White Paper on Managing CAD and CAE Environments

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Introduction

Computer-Aided Design (CAD) and Computer-Aided Engineering (CAE) applications are critical to industries such as automotive, aerospace and manufacturing in general. Organizations using CAD and CAE solutions face unique challenges in scalability, compatibility, licensing, security, and performance optimization. Managing these environments efficiently ensures higher productivity, reduced downtime, and cost optimization.

This white paper explores strategies to effectively manage CAD/CAE applications while ensuring high performance, security, and cost-effectiveness.

Overview of CAD & CAE Application Environments

CAD Applications

Following are some examples of common and specialized design tools:

- Autodesk AutoCAD – General-purpose CAD software.
- Dassault Systèmes CATIA – High-end CAD for complex 3D modelling.
- Siemens NX – Advanced CAD/CAE software for design and simulation.
- PTC Creo – CAD for parametric modelling.
- Ansys Motor-CAD - Designing electric motors, focusing on thermal and electromagnetic aspects.
- Altair PSIM - Specialized design tool for power electronics and control systems.

CAE Applications

Following are some examples of analysis tools:

- Ansys – Finite Element Analysis (FEA) and Computational Fluid Dynamics (CFD).
- Simulia Abaqus – Advanced FEA for structural simulations.
- MSC Nastran/Patran – Structural and dynamic analysis.
- Altair HyperWorks – Multi-physics simulation and optimization.
    - HyperMesh – FEA/CFD Pre-Processor
    - SimLab – Automated CAE Pre-Processing
    - HyperCrash – Crash & Impact Simulation Pre-Processor
    - HyperForm – Sheet Metal Forming Simulation
    - OptiStruct – Structural Analysis & Optimization

    - Feko – Electromagnetic Analysis (EM)
    - HyperView – Post-Processing & Visualization
    - HyperGraph – Graphing & Data Analytics
- Relyence Weibull - Weibull analysis is used in reliability engineering and failure prediction.
- Inspire - Simulation-driven design tool used for topology optimization and structural analysis.
- Maxwell - Electromagnetic field simulations.
- ANSA/META - ANSA is a pre-processing tool for CAE, and META is a post-processing tool for analysing simulation results.
- SimSolid - SimSolid is primarily a CAE tool used for structural analysis without traditional meshing.
- Cetim Cobra - This software is used for analysing bolted and screwed joints, particularly in industries like transportation, gas, petroleum, agriculture, and construction.

Infrastructure Components in CAD/CAE Environments

- License servers – Servers running license manager software to host licenses.
- Workstations – End user machines with right graphics card and memory for rendering.
- HPC – High-performance computing environment for simulations.
- Cloud vs. On-Premise Deployments – Balancing flexibility, security, and cost.

Challenges in Managing CAD/CAE Applications

Licensing & Compliance Management

- Managing floating and cloud-based licenses.
- Ensuring up-to-date version of license manager in compliance with vendor agreements.
- Selection of right license bundle, ensuring optimal use of license tokens.
- Efficient scheduling of simulation jobs for optimal license utilization.

IT Support & User Training

- Addressing frequent updates and patches from software vendors.
- Ensuring users have proper training on the latest features for optimal software usage.

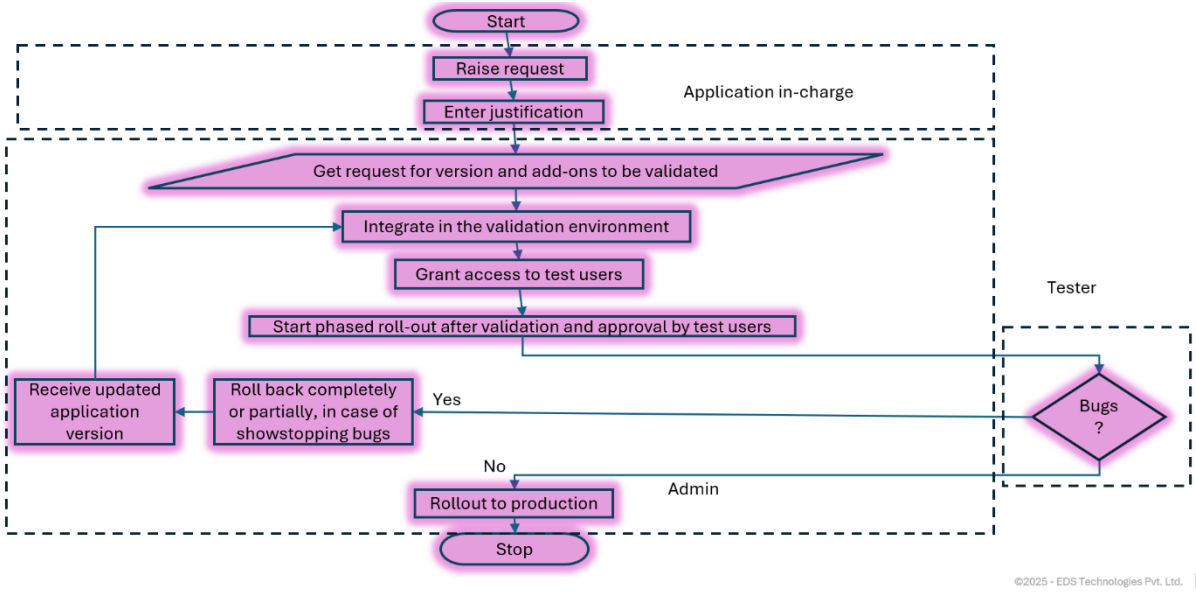
High Computing Resource Requirements

- Large-scale simulations require significant CPU/GPU resources.
- Performance bottlenecks due to hardware limitations.

Security & Data Integrity

- Protection of proprietary designs and intellectual property.
- Ensuring role-based access control (RBAC) in multi-user environments.
- Design, develop and administer an application launcher as a single point of access to multiple applications and their versions.
- Stratification of environments into testing, staging, preproduction and production.

Best Practices for Managing CAD & CAE Environments



License Administration services

- Effective management of license servers (e.g., DSLS, FlexNet, RepriseLM, LM-X, Sentinel RMS) for floating licenses.
- Monitor usage to optimize software license costs.

IT Support & Automated Updates

- Establish automated patching mechanisms for software updates.
- Provide self-service knowledge bases for common troubleshooting issues.

Standardizing Environment Configurations

- Use pre-configured templates for servers and cloud instances.
- Automate installation scripts for faster deployment.

Performance Optimization

- Leverage HPC clusters and cloud-based GPUs for intensive computations.
- Optimize network bandwidth for CAD/CAE file transfers.

Security, Compliance, and Performance Optimization

Compliance Management

- Ensure up-to-date license managers and corresponding application versions, in compliance with vendor agreements.
- Maintain audit logs for user access and modifications.

Cloud vs. On-Prem Optimization

- Use hybrid cloud setups for flexible compute power.

Future Trends in CAD/CAE Environment Management

- Machine learning based resource allocation – Allocation of compute power for various simulation jobs based on machine learning from past usage data.
- Blockchain for Data Security – Ensuring design authenticity and preventing unauthorized changes.
- Augmented Reality (AR) & Virtual Reality (VR) – Enhanced visualization for design collaboration.

Conclusion

Managing CAD and CAE environments require a structured approach to licensing, performance optimization, security, and data integrity. Organizations should implement CAD environment management and centralized license management services to optimize resources. By adopting best practices, enterprises can ensure scalability, security, compliance, high availability and improved engineering productivity.