Infosys cobalt

WHITE PAPER

UNDERSTANDING HOW ORACLE CLOUD PRODUCTS ALIGN WITH THE BUSINESS

Reference Architecture for Oracle Cloud Services

Abstract

Oracle has been at the forefront of innovation by constantly upgrading its complete technology and product stack to include state-of-the-art hardware, databases, middleware, and applications. It offers organizations a significant advantage by providing products that are homogenous and integrate seamlessly. However, decision-makers often struggle with deciding which specific Oracle offering – in SaaS, PaaS, IaaS, or DaaS – is best suited to their enterprise and what the typical architecture blueprint would look like.

This paper provides a detailed overview of a reference architecture of Oracle Cloud Services. Drawn from a successful Infosys engagement with one of the top 5 key Energy Suppliers in UK this paper gives organizations a view into different components of Oracle Cloud Services and how these knit together in the overall Oracle Cloud landscape. It will help decision-makers understand Oracle Cloud journeys so they can build a foundation, accelerate decision-making, enable governance, and implement future-proof products that scale with the business.

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Introduction

Enterprises with massive legacy estates and diverse technologies are looking to cloud to help them keep pace with disruption and digital transformation. However, they struggle with a deluge of information on methodologies, best practices, points of view, etc., which makes it difficult to determine a starting or reference point.

Take the case of Oracle, a leading cloud vendor with a wide range of products in software-as-a-service (SaaS), platform-as-a-service (PaaS), infrastructure-as-a-service (IaaS), and database-as-a-service (DaaS). Each of these offerings is extremely innovative and tailored towards enterprise goals. Nevertheless, enterprises seeking to adopt these products and move to cloud remain unsure of whether to follow a big bang or a staggered approach.

Challenges in the Existing Technology Stack

Over the years, organizational teams have gotten used to working with legacy systems. Lately, there is a demand from employees for enterprises to renovate their technology landscape and adopt tools that boost productivity.

A key challenge when planning such transformation programs is the finding a reference point that supports greater scalability, return on investment (RoI), and innovation. Typically, organizations limit pilot programs to a confined set of business functions in order to assess feasibility, cost, benefits, and risks. It also allows them to roll back programs, if needed. However, in due course, this leaves organizations with several disparate new technologies without having parallelly offloaded obsolete ones. Inevitably, the complex IT landscape does not support rapid change and delivers only mediocre success rates with regards to adoption and long-term value.

The way forward is for enterprises to identify the right solutions that address their business needs, implement these to gauge value, and scale them in a future-proof manner to maximize RoI.

Overview of OCI Reference Architecture

Cloud vendors periodically release and update products and services to support the digital transformation journeys of their customers, i.e., enterprises. Even as these customers adopt various cloud products and services, they often lack visibility into how these solutions stitch together into a single fabric that drives digital success for business operations.

As a leading global cloud vendor, Oracle has a complete portfolio of SaaS, IaaS, and PaaS products within the Oracle Cloud Infrastructure (OCI) Generation 2 platform. Each of these products can be integrated securely to service enterprise business operations, meet their requirements, manage various project lifecycles, and transform people, processes, and technology.

Oracle Cloud Reference Architecture not only steers the successful delivery of IT projects but also amplifies productivity for different business personas as listed below:

- CTOs get guidance on forecasting and selecting the technical product stack
- Product owners can better understand where products fit in the overall Oracle product landscape and how they support digital transformation
- Chief architects can benefit from robust and secure architecture
- Project leads and developers can better visualize how these Oracle products work in an integrated environment

Oracle Cloud Service Architecture enabled on OCI Gen2

OCI is a platform of cloud services that allow enterprises to build and run many applications in a highly available and highly performant environment.

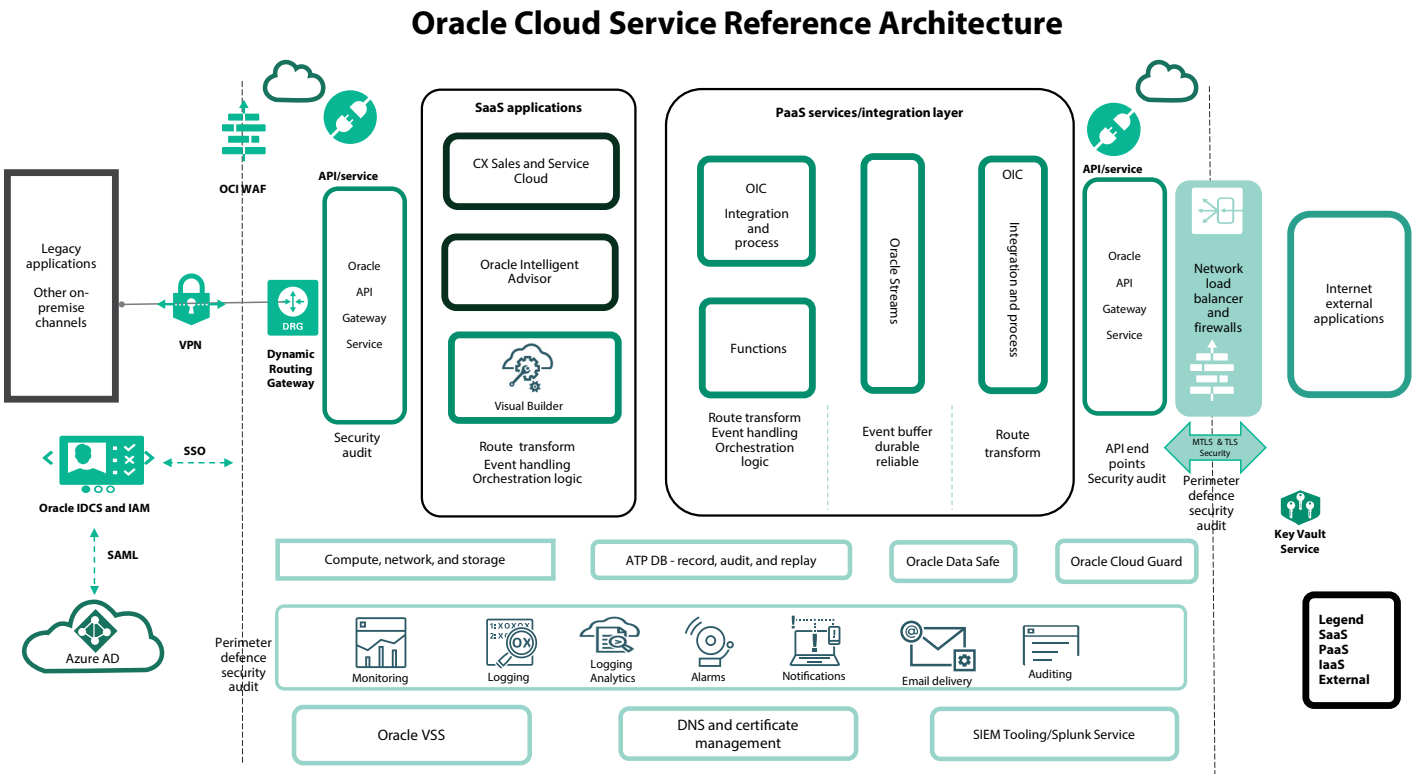

Figure 1 – Oracle Cloud Service Reference Architecture

Each product and service in OCI has a distinct role that maps to unique benefits and business requirements. Figure 1 provides a reference architecture of a complete OCI implementation for an Infosys client. It illustrates how different OCI Generation 2 offerings such as SaaS, PaaS, and IaaS products merge into an integrated and secure application for a modern and hybrid cloud environment.

Features and Benefits of Oracle Cloud Reference Architecture Components

1. SaaS

Oracle Cloud has a variety of SaaS offerings tailored to functions (such as sales and marketing), operations (such as ERP), and industries (such as SCM). The most important feature of these SaaS products is the ability to securely present data via modern integration methods. These include REST-based APIs, event-driven (publish-subscribe), agent-based, connectivity between cloud and on-premises, Extract, Transform, Load (ETL), etc.

Every Oracle SaaS offering has a list of catalogues on integration services for data and security. Oracle Visual Builder Cloud Service (VBCS) allows customers to extend the out-of-the-box SaaS features as per their need. Oracle delivers these SaaS offerings as Oracle Managed Products whereby the underlying infrastructure and security is managed by Oracle. Enterprises can also scale and upgrade the capacity of these Oracle SaaS products by placing a request with the Oracle Service team.

2. PaaS

Oracle has an exhaustive list of robust cloud PaaS offerings.

- One of the core PaaS offerings (shown in Figure 1) is Oracle Integration Cloud (OIC) that comes with pre-built adapters and supports integrations in multi-cloud environments for Oracle products, on-premises applications, and external cloud applications. In Figure 1, OIC has been used as an orchestrator engine, routing and transformational service between various end applications in the solution. OIC Service are executed as scheduled services.
- Oracle Serverless Functions is another core PaaS offering. It is an open-source functions project that allows developers to create and run applications in any cloud or on-premises environment. In Figure 1, this offering is used to securely authenticate autonomous transaction processing (ATP) databases and external service on the Internet against the secrets stored in the OCI Vault Service. Further, Oracle Serverless Functions can be deployed on Oracle API gateway to securely expose its endpoints as HTTP(S) services.
- Oracle Streams provides a fully-managed solution to ingest large volumes of data and perform data processing in real-time. The main use case for Oracle Streams is in a publish/subscribe model where data is processed continuously and sequenced for further processing in an event-driven approach. In Figure 1, a large volume of data is ingested by an external application on the Internet, sent to Oracle Streams for processing in OIC, and to the API Gateway for further downstream integration.
- Oracle API Gateway acts as a gatekeeper. Here, all the APIs written in Oracle Serverless Functions, the container registry, and application endpoints are registered as HTTP(S) interface. It provides a wrapper between OCI Generation 2 services and external services. The API Gateway also establishes transport layer security (TLS) and mutual transport layer security (mTLS) integrations between OCI and external services.

The above Oracle PaaS offerings can be scaled up based on the client's capacity needs. OIC includes a single default message pack that can be scaled in OCI to multiple message packs based on client requirements. Figure 1 illustrates 94 message packs to suit the capacity needs of the Infosys Client, which could be further scaled down based on their operations. Similarly, Oracle API Gateway can also be upgraded and scaled up as per the capacity demands.

3. IaaS

Infrastructure and networking

A robust network implementation is important to establish internal connectivity between various OCI IaaS and PaaS services as well as external connectivity between the client's on-premises, OCI network, and Internet applications. In the above reference solution, OCI networking has been categorized in two major areas.

- OCI to client's on-premises network – The client used this to extend their on-premises datacentre with an encrypted and dedicated network using IPSecVPN tunnel (or FastConnect for high-speed transfer). It allows on-premises services to send traffic to OCI network securely using a high bandwidth. OCI further uses Oracle Dynamic Routing Gateway (DRG) services to route traffic to various virtual cloud networks (VCNs) depending on the route table configuration. Enterprises can use the hub-spoke model to route their traffic on production and non-production environments. OCI further provides a granular approach to control traffic using the network service group (NSG) at an individual OCI service level inside VCN. This end-to-end feature of controlling traffic allows organizations to work at different levels of networking security with OCI and their on-premises datacentre. In case of multi-cloud environments, Interconnect (FastConnect + express route) is used between OCI and Azure to get the best of all cloud environments.
- OCI to Internet service – It is important to inspect the traffic when certain applications or API endpoints are exposed on the Internet or when traffic from the Internet is allowed inside the OCI network. In the above reference solution, Oracle Web Application Firewall (WAF) and FortiGate are used as protection services. These ensure that the traffic is inspected and that all malicious and unwanted traffic is rejected. It also issues SSL/Transport Layer certificates to all integrated services to ensure that endpoints are SSL secure and TLS/mTLS authenticated. It is important to build mutually trusted connectivity where both parties on the Internet trust each other's identity, as verified by a trusted Certificate Authority.

  Depending on the use case, Oracle WAF or a third-party firewall (like FortiGate) can be used for external IP threat detection, access control, flow-based inspection services, etc. These firewalls also establish translation mapping between external DNS to internal DNS of the API Gateway. Further, any external traffic moving into the enterprise can be offloaded with the mTLS and TLS certificate handshake.

Access management

Azure AD <> Oracle IDCS <> CX/ERP Cloud – In most environments where on-premises or vendor-based cloud active directory (AD) acts as the Identity Provider (IDP) and Oracle Identify Cloud Service (IDCS) acts as the service provider for Oracle SaaS, PaaS, and IaaS, it is important to establish automated user and group synchronization by setting up a federation trust for single sign-on (SSO). This process eases user onboarding and offboarding in OCI. It enables IDCS as a single source of truth for OCI user management and provides SSO using Security Assertion Markup Language (SAML) integration.

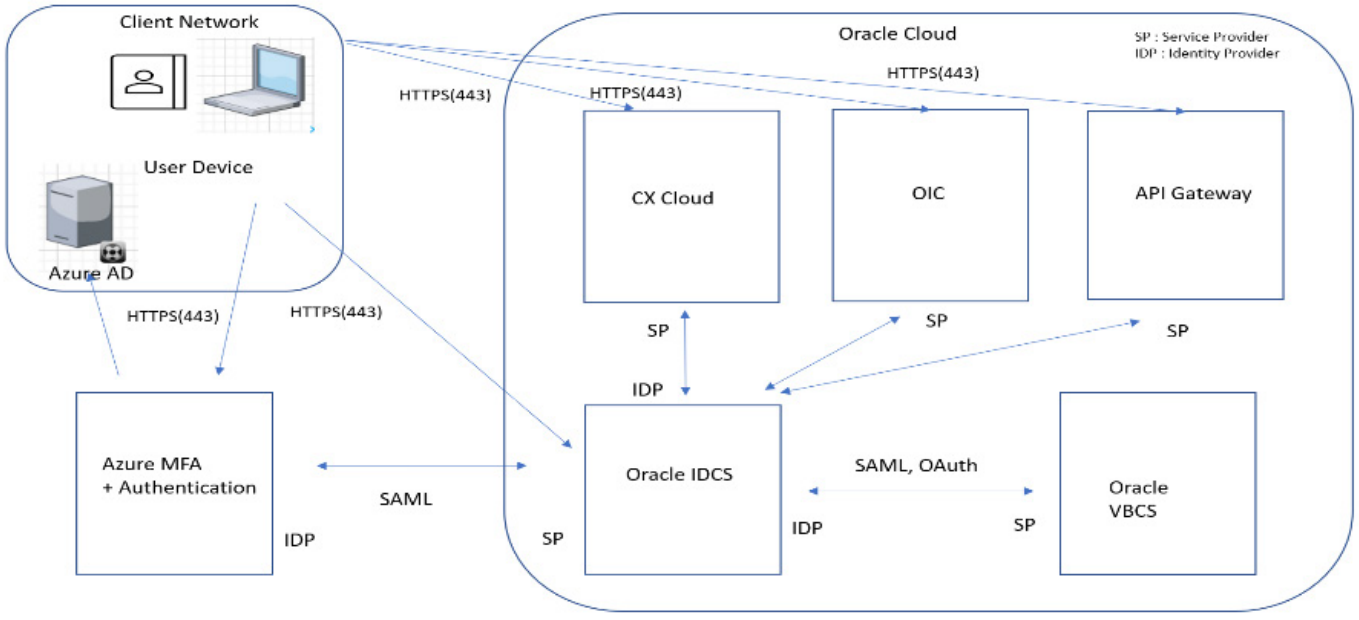

Figure 2 – Synchronization between Azure AD, Oracle IDCS, Oracle SaaS, and PaaS

DevOps monitoring services

Organizations typically set up monitoring services in their infrastructure to conduct daily health checks on the performance of the deployed services. OCI Generation 2 in the above reference architecture provides a variety of monitoring services for core OCI, security, and various application services.

Oracle Cloud Observability and Management capabilities have been set up to manage various PaaS and IaaS applications with full stack visibility and integrated analytics on a single platform. In this case, logs related to PaaS applications (such as OIC, APIPCS and Functions) as well as IaaS services are ingested in buckets and further integrated with Oracle Log & Analytics for troubleshooting and to analyze the performance of the deployed services as part of daily operations.

While Oracle Log & Analytics provides an operational analytics view of the application and infrastructure, security monitoring plays a critical role to ensure services are securely integrated without any vulnerabilities and threats. To report and scan vulnerabilities in OCI Generation 2, the reference architecture shown in Figure 1 uses Oracle Vulnerability Scanning (VSS) across all the hosts inside OCI Generation 2 infrastructure and informs operations to fix the identified vulnerabilities.

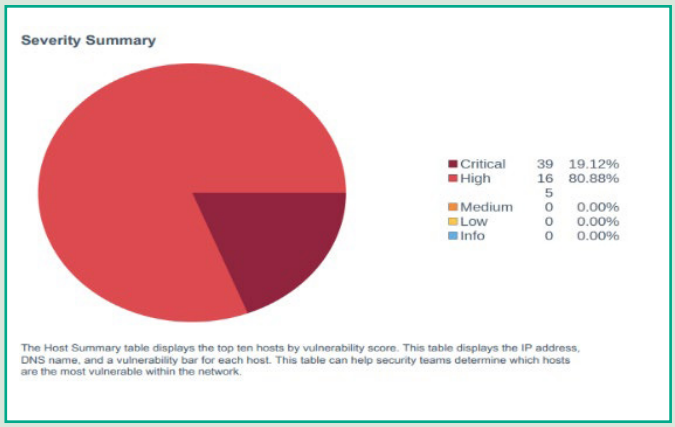

Figure 3 – Sample VSS report

Oracle Cloud Guard is set up to detect weak security configurations in the OCI platform based on threat detection rules. It reports misconfigurations in OCI, tags the affected OCI services, and submits this to the responder to mitigate and prevent security issues. Detector via Cloud Guard establishes a unified security posture of IaaS in Oracle Cloud.

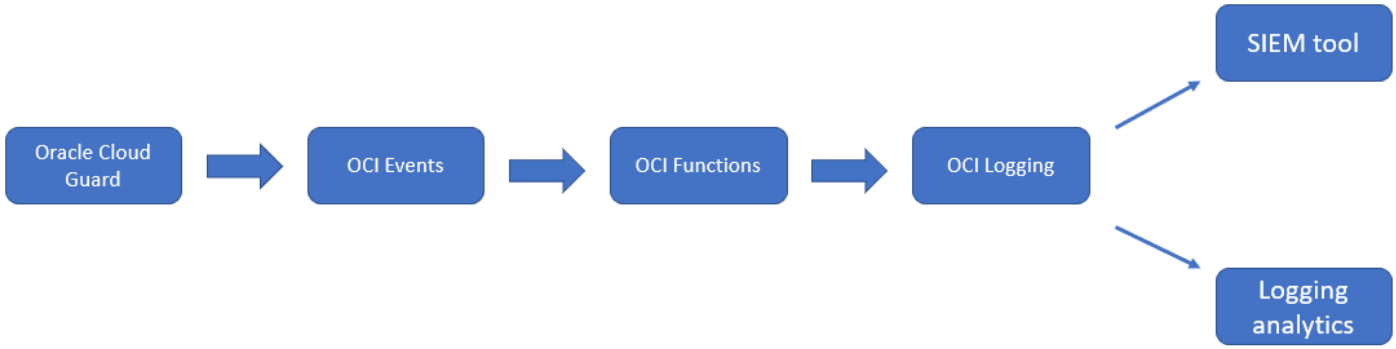

Figure 4 – Cloud guard detection and reporting

The SIEM Tool is another critical part of the above reference solution for monitoring security events from external traffic and within the OCI Generation 2 network. In the above reference architecture, Splunk Professional is used. The SIEM tool reports all accepted versus rejected traffic from the firewall and raises necessary events and alarms for the SecOps team to take action on the reported threats. Administrators can use all the logs from various sources (external and internal traffic) in OCI, which are ingested in the SIEM tool and report on all necessary security events.

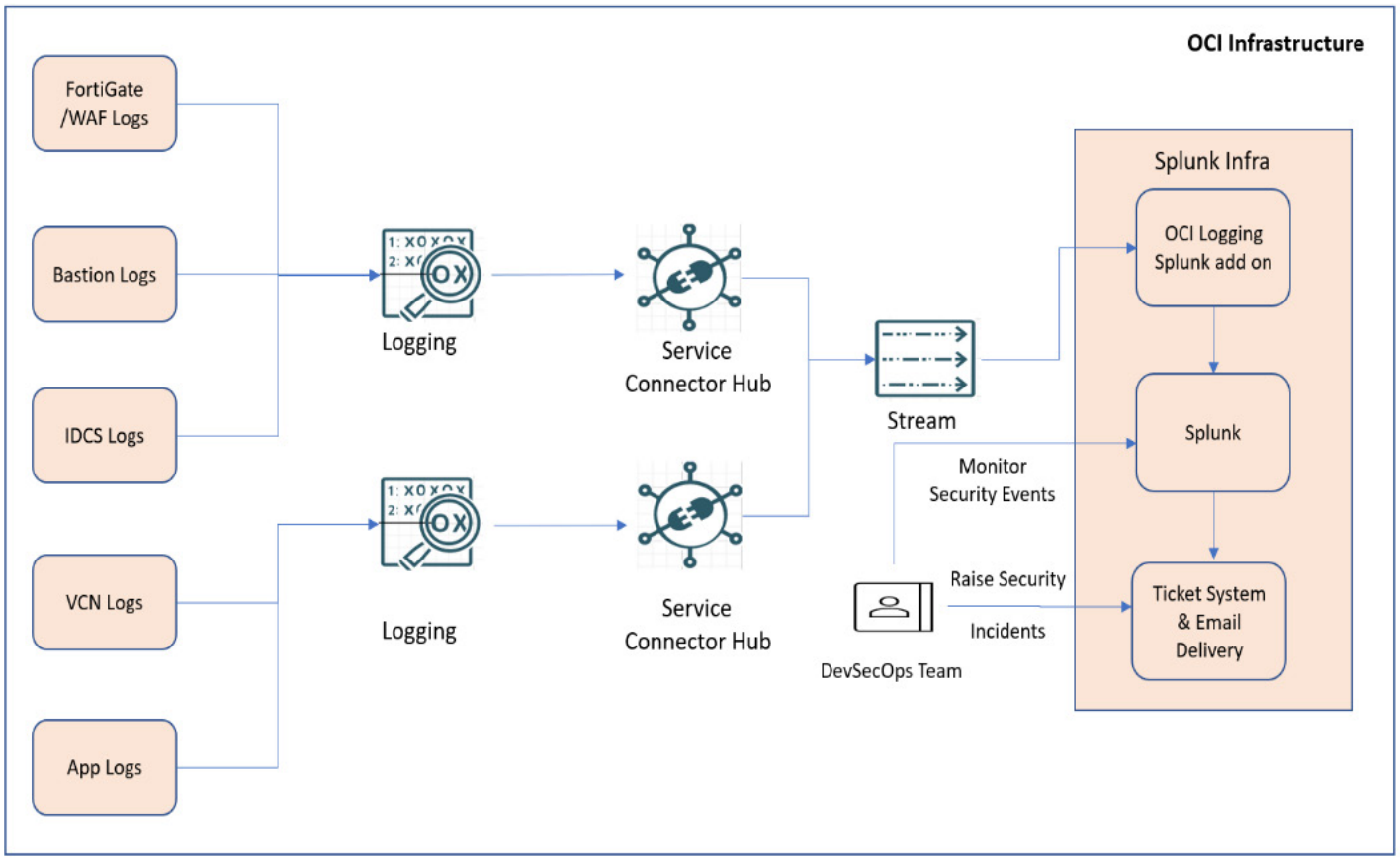

Figure 5 – SIEM tool with OCI log ingestion and monitoring

Elasticity and scalability are important in OCI Generation 2 Services. The core OCI resources can be scaled up or down based on the system workload requirements. For example, users can scale the CPU and storage of the Oracle autonomous database without any service interruption using the autoscaling feature. This also helps organizations achieve optimal performance cost-effectively.

DevOps deployment and release services

Oracle Developer Cloud Service is fully integrated with OCI platform and provides robust automated deployments on Oracle Cloud Services..

- OCI DevOps Service has a simplified delivery lifecycle of software release features that are fully automated using technology. It also enables people and process transformation.
- PaaS deployment with automated CI/CD visual builder pipelines and Shell scripting allows continuous integration and continuous deployment of application code across all the environments
- Terraform-as-a-Code integrates with VBS pipelines and enables the provisioning and maintenance of OCI Platform-as-a-Code

Tools	Oracle Developer Cloud Service, Terraform-as-a-Code, VBCS Pipeline, VBCS Board, Maven, GIT Repository, Selenium, Post-Man, WireMock, Terraform, Oracle Kubernetes, Docker, and Jira		
PEOPLE	DevOps team from Infosys: OIC and Middleware DevOps engineers, CX Sales/Service cloud and ERP cloud engineers, DevSecOps engineers, network administrators, release and configuration engineers, data analytics cloud engineer, infrastructure Terraform engineer, automation and manual testers etc.		
PROCESS	Release & Config Management		Change Management
	Service operational management		Incident Management
	Data & security environment		Environment Management
TECHNOLOGY	**SaaS** Oracle CX Service Cloud Oracle CX Sales Cloud Oracle Intelligent Advisor	**PaaS** Oracle Integration Cloud Oracle API Gateway Oracle Streams & Functions Oracle Adapters Oracle Process Cloud Oracle Visual Builder Service	**IaaS** Terraform-as-a-Code ATP Database Oracle IDCS & IAM Fortinet and Oracle WAF Oracle Cloud Guard Oracle Data Safe OCI Vault Service Oracle OCI Kubernetes and Docker Oracle Observability and Analytics Cloud

Operating model

After aligning the reference architecture and DevOps process/tooling, it is important to establish agile processes and agile project delivery.

The reference operating model of agile and continuous integration and continuous feedback shown in Figure 6 allow full product delivery in the Oracle Cloud landscape.

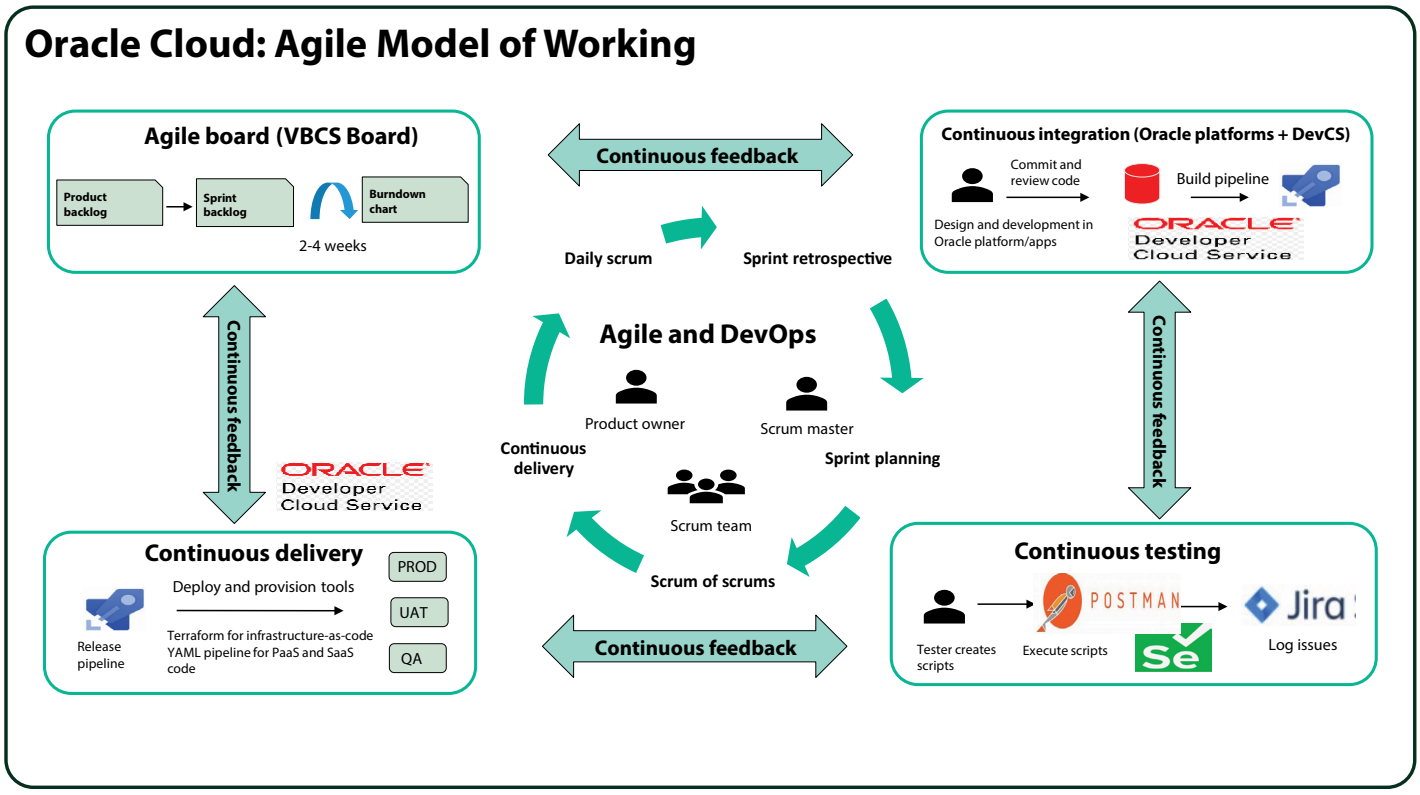

Figure 6 – Agile operating model in Oracle Cloud

Conclusion

Oracle Cloud encompasses a complete suite of SaaS, PaaS, and IaaS offerings that help organizations achieve core digital transformation and cloud-first operations across different business use cases. However, many struggle with understanding the features of these different offerings and how they map to the overall Oracle Cloud landscape. The reference architecture discussed in this paper, demonstrates how different Oracle products integrate seamlessly into a robust operating model. It allows organizations to tap into Oracle Cloud Services with higher security, better user productivity, and lower TCO.

About the Authors

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Charudatta Joshi has over 25+ years of hands on experience in IT solutions. He heads Infosys Oracle Technology center of excellence ideating new Cloud solutions, convert into compelling cost take out and value add offerings, prepare GTM Strategy , work closely with internal stakeholders, clients and liaison with Oracle. He leads a strong team of Oracle certified architects globally

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