era of cut throat competition that demands innovation and agility at lower costs for survival. Business leaders are looking for ways to focus on their core strengths and delegate non-strategic functions to external entities. IT functions are being elevated from support centers to strategic partners that can provide game changing capabilities to the business units. Cloud computing presents a great opportunity to these agile enterprises to achieve innovation and agility at lower cost.

A recent Gartner study¹ states that Cloud computing influences future data center and operational models, and applications must be designed with a Cloud model in mind. In order to achieve this, consumer enterprises must partner with a leader in the Cloud space that offers a broad portfolio of business applications and platforms through a variety of deployment models including public, private, and managed services. The Gartner study also states that Hybrid Cloud computing is an imperative, which emphasizes the need for interoperable private and public Clouds that allow easy migration of services across the Cloud boundaries.

Successful Cloud adoption requires not only products to build the Cloud but also guidance around planning and execution of the Cloud initiative. Adopting a Cloud strategy may have impacts that span beyond just the technology architecture, influencing business and organizational strategies. Organizations new to Cloud look for tools, processes, and best practices to guide them with decisions around Cloud strategy, migration, and implementation.

Defining a Cloud Reference Architecture is an essential step towards achieving higher levels of Cloud maturity. Cloud Reference Architecture addresses the concerns of the key stakeholders by defining the architecture capabilities and roadmap aligned with the business goals and architecture vision.

Most enterprise transformations require some kind of organizational change to succeed and Cloud is not an exception. In a way, Cloud is a paradigm shift and it leads to shifts in organizational structure and roles.

¹ <http://www.gartner.com/it/page.jsp?id=1971515>

This whitepaper outlines the Cloud Reference Architecture and discusses the key organizational changes required for Cloud adoption.

Introduction

Cloud computing is a significant advancement in the delivery of information technology and services. By providing on demand access to a shared pool of computing resources in a self-service, dynamically scaled and metered manner, Cloud computing offers compelling advantages in cost, speed, and efficiency.

Traditionally deployments require applications to be bound to a particular infrastructure. This results in low utilization, diminished efficiency, and inflexibility. Cloud brings in capabilities to allow applications to be dynamically deployed onto the appropriate infrastructure at runtime. This elastic aspect of Cloud computing allows applications to scale and grow on demand without needing traditional patches or upgrades.

IT departments and infrastructure providers are under increasing pressure to provide computing infrastructure at the lowest possible cost. There are also a growing number of public Cloud providers that are looking for ways to build a versatile Cloud Infrastructure to support their clientele. To do this, the concepts of resource pooling, virtualization, dynamic provisioning, utility and commodity computing could be leveraged within the public Cloud or create a private Cloud that meets these needs. Customers driven by concerns over security, regulatory compliance, control over Quality of Service (QoS), and long-term costs, will build internal private Clouds. Private Clouds allow internal IT providers and application development teams more control of data security to meet their governance regulations. However, as the technology matures and these concerns ease, we will see more customers adopting a hybrid Cloud model that makes use of both private and public Clouds using the most suitable of the hybrid strategies.

This whitepaper describes a reference architecture for Cloud Computing using a number of architectural views and models that include conceptual and logical perspectives. This offers a clear separation between views that describe what capabilities the architecture provides and how those capabilities are realized. This paper also describes how the architecture conforms to well-established architecture principles, and how it can be achieved using various Cloud portfolio products from Oracle.

Cloud in an Enterprise Ecosystem

Why is Cloud Computing important for an enterprise? How does it enable and transform enterprise applications? Figure 1 shows how Cloud strategy fits in and supports an enterprise ecosystem by providing additional deployment choices to enable business agility and flexible cost structures.

Cloud Computing has emerged as one of the most important new computing strategies in the enterprise. A combination of new technologies and processes has led to a revolution in the way that computing is developed and delivered to end users. It promises the ability to deliver applications at a lower cost.

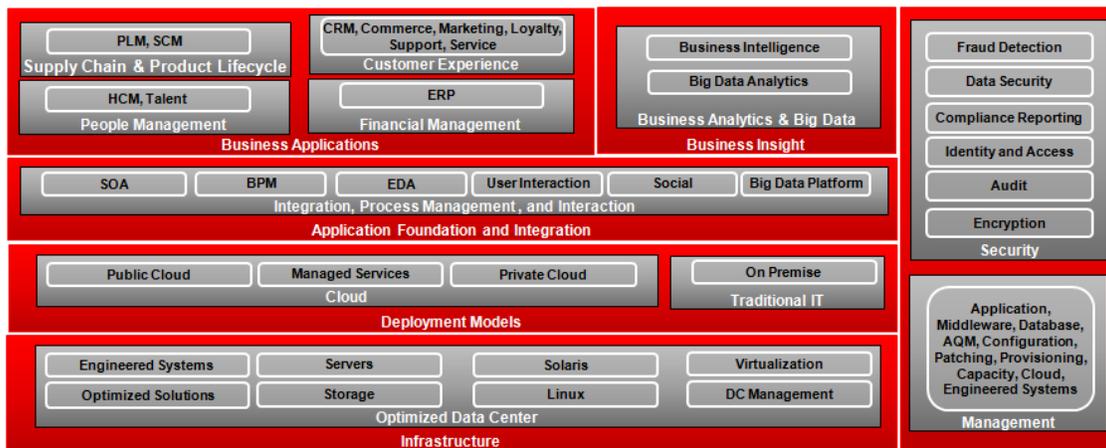


Figure 1 - Cloud in an Enterprise Ecosystem

Successful Cloud adoption requires businesses to choose a vendor that offers the following:

- Broad portfolio of complete and integrated products to build Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS).
- Portfolio of Cloud products to build Cloud management layer offering automation, security, and reliability.
- A variety of deployment choices to support the needs of the business and easy migration between the deployment models.
- Support for solutions that enable businesses to adopt cloud at a pace that fits their business. Customers vary widely in terms of how rapidly they wish to move to the Cloud and to what extent they wish to move to the Cloud. The vendor should enable customers to evolve and transform to the Cloud at a pace appropriate for their business.

Cloud Solution Portfolio

As organizations adopt Cloud Computing, they will need to define a roadmap that aligns with their own business drivers and clearly identifies their current and future capabilities for delivering IT services. Cloud services and management capabilities need to be identified and prioritized in a Cloud solution portfolio. The ITSO Oracle Practitioner Guide, “A Pragmatic Approach to Cloud Adoption” defines an approach for Cloud adoption and describes the “Cloud Candidate Selection Tool (CCST)” that can be used in this process.

Figure 2 defines a Cloud solution portfolio that illustrates the following characteristics:

- A broad spectrum of business applications to support the core business processes and business operations. Examples include Sales, Marketing, Financials, Human Capital Management, and Supply Chain Management.
- Platforms and frameworks to develop and run custom processes, applications, and integration components.
- Reliable and Highly Available infrastructure components to support the quality of service requirements of the business.
- Capabilities to support the build-time and runtime Cloud management operations including business management, operations management, model management, orchestration, provisioning, security and policy management.
- Choice of architecture in terms of deployment and engineering. Deployment choices should include on-premise and off-premise deployment models. Engineering choices range from best-of-breed infrastructure to optimized best-practice solutions to engineered systems.

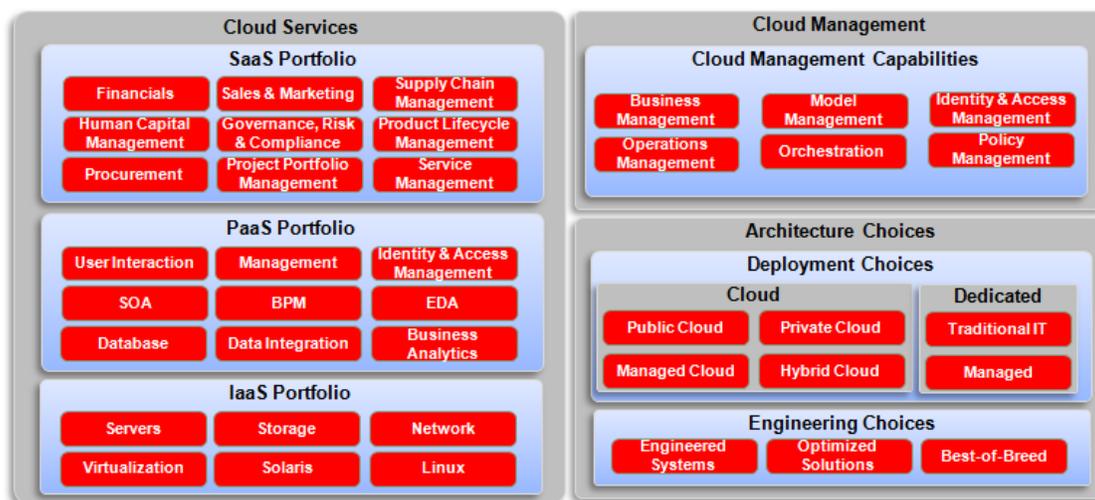


Figure 2 – Cloud Solution Portfolio

Basic Roles in Cloud Computing

Cloud adoption requires a conceptual understanding of the basic roles involved and the relationship between them. Figure 3 shows the basic (macro level) roles involved in building, deploying to, and using the Cloud. Also shown are the services, management capabilities, and integration points.

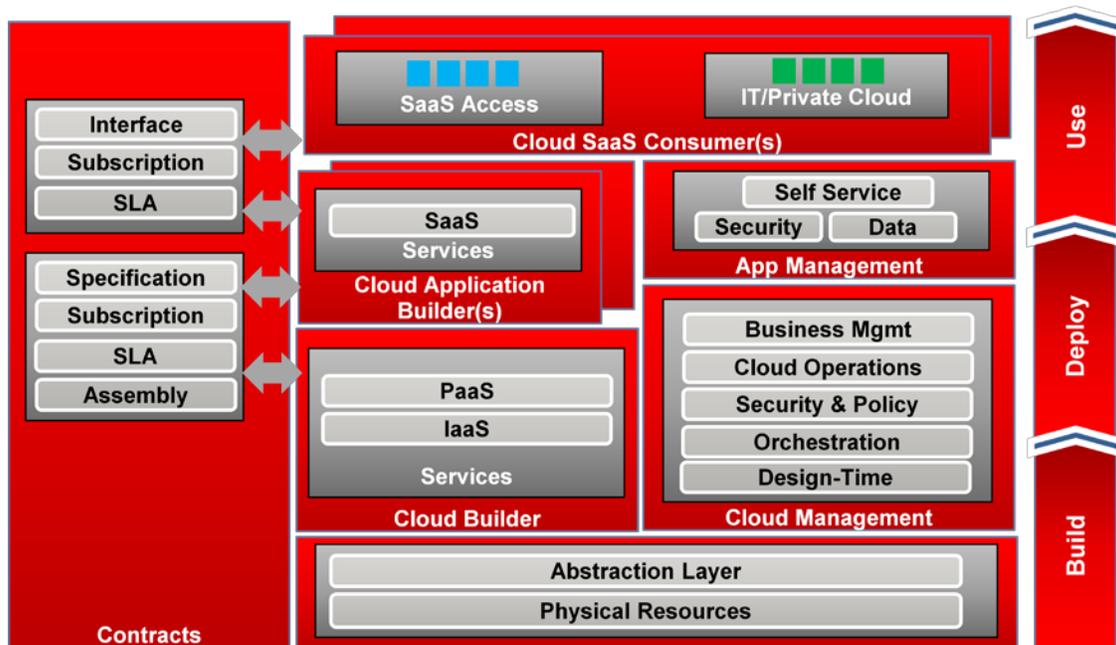


Figure 3: Cloud Basic Roles

Figure 3 shows the key components of the Cloud infrastructure that are summarized below:

- Physical resources supporting the Cloud infrastructure and the logical abstraction layer that pools the physical resources.
- Cloud Builder that builds and operates the Cloud infrastructure and platforms as a Service.
- Cloud Application Builder that develops applications for the Cloud and deploys them on the PaaS platform and offer as SaaS services. Cloud Builders support multiple application builders and applications.
- SaaS consumers that consume the software services. Cloud Application Builders support multiple SaaS consumers. SaaS consumers may have a hybrid model where some functionalities are provided by the public Cloud and some are provided by the internal private Cloud or traditional IT.
- Cloud Management infrastructure supporting the Cloud Builder and Cloud Application Builder. The Cloud management capabilities are described in the ORA Cloud Infrastructure document.
- Application management includes the self service capabilities provided by the Cloud Builder to provision and manage applications deployed on the Cloud. Additionally, security and data integration concerns must be addressed.

The binding agreement between the Cloud Builder, Cloud Application Builder, or SaaS consumer should cover the following elements as applicable:

- Workload specifications that define the exact definition of what will and what will not run on the Cloud platform. Any exceptions to standards must be clearly stated and agreed upon.
- Subscription terms that include pricing, billing, and revenue terms.
- SLA terms to cover the service levels and non-functional specifications
- Packaging and assembly tools and standards must be agreed upon between the two parties to ensure that the platform and the application deployed on the platform are compatible.
- Interface specifications that specify the user interface or API specifications and functionality offered to the SaaS consumers.

Architecture Principles and Guidelines

This section contains high-level architecture principles that must be followed for a successful Cloud architecture. The following list is not indented to be an exhaustive set of Cloud architecture principles; instead it provides a starting point for the formulation of more specific Cloud architecture principles.

- Cloud interfaces and formats must conform to relevant industry standards.
- The system must present only the information (interfaces etc.) necessary to perform each specific function.
- The architecture should provide monitoring of all aspects of resource usage for the various dimensions required by both the Cloud consumer and provider.
- Any Cloud provider's claims of Reliability, Availability, Security, and Performance must be verifiable.
- Availability should not be limited by inevitable hardware failures.
- Robust Identity Domain Separation – consumers of the system have no exposure to the consequences of other consumers' use of the system.
- Transparent Architecture and Control – consumers have visibility into the design and operation of the system.
- Improved Productivity - deliver an order of magnitude improvement over current levels of efficiency and productivity experienced in traditional IT environments.
- Assured Data Protection – consumers are assured of compliance with data privacy standards and regulations, have confidence that removal of data is absolute.
- Automate Operations – consumers' runtime of business process services and platform services involves minimal manual operations.

More details on these architecture principles can be found in the ORA Cloud Foundation document.

Conceptual View

The conceptual view of the architecture, shown in Figure 4, brings together three key Cloud perspectives - the provider, consumer, and the broker.

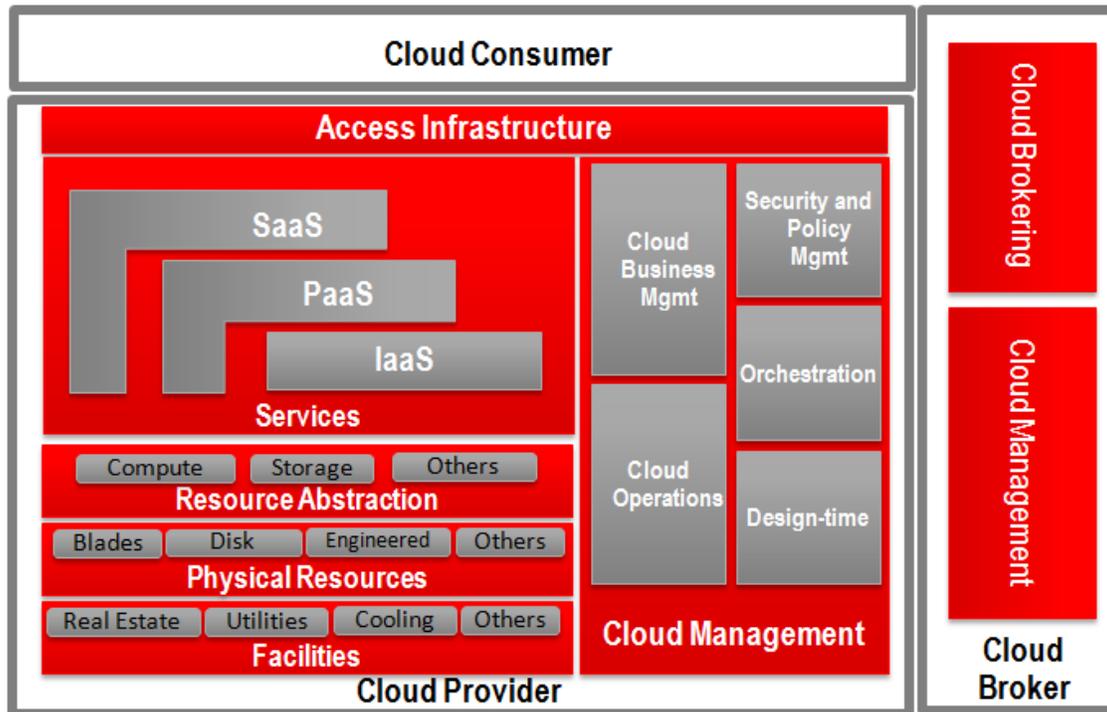


Figure 4 - Cloud Conceptual View

The role of the Cloud provider is the most important and most complex of all. Infrastructure for the Cloud is usually of unprecedented scale and stringent requirements. Implementing the Cloud and maintaining it to satisfy the SLAs of the consumers requires extensive planning and precise execution.

A Cloud provider can spread the costs of facilities, across consumers to achieve economies of scale. Facilities expense may include the cost of real estate, cooling, utilities, and rack space among other things.

The physical infrastructure components may include blades, networks, engineered systems, and storage disks. These resources must be pooled and provisioned through grid technologies in order to support the elasticity and scalability demands of Cloud infrastructure.

The physical resources need to be logically partitioned and secured in order to support multi-tenancy. Rapid elasticity requires the resources to be quickly deployed and undeployed at granular levels. Traditional deployments require downtime for scaling and maintenance but Cloud infrastructure does not have that luxury. The approach is to create and deploy new instances on the fly to grow, shrink, or fix the existing deployments. The resource abstraction layer provides the capabilities to logically abstract the physical resources.

The Service infrastructure exposes the Cloud services to the consumers through the access infrastructure. Many resources can be offered as services but the ORA conceptual model defines three broad categories of services listed below:

- Infrastructure as a Service (IaaS)
- Platform as a Service (PaaS)
- Software as a Service (SaaS)

The diagram also illustrates a core concept that although there is an inherent ordering of these layers, there is no particular dependency between these three layers. For example, PaaS and SaaS may exist independently without the overhead of an IaaS layer. In this case, they would use dedicated infrastructure for running the PaaS and SaaS services. Alternatively, they may use any of the underlying layers. For example, a SaaS service may leverage a PaaS service that is built on an IaaS service. It should also be noted that the consumers may access any of these services through the access layer, as indicated by the placement of the layer bars.

The Access Infrastructure controls access to the services and provides the appropriate interfaces to the consumers to access the services.

Logical View

This section describes the logical view of the Cloud infrastructure. Figure 5 shows the logical layers and key logical components of the Cloud infrastructure.

The access layer decomposes into two important sets of functionality: interfaces and network components. The Cloud needs a variety of interfaces to allow for access to the underlying services as well as its management capabilities. In addition to the end-user facing interfaces present in the access tier, there will be several operator specific capabilities present.

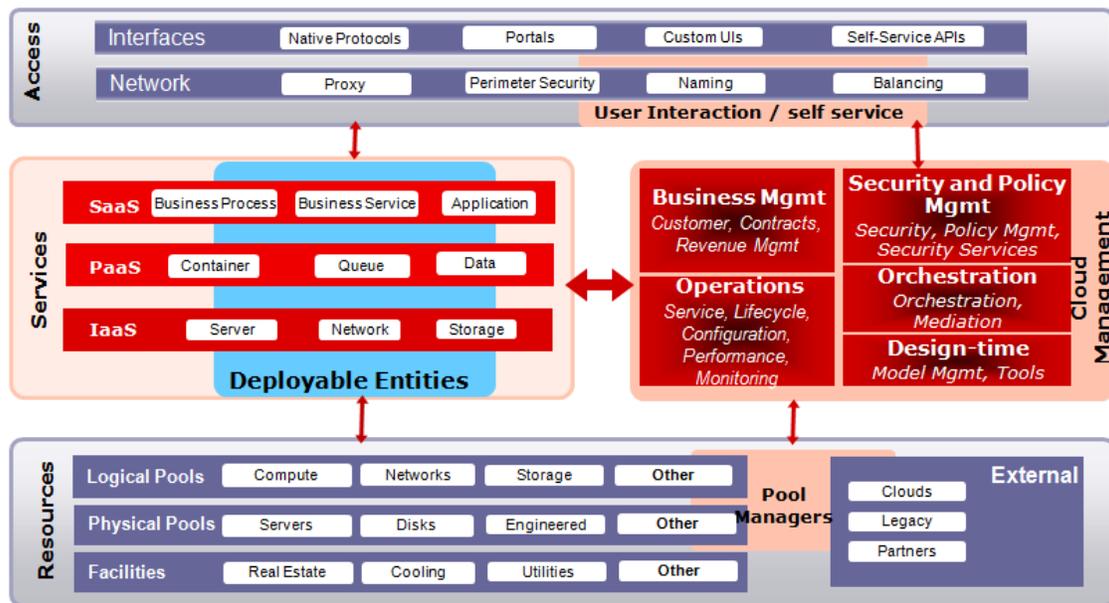


Figure 5 - Cloud Logical View

A common Cloud management layer provides the management capabilities required for all types of services. A unified management framework provides a holistic view of the infrastructure and end-to-end visibility. The management layer provides support for both build-time and run-time activities.

Logical and physical pools of resources contain virtualized or physical resources managed by the pool manager. These resources may be fairly simple in nature (as the single virtualized server example above) or complex (such as a highly-available or clustered Java application platform).

External resources may include third party Cloud services, legacy systems, and partner services.

The services layer shows the concept of deployable entities that are self-contained, logically grouped, and packaged service resources that can be used to rapidly provision the services. The deployment entities are “templated” to automate and accelerate the provisioning of services.

Cloud Management

The Cloud management infrastructure provides the key capabilities to manage the resources, control access, and govern the infrastructure. Figure 6 lists the Cloud Management capabilities.

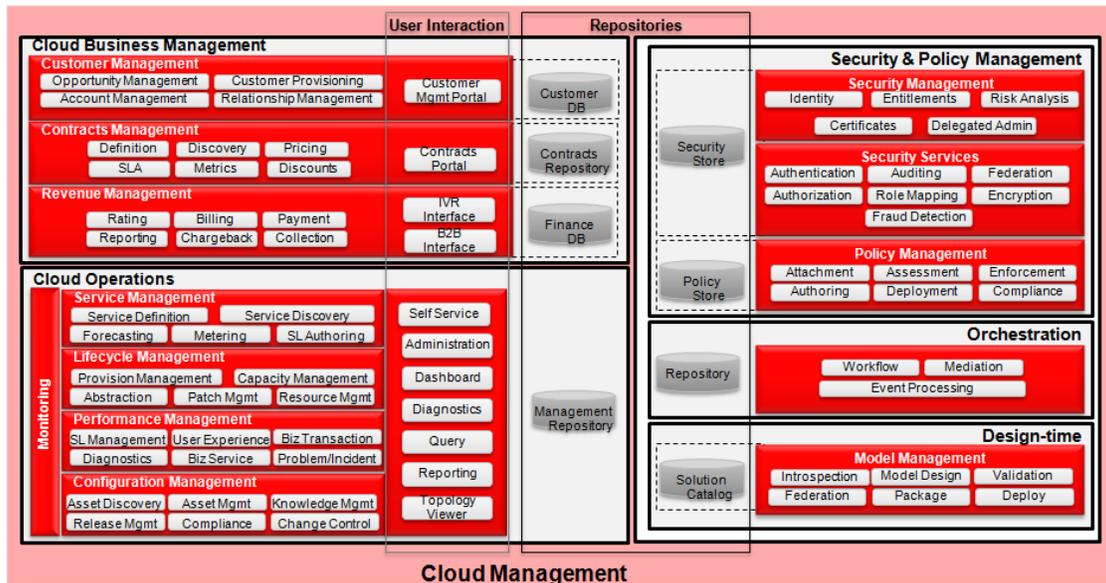


Figure 6 - Cloud Management Capabilities

A key characteristic of the Cloud architecture is automation and the ability to self-service most of the consumer needs. To that effect, access interfaces of various forms should be provided to the consumer to access the self management capabilities of the Cloud. The type of interfaces may range from sophisticated self-service portals to low level APIs to automate the management of the Cloud resources.

Another cross cutting concern is the management and sharing of information across various management activities. For example, the service usage information is captured by the runtime/operations infrastructure components but needs to be shared with the revenue management components for billing and revenue management. The repositories shown in the diagram are shared across the management components but their primary affinity is shown with the dotted lines.

The primary goal of the Cloud providers is to build and offer services to the consumers at a lower cost and faster time-to-market than traditional IT. Providing the service infrastructure is only a part of the solution. Customer acquisition, customer management, account management, billing, and revenue management are critical functions that providers will need to support their business.

It may first seem like the business management function is only applicable to public Clouds. But even private enterprise Clouds need to be run as a business in order to achieve the benefits of Cloud. Some of the capabilities in this section may be used less so than others by private Clouds, but the idea of monitoring usage, tracking users, charging back the appropriate business unit, and settling the revenue (or cost allocation) are examples of activities very much applicable to private Clouds as well.

Another interesting aspect of the Cloud business management is the possibility of using external Cloud services (SaaS) for common, non-core functionalities. Most customer management functions can be implemented and used as on-demand, Software as a Service. This approach reduces the footprint of the custom management infrastructure and increases reuse by availing the services for both internal management as well as external pay-as-you-go offering.

Cloud Operations groups the operational capabilities of Cloud Management. The capabilities are further categorized into the following groups:

- Service Management
- Lifecycle Management
- Performance Management
- Configuration Management
- Monitoring

In a Cloud, due to the self-service, automatic provision, and dynamic elasticity, there is an expectation that IT resources get provisioned more quickly. Hence the normal defense mechanisms such as hardening, policy checking, governance etc. may be skipped which results in risk.

Hence one of the important aspects for security in Cloud is automation to ensure these essential steps are not missed. However, automation is just one part of the solution. There must be governance in terms of who can provision environments, what data can be loaded into an environment (think data classifications), what security controls need to be put in place (proper risk assessment), standardization of security services, etc.

Security and policy management provides services common to both the build-time and runtime functions of the Cloud management layer. Commonly, these will include:

- Security Management
- Security Services (Runtime)
- Policy Management

Orchestration is one of the key capabilities of a Cloud infrastructure. Many Cloud management requests require a group of resources to be coordinated. For example, a scale up provisioning request may require several resources such as hardware, VM, middleware, database, firewalls, proxy servers, and load balancers to be allocated, provisioned, and configured to fulfill the service level requirements.

Model management provides capabilities for developers and deployers to create deployable entities. It supports this build-time functionality by exposing Cloud resources, validating, and deploying the deployable entities. Model management is the main point of interaction for developers with the Cloud infrastructure.

Product Mapping

Cloud computing is the evolution and convergence of technology trends that have been driving enterprise data centers and service providers over the last several years, such as grid computing, clustering, virtualization, SOA shared services, and large scale management automation. Oracle has been a leader in these areas with thousands of customer successes and a high level of investment. Today, Oracle powers the Cloud and is the foundation for many of the world's public and private Clouds.

Oracle's strategy is to offer a broad portfolio of software and hardware products and services to enable public, private and hybrid Clouds, enabling customers to choose the right approach for them. Oracle provides the broadest, most complete and integrated Cloud offerings in the industry.

For private Platform-as-a-Service (PaaS) Clouds, Oracle offers an extensive portfolio of horizontal and industry applications that run on standards-based, shared services platforms. Engineered Systems such as Oracle Exadata Database Machine, Oracle Exalogic Elastic Cloud, and Oracle Exalytics provide the high performance platform for building Platform Services. For private Infrastructure-as-a-Service (IaaS) Clouds, Oracle offers leading hardware products. For public Clouds, Oracle Cloud is a new offering delivering a broad portfolio of application and platform services to customers. Customers can also choose to run Oracle products in third party public Clouds. Many third party SaaS ISVs and other public Clouds are powered by Oracle technology. Finally, Oracle also offers software to integrate across public and private Clouds.

Oracle offers a broad spectrum of enterprise products to support public, private, and hybrid clouds. Oracle offers many of these new generation applications through a public Cloud and on-premise or off-premise private models. Figure 7 demonstrates that Oracle has a wide spectrum of products to support the provisioning, consumption, and management of private, public, and hybrid Cloud models.

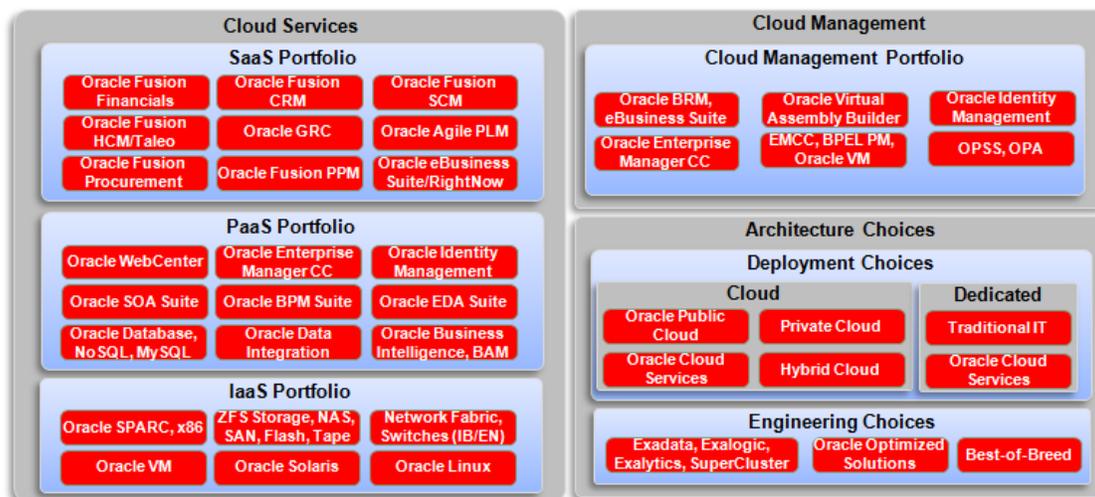


Figure 7 - Oracle's Cloud Offerings

Figure 8 shows the mapping of Oracle products to the Cloud logical view discussed earlier in this document.

Oracle Enterprise Manager Cloud Control (EMCC) provides a rich set of management and self service user interfaces for managing services in the Cloud platform. These user interfaces are not intended for system administrators but rather the users that provision and manage the services.

Perimeter security, proxy, and naming services are provided by the Oracle security products such as Oracle HTTP Server (OHS), Oracle Identity Management, Oracle Access Management, and Oracle Directory Services Plus.

Oracle middleware products including SOA Suite, BPM Suite, and EDA Suite are used to build standards based platforms to develop and run services. Oracle database can also be made available as a platform for third party development. Oracle Exadata and Exalogic engineered systems are used to build high performance, mission critical platforms offered as services.

Oracle Exalogic, Oracle ZFS Storage, Oracle Solaris, and Oracle Linux are examples of compute and storage infrastructure resources that are made available as a service through the Cloud.

Oracle's virtualization technology, Oracle VM, is a key technology mapped to the resources layer. It provides the abstraction and pool management capabilities for compute resources. Oracle SPARC, ZFS Storage server, Oracle Sun Super Cluster, and Sun Blade Ethernet Switch are examples of compute, storage, and network resources.

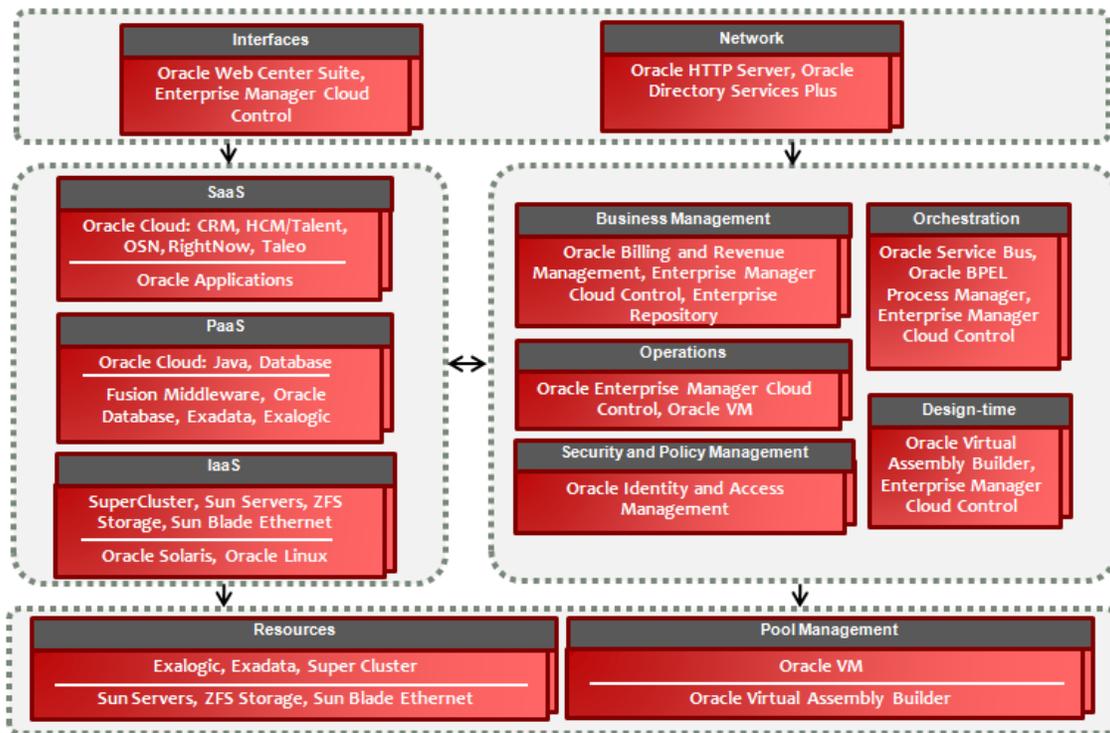


Figure 8 - Product Mapping to the Logical View

Oracle Cloud Management layer may possibly run on an Oracle Exalogic Elastic Cloud platform. Oracle Exalogic is an optimized stack of Oracle products to implement Cloud services and management components. Alternatively, the Cloud management layer may be implemented on an open hardware/OS stack such as Oracle Sun Sparc servers and Oracle Solaris OS platform

Oracle Billing and Revenue Management (OBRM) provides most revenue management capabilities including billing, payments, reports, and business intelligence.

Enterprise Manager Cloud Control (EMCC) is the key management product that provides the following capabilities:

- A complete cloud lifecycle management solution to quickly set up, manage, and support enterprise clouds
- Comprehensive, deep, and integrated management of the entire Cloud stack, all the way from applications to middleware, database, operating systems, hypervisors down to hardware components.
- Best service levels for traditional and cloud applications through business-driven application management

A self service environment demands automated packaging and delivery. Oracle Virtual Assembly Builder is a tool for packaging multi-tier applications, including both middleware and database components and their "interconnections" in a way that is easily deployable, movable, etc

Deployment View

Cloud deployment architecture depends on a number of factors such as the architectural options chosen, the scale of deployment, and the type of services provided. Private Cloud implementations may be relatively simpler compared to large-scale, massive public Cloud infrastructures that support hundreds or thousands of consumers.

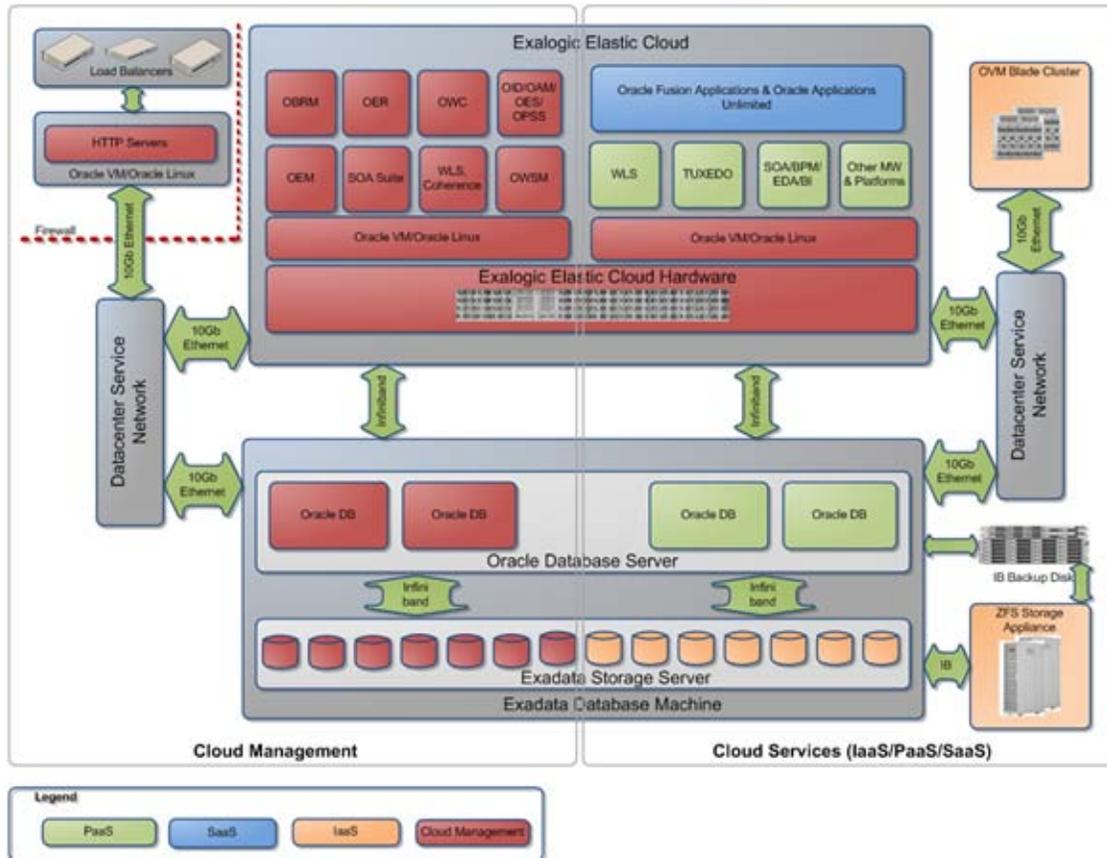


Figure 9 - Deployment View

Most Cloud deployments are massive and require mission-critical infrastructure to achieve the performance, elasticity, and SLA goals. Cloud infrastructure can be best implemented using Engineered Systems. Figure 9 illustrates the use of Engineered Systems to implement an enterprise Cloud infrastructure.

As discussed in the logical view, Cloud infrastructure includes both the management components and service resources. Engineered Systems are powerful enough to accommodate both of these layers of the Cloud infrastructure. Figure 9 shows a sample configuration in which the Cloud infrastructure is built on Exalogic and Exadata Engineered Systems. The Exalogic Elastic Cloud runs the software infrastructure required for managing the Cloud, such as OEM, OAM, OER, OBRM, SOA Suite, and others.

Exalogic also hosts the SaaS and PaaS services offered to the consumers. The figure shows a sample set of SaaS and PaaS components that are hosted on Exalogic platform. A variety of platform products may be hosted on the Exalogic platform. Examples include Oracle WebLogic (Java EE application server), Oracle TUXEDO (OLTP monitor), SOA/BPM/EDA suite, and other middleware platforms. Oracle Fusion applications and Oracle application unlimited are examples of SaaS services that can be provided on Exalogic.

The asset and model management are design-time aspects of Cloud management. The tools used for design-time activities may include Oracle Virtual Assembly Builder and Oracle Enterprise Repository. OER can also be used for managing the service catalog for the consumers. OVAB is not shown in the figure, but it can be deployed and run externally in a non-production environment.

Figure 9 also shows the load balancers, firewall, and HTTP servers that are essential capabilities of the Cloud infrastructure. These components need to be configured to support the multi-tenancy requirements of the Cloud. For example, the HTTP server needs to be configured with routing rules to direct the customer traffic to appropriate service instances.

Exalogic Elastic Cloud and Exadata Database Machine are connected through the high speed infiniband network and connected to the datacenter service network using 10 GB Ethernet connection.

Exadata Database machine provides data management capabilities for the Cloud management layer in addition to providing the resources for the database as a service (DBaaS). The Exadata Storage Server resources are offered as Storage as a Service. In addition Oracle ZFS storage can be connected to this platform with Infiniband to add additional storage capacity to be offered as a service. Computing capacity may be offered through Oracle SPARC SuperCluster or Oracle VM blade cluster, aka Oracle Optimized Solution for Enterprise Cloud Infrastructure.

Organizational Changes

Traditional IT implies not only the strong definition of separated roles (networking, operations, development, etc.) but typically the isolation of these roles in separate organizations. This exacerbates a classical challenge of trying to figure out how to scale a deployed application after it has been developed and deployed. The concept of dev-ops implies merging the roles and responsibilities of development and operations into combined teams that both develop applications and are responsible for moving them to production and on-going operations. The goal is radical improvements in time-to-market, but this implies not just deploying new tools and technology, but shifting the organizations IT culture and organization.

Unlike traditional deployment environments, the Cloud needs to provide capabilities and infrastructure to support both the build-time of an application (development environment) and the run-time of an application (deployment environment) as shown in Figure 10.

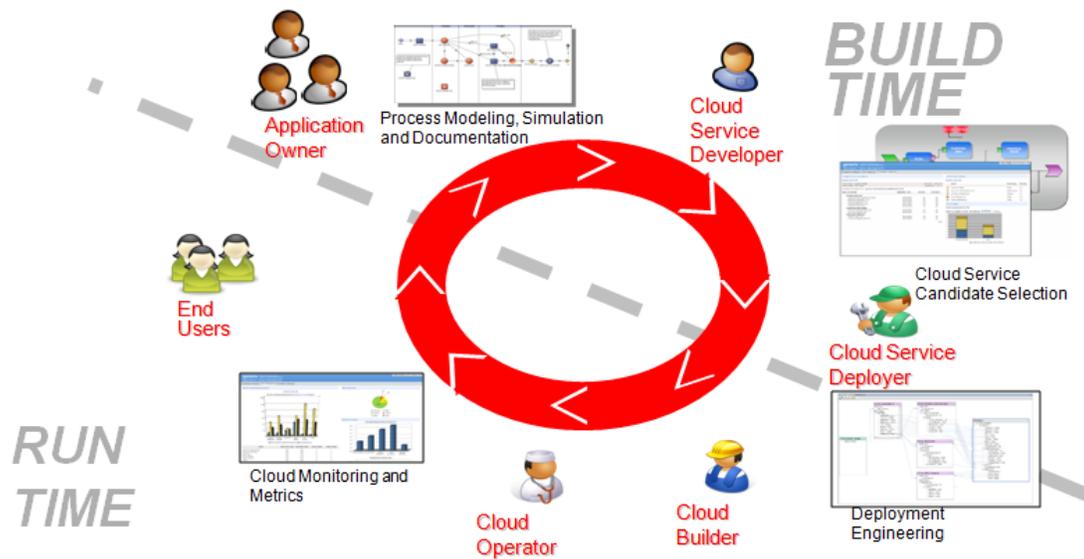


Figure 10 - Build-time Vs Runtime Roles

Build-time characteristics may include standardized packaging tools and formats, service catalogue, deployment & control APIs, debugging and validation, and Cloud service directory. Key runtime characteristics may include metering, monitoring, capacity planning, and SLA enforcement.

If the Dev-Ops model implies a refactoring or combination of previous roles, then a Cloud model may also imply a new separation of roles between building the infrastructure and the independent building of services and applications. Historically an application would be deployed concurrent with its systems environment, at the time that it was built. The Cloud model isolates early resource pool build out from later phase application service deployment. In its extreme this implies the delay of the instantiation of actual application 'architecture' to run-time. And similarly, operations, which use to be done reactively, would now be increasingly architected up-front into self-service automated procedures.

Cloud needs to support diverse categories of roles:

- **Cloud Service Provider:** The operator and provider of the Cloud computing infrastructure. Roles within this category will include Cloud builder and Cloud operator.
- **Cloud Service Developer:** These are the roles responsible for designing, creating, packaging, and deploying Cloud applications for end-user consumption. Typical roles within this category include service developer, application owner, and service deployer.
- **Cloud Service Consumer:** End-users of Cloud computing. These include the actual users of the Cloud application as well as the application owners.

Conclusion

Cloud is quickly becoming a key strategy for business and IT alignment and is starting to dominate architecture roadmap discussions. Most enterprises have either adopted, or have plans to adopt, Cloud as a strategic choice in support of their business and technology goals. Most Cloud implementations are going to involve some kind of a hybrid approach where enterprise private Clouds are integrated with either other private Clouds or public Clouds. Understanding both provider and consumer perspectives of the Cloud is necessary to successfully implement complex and highly-scalable Cloud infrastructures that support the internal and external needs.

Cloud infrastructures are differentiated from traditional IT infrastructure by the scale, velocity, and the level of automation required. Building a successful Cloud infrastructure requires extensive planning and precise execution to ensure that resource capacity is not under- or over- estimated by a large margin. Automation and self-service should be built inherently into the infrastructure to support provisioning, elasticity, and management.

Oracle Reference Architecture (ORA) Cloud ETS provides a reference architecture for building enterprise-class, highly scalable Cloud infrastructure. Oracle provides comprehensive end-to-end solutions to implement and manage Cloud environments. Oracle products such as Oracle Enterprise Manager Cloud Control, Oracle VM, and Oracle Billing and Revenue Management help implement the Cloud management layer with their out of the box Cloud management capabilities. Oracle hardware solutions, engineered systems (Exadata and Exalogic), Oracle applications, and Oracle middleware products provide high performance hardware and software for building Cloud services. Oracle products help organizations build their Cloud architecture faster, better, and at a lower cost.

Further Reading

IT Strategies from Oracle

IT Strategies from Oracle (ITSO) is a series of documentation and supporting material designed to enable organizations to develop an architecture-centric approach to enterprise-class IT initiatives. ITSO presents successful technology strategies and solution designs by defining architecture concepts, principles, guidelines, standards, and best practices.

This document is part of a series of documents that comprise the Cloud Enterprise Technology Strategy, which is included in the ITSO collection. Access the ITSO [website](#) for a complete listing of Cloud documents as well as other materials in the ITSO series. A list of related documents is provided below.

- **Cloud Practitioner Guides**

- **A Pragmatic Approach to Cloud Adoption:** For enterprises that seek to transform their own IT capabilities and avoid adverse disruption in the process, a structured and pragmatic approach to Cloud computing is required. This practitioner guide details a framework that can be used within any organization for developing such an approach to Cloud adoption.

- **Cloud Reference Architectures**

- **Cloud Foundation:** Cloud computing offers the potential for substantial reduction in IT costs while increasing IT agility. This document describes architectural characteristics and expectations of Cloud from a business and operational perspective. Architectural principles, standards, concepts, and a conceptual view for Cloud architecture are also provided.
- **Cloud Infrastructure:** Cloud computing has emerged as one of the most important new computing strategies in the enterprise. This document focuses on Cloud from a provider view. It covers the capabilities for public and private Clouds, a discussion of Cloud architectures, and provides key architecture views to jumpstart a Cloud architecture initiative.

- **Cloud White Papers and Datasheet**

- **Oracle's Approach to Cloud (data sheet):** Successful adoption of Cloud computing requires the definition of an approach that aligns with business drivers and operational capabilities. This is why Oracle has developed a pragmatic approach, based on experience with numerous companies, to help customers successfully adopt Cloud. This data sheet provides an executive overview of Oracle's proven approach to Cloud.
- **Cloud Candidate Selection Tool:** Oracle offers a comprehensive cloud evaluation framework to help IT organizations determine which applications, services, modules,

components, and more are appropriate for deployment to either a public or private cloud. This white paper describes the tool and how to use the resulting analysis.

- **Cloud Computing Maturity Model:** Oracle offers a comprehensive cloud maturity model based on collective experience and best practices. Maturity models are useful to benchmark yourself against others in your industry, gauge progress on your initiatives, and perhaps even discover that you are on track to achieving your goals. This white paper provides you a framework to evaluate your cloud initiative.



Cloud Reference Architecture
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