PTC WINDCHILL ON AWS

Why does cloud make sense for engineering?

Security · Flexibility · Scalability · Performance · Cost · Resilience

Introduction

Product Life Cycle (PLM) systems have become an integral part of product development teams. However, in this fast-changing world, simply traditionally operating a PLM system is no longer enough. Instead, organizations are embracing cloud to march ahead of the competition and make their team agile.

The IT industry has accelerated cloud adoption for its entire workload. Even engineering applications like Product Lifecycle Management (PLM) are considered as PLM vendors already provide SaaS versions of their products. For instance, PTC has acquired Arena to widen its portfolio of SaaS products.

However, those organizations that have moved their PLM system to the cloud are still struggling to realize their full potential and face performance issues and failure. Companies should not consider PLM migration to the cloud as a one-off but as part of an overall cloud transformation strategy. Migrating the application using the "lift and shift" strategy cannot realize the full potential of the cloud. Each application should be analyzed, designed, and planned before the migration.

This whitepaper provides insights on the strategy organizations must consider before migrating PLM applications to the public cloud. The paper is based on our experience when installing Windchill on AWS Cloud.

01. Security

The comparative advantages of hosting solutions and data internally or externally have been widely discussed. However, it's important to understand the considerations when planning or starting the PLM (Product Lifecycle Management) journey. The PLM sector started adopting more recently, mainly because organizations understandably took time to trust someone else with their confidential product data. Although many cloud PLM solution vendors now offer both internal and external hosting, this is still not an established practice.

Even still, cloud vendors have made rapid strides to keep their infrastructure and customer data secure. According to Gartner's latest predictions, in 2020-21, the public cloud infrastructure-as-a-service (IaaS) workload will experience at least 60% fewer security incidents than those in traditional datacenters.

In a proof of concept (POC) with AWS, we also found that the cloud offers different levels of security to make the complete environment impermeable.

AWS provides a security offering in all categories like Identity and access management, threat detection, infrastructure protection, incident response, and compliance. In addition, Infosys provides expert guidance, best practices and accelerates implementation on AWS security service and third-party security tools that can be used to fortify each layer in the cloud architecture after understanding the requirements.

As PLM users trust cloud security more, we expect adoption numbers to grow.

02. Performance

The cloud provides the highest level of scalability where it is possible to scale up infrastructure on-demand to handle the increased workload through more virtual machines (VM), scalable databases and content delivery networks.

Performance is the second concern of any engineering application, especially PLM systems. It was interesting to check how

cloud can handle PLM systems which are resource-intensive applications, as they deal with heavy CAD models. The models are uploaded or downloaded from a server based on user actions.

During a POC with Windchill on AWS, we could design a scalable architecture based on usage and data-intensive task patterns without compromising performance.

03. Flexibility

Cloud offers flexibility to act as per an enterprise's priorities and preferences. Here is a sample of how it can help -

- **Additional environments:** The organization can spin off additional environments CAD/PLM to meet their requirements. They can later release the resources without incurring huge costs and effort.
- **Remote working:** Engineering teams can work on CAD or PLM tools by just logging into the browser.
- **Improved collaboration:** With resources empowered with cloud-based PLM, they can collaborate easily with internal or external users without waiting for a physical presence in the office.
- **Transformation:** Organizations are inventing new business models with the cloud

04. Scalability

Organization IT resources requirement changes based on projects and programs. More projects/programs demand more IT resources, but these IT resources are idle during a lean time, incurring costs.

Cloud solves this problem by allowing organizations to scale their IT resources and pay based on usage.

The clouds' biggest advantage is scalability which is why more and more clients migrate their applications to the cloud. As a result, the application owner doesn't have to worry about computing, storage limitations.

PLM applications not being cloud-native applications don't auto-scale automatically. Infosys has designed a solution to ensure

PLM application auto-scale based on the number of users or processing to improve performance while containing cost.

05. Resiliency

AWS defines resiliency as the ability of a system to recover from a failure induced by load, attacks, and any other hardware issue.

The cloud vendor provides multiple solutions to improve resiliency, and a vendor like Infosys can design a cost-effective, robust, resilient system. High availability and disaster recovery are like two sides of the same coin. High availability revolves around scalability and performance, while disaster recovery is about building a resilient architecture.

Infosys cloud experts work with companies to identify the system complexities and criticality and recommend a solution with the below design principles:

- Automatically recover failure nodes
- Test recovery procedures
- Scale horizontally based on workload
- Manage change through automation

We have installed and configured the highly available PLM system on AWS cloud as well as set disaster

management system based on Recovery Time Objective (RPO) and Recovery Point Objective (RPO).

06. Cost

How will cloud-based PLM impact enterprise costs? Our study revealed that these costs would definitely be lesser than an on-premises setup.

An on-premises setup requires enormous arrays of expensive servers and sufficient real estate for storage. On top of that, they need upgrades every few years but with an on-cloud implementation that's taken care of elsewhere.

Although cost is one of the important factors of moving to the cloud, cloud transformation is the strategy, and other factors mentioned play a key role in ensuring the success of cloud migration.
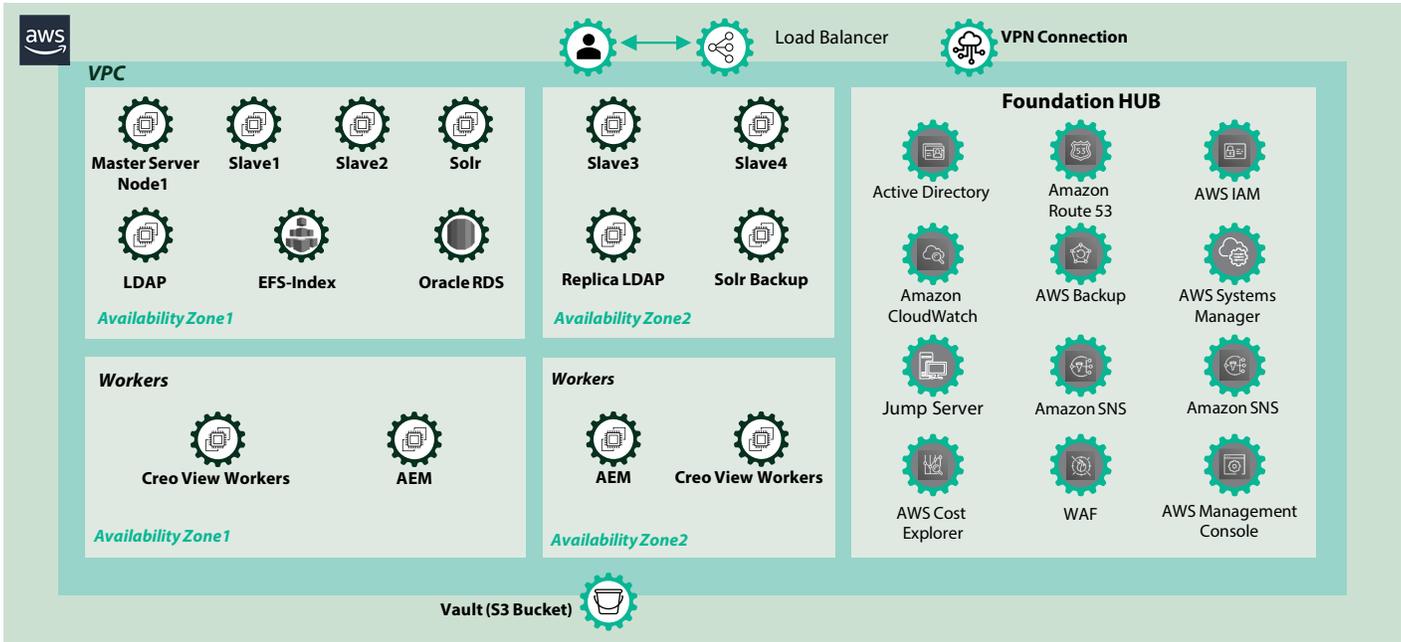
Windchill on AWS Cloud

Customers have many options to migrate their PLM workload onto the cloud, the most popular being "lift and shift" and "redesign or rearchitect." However, redesigning the on-premise Windchill architecture to meet the cloud requirement is preferred. After a redesign, customers can expect performance improvement, high availability of servers with optimized cost.

The approach to design the architecture depends on multiple factors irrespective of whether it is migration or a new system on the cloud:

• Usage of PLM system

• Windchill Modules installed

• Client requirement

• Restriction

• Integration etc.

Our cloud experts have created a standard cloud questionnaire template covering all aspects that cloud PLM architects must consider. A tailored architecture can be prepared based on the inputs received while optimizing cost and achieving better performance.

Architecture Overview

Our PLM and AWS cloud experts came together to create a reference architecture to install Windchill on AWS.

As part of the POC, we created a working environment on AWS with Windchill.

Figure 1 is a reference, and the actual architecture may differ based on client requirements. This section details different AWS components used in the architecture.

Services used:

Installing Windchill on AWS cloud solutions typically involves the following services -

Role	Service	Usage
Compute	EC2 Instances	Hosting PLM server (Background & Method Server)
Database	RDS	SQL database
Storage	S3/EFS	Persistent storage
Security	IAM/Cognito/WAF/Shield	Various security arrangements
Miscellaneous	Load Balancer, VPC/NAT Gateway	Load balancing across zones, keeping different instances on public or private subnets

Compute (EC2 Instances):

All the Windchill components are installed on EC2 instances except vault. The number of EC2 instances is determined based on responses to the Infosys questionnaire and equation (based on PTC equation but modified to meet cloud). AWS provides several EC2 options such as general purpose, memory optimized and compute optimized. Each instance type is designed to meet a specific requirement and task.

Infosys has benchmarked different instances and recommends EC2 instances meeting Windchill requirements.

Database (Relational Database Services (RDS)):

AWS provides multiple offerings for relational databases (Oracle, SQL Server, Aurora), whereas Windchill only supports MS SQL and Oracle databases. RDS is a native service from AWS for a relational database. The client can use their license or combine it while provisioning the RDS instance.

The database can be installed in the EC2 instance and connected with Windchill. RDS or database on EC2 has its pros and cons. During the design phase, all these scenarios are discussed and finalized.

Storage(S3/EFS):

Storage is a critical component and plays a significant role in Windchill performance (Windchill vault stores content, i.e., CAD file, image, text and other documents). The right service component ensures quicker storage and retrieval and directly affects end user performance.

AWS offers different storage options like S3, EFS, FSx, and each service has impacts performance.

S3 is the cheapest storage service with different flavors (Standard, Glacier etc.). S3 connectivity with Windchill affects performance.

EFS is a costlier option but has its own advantage. Clients had used EFS when Windchill did not support S3.

FSx is the new file system that is feature rich and delivers high performance.

A company can use one service or a combination of services to achieve performance.

Security:

Security is vital for safeguarding design data stored in Windchill.

Infosys has used a combination of services (AWS, third-party tools). More information is present here.

Miscellaneous:

Additional AWS components are used to complete the architecture – for example, load balancer, NAT gateway to communicate between public-private subnet and backups.

Use cases

We have considered the following scenarios for Windchill:

Public Cloud

When Windchill, CAD workers and replicas are on cloud, then it is a public cloud setup.

The public cloud is becoming popular due to the global presence of AWS datacenters, allowing the client to choose the nearest zone with a wide range of services. For example, Windchill, CAD workers and replicas can be configured on cloud based on user location.
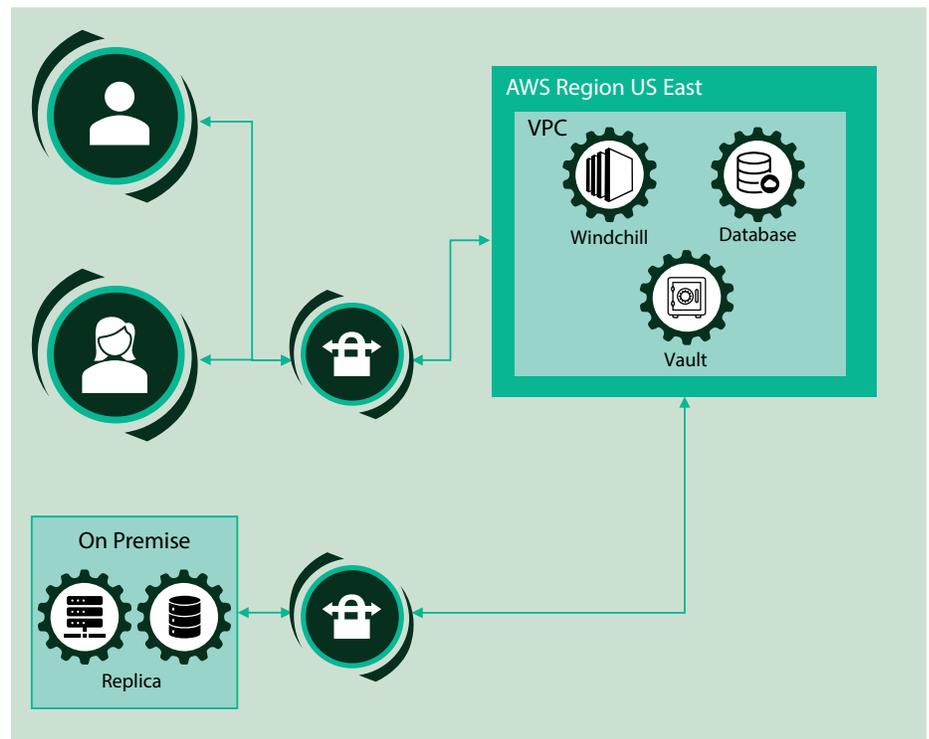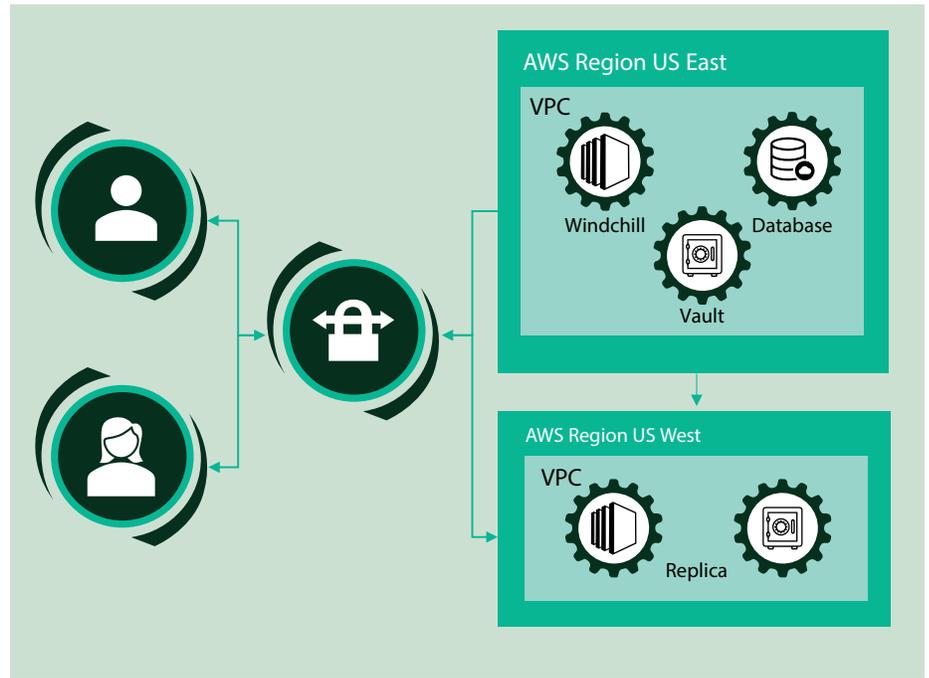
Hybrid Cloud

When Windchill is installed on cloud with one or more CAD workers or Replicas configured on premise, then it constitutes Hybrid Cloud.

Hybrid cloud, a popular option, where Windchill is migrated to AWS cloud, but the local vault is installed and configured in a private data center or office premise.

Hybrid installations provide flexibility where existing replicas or workers are used. They can be transitioned to cloud based on cost and requirements.

Private Cloud

The private cloud is popular with defense organizations due to data regulation and security concerns. The entire landscape is present in the private cloud like AWS Outpost. The architecture is similar to a public cloud, but hardware is physically secluded and only accessible to a limited group.

AWS Region US East — VPC: Windchill, Database, Vault
AWS Region US West — VPC: Replica

AWS Region US East — VPC: Windchill, Database, Vault
On Premise: Replica

Conclusion

Most manufacturers are now creating and producing more designs than ever before, implying more design data and higher complexity, which needs to be managed. PLM systems are essential tools for managing engineering workloads. However, hosting PLM software on-premise is not enough when the magnitude of data increases exponentially and when teams exist across geographies requiring instant access to data. Therefore, migrating PLM onto cloud is an urgent need.

We can help companies at whatever stage they are in their Cloud journey.

With a standardized approach perfected through our rich experience, our PLM and cloud consultants help clients on their cloud transformation journey.

Our team can assess the current PLM landscape, design the right sized cloud architecture, and create a tailored transformation approach.

Once the PLM starts running on cloud, we can manage and operate hybrid clouds globally with continuous governance, risk management and compliance. In addition, Infosys provides transparent execution, simplifies operations and optimizes costs for PLM cloud implementation.

Accelerate your PLM migration and adoption to the cloud and empower your team by capitalizing on our experience, templates, methodologies and cloud best practices.

About the Author

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Solution Architect and Consultant in PLM.

He has over 16+ years of PLM implementation in various industrial domains. He is part of PTC Center of Excellence practice in Infosys and working on migrating Engineering workload to Cloud, automating task using IOT tools, implementing Industry 4.0 concepts, Application Lifecycle Management, Service Lifecycle Management. Currently developing assets helping client move their Engineering workload to cloud ensuring security, scalability, resilience, and cost optimization.

Infosys Cobalt is a set of services, solutions and platforms for enterprises to accelerate their cloud journey. It offers over 14,000 cloud assets, over 200 industry cloud solution blueprints and a thriving community of cloud business and technology practitioners to drive increased business value. With Infosys Cobalt, regulatory and security compliance, along with technical and financial governance comes baked into every solution delivered.

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