



**With Cloud Migration,
Refinery Plant Simulation
Can Be Smooth Sailing**

Petrochemical plants are as unique as they are complex. Oil & Gas (O&G) companies have long since discovered that dynamic simulation across units and processes in these complex environments is useful in several ways. Simulations are used to understand how change in feed properties and atmosphere affect output, how best to blend products, how product value can be accurately calculated, and the best ways to integrate units, improve reliability and meet regulatory norms.

Simulation is also an effective training tool. It provides operators the necessary skills and confidence to operate plants and control production. Using simulation, plants can boost operational reliability, increase safety and bring down costs. Today, simulation is an essential component of plant operations. But, with oil prices going down, every function within a plant is being mandated with optimizing costs to improve margins. We believe that Cloud technologies can be leveraged to substantially bring down the cost of simulation.

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Centralizing a fragmented process

Cloud technologies are being leveraged across industries - from retail to education and from financial services to manufacturing. However, their use in refinery plant simulation remains to be explored.

Normally, dynamic plant simulation development is a highly fragmented process. The scope is vast, affecting different areas of operation. Therefore, the scope is broken down and modelled by different teams. During development, there is a considerable amount of back-and-forth communication between the customer and the development teams. There are requirement and design updates, change management, data queries, model validation tests, factory acceptance testing and site acceptance testing before the simulation modules can be deployed for onsite training.

Between these activities, bench models are developed, tested, reviewed and integrated into a single model. The process involves backup of the different models in a centralized server, physical transfer of stand-alone model files during review and feedback, and ensuring they are readily available for final integration and delivery.

These activities look simple on paper. But, in reality, they present a challenge in terms of data security, version management, access to the customer for clarification through different modes of communication, transferring data. This results in fragmented records, unreliable backup and unsecured data transfer. There is also loss of time and effort when a centralized server fails.

The emerging technology of Cloud computing provides a solution for these challenges and improves upon the development of simulation projects.

Reliable Cloud environments can be used by simulation development teams to create their models and maintain backups without hardware failure affecting effort and timelines. Access to the environment can be provided based on user profiles with specific authorization protocols that maintain and enhance security. Team members can access files, change requests, plans, schedules, meeting requests/client communication, resources, review documents, transfer data and safe backups etc., from anywhere in the world, without the need to be on premise as is the tradition with simulation development.

Complete cloud solution for simulation

Typical Cloud infrastructure for simulation will be broken up into three modules:

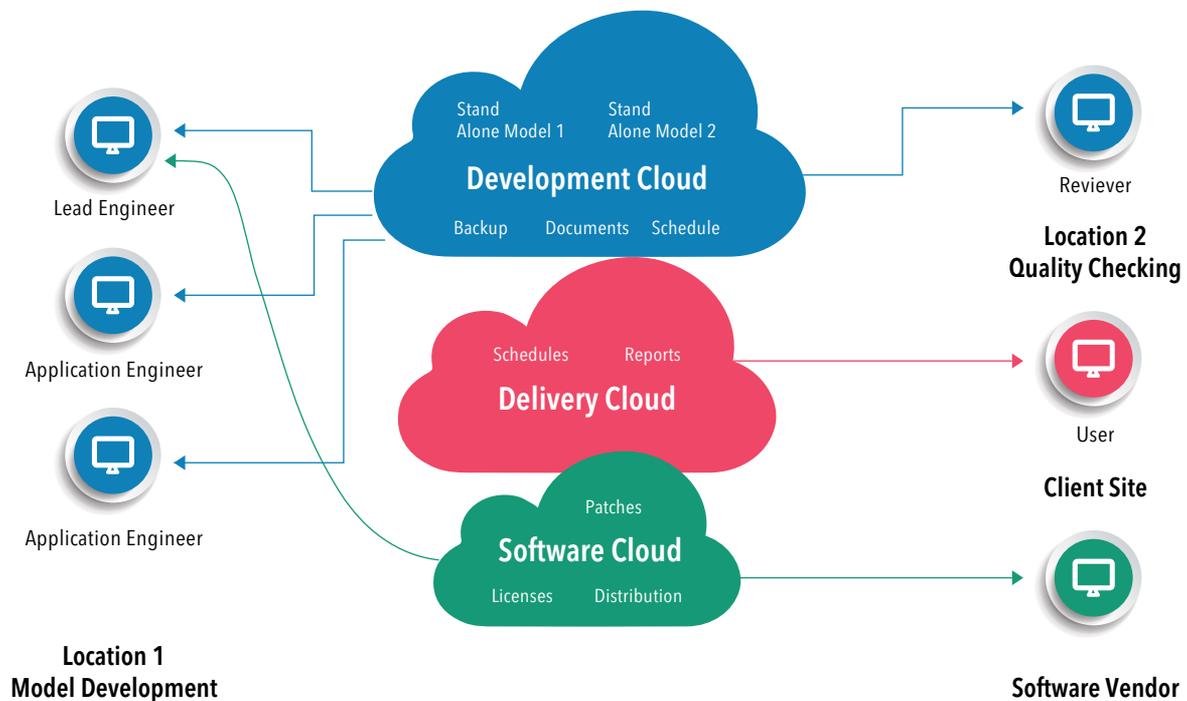
- **Development Cloud:** This would contain requirements, models, schedules and backups. Application engineers and reviewers would have access to this module
- **Delivery Cloud:** Client-side users will be able to access the simulation models for use from anywhere, anytime. They could use this to train operators without having to maintain an on-premise server with

backups and security protocols

- **Software Cloud:** This will be accessible to software vendors to ensure regular patches, upgrades and license/distribution details are maintained based on users/usage

Such a Cloud environment will centralize, secure and back up all development/output (see Figure 1) associated with simulation model development, making it easier for customers, developers and vendors to collaborate while keeping costs low.

Model development in cloud environment



The key advantages of Cloud for the development team will be:

- Ability to support, manage and maintain large volumes of data
- Superior data transfer speeds, thus yielding cost and time savings
- Protection against server failure
- Enhanced security
- Zero hardware maintenance
- Easy access and deployment

While setting up the Cloud environment with appropriate authorization and security protocols will be a one-time effort, refineries will need to invest in the continuous training of simulation engineers, vendors and partners in the use of Cloud functionality.

The bigger challenge will be in the form of managing inter-state, cross-country regulatory requirements and license management. These factors need to be investigated in detail before modeling and simulation projects are migrated to a Cloud environment.

Cloud computing is here to stay. It is being leveraged by every industry to reduce the reliance on hardware, manage complexities and bring down costs. And as the Industrial Internet of Things (IIoT) begins to draw upon an increasing amount of data in O&G operations, Cloud will become essential for cost optimization. We, therefore, believe that the time is ripe for simulation projects to begin to migrate to Cloud as quickly as possible.

About the author

Senthil Kumar Subramanian is a Domain Consultant for Wipro's Energy Downstream CoE. Senthil, with 16 years of experience, specializes in implementations of Operator Training Simulator (OTS) projects for the Oil and Gas and other process industries. He has handled simulation, MES application implementations, integration and support. He is a Chemical Engineer.

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WIPRO TECHNOLOGIES, DODDAKANNELLI, SARJAPUR ROAD, BANGALORE - 560 035, INDIA. TEL : +91 (80) 2844 0011, FAX : +91 (80) 2844 0256

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