MBSE for Datacenters and AI Infrastructure: Understanding the Systems Behind the AI Revolution

BIOGRAPHY

Umar Ahmed leads Model-Based Systems Engineering and Digital Engineering initiatives across North America for Dassault Systèmes. He oversees consulting services and enterprise deployments supporting major programs including NVIDIA AI Factory infrastructure, SWITCH datacenter facilities, and digital engineering transformations across Aerospace and Defense organizations such as Boeing, Lockheed Martin, RTX, BAE Systems, and Northrop Grumman.

His work sits at the intersection of systems engineering, product strategy, and emerging technology. He focuses on helping organizations move from traditional document-based engineering toward model-based environments that change how architecture decisions are made and how complex programs are executed.

Before his current role, Umar worked directly in aircraft development, participating in three clean-sheet aircraft programs spanning flight test, certification, systems engineering, and program execution. Those experiences shaped his approach to complexity, traceability, and engineering decision-making under uncertainty.

His current focus areas include AI-integrated engineering workflows, AI infrastructure and datacenter modeling, Model-Based Acquisition for defense transformation, and technology roadmapping that connects long-term planning with engineering execution.

ABSTRACT

Behind every AI breakthrough is a massive physical infrastructure—one of the most complex engineered systems ever built. Modern AI datacenters are not IT projects. They are system-of-systems engineering challenges where architecture decisions ripple across energy consumption, performance, scalability, and sustainability.

This seminar examines how Model-Based Systems Engineering applies to the design and optimization of AI datacenter infrastructure. The talk covers the convergence of high-performance compute, advanced networking, power delivery, and thermal engineering that makes large-scale AI possible. It addresses concrete questions: How do we scale compute without unsustainable energy growth? How do cooling architectures evolve for extreme hardware density? How do engineers coordinate across disciplines when every subsystem affects every other?

Traditional document-based engineering breaks down at this scale. The seminar explores how MBSE introduces system-level thinking through shared digital models—enabling teams to visualize architecture relationships, simulate performance impacts, and maintain traceability from concept through deployment. Drawing on real-world experience from AI infrastructure engagements, the talk provides industry perspectives on architecture-driven engineering, virtual twin approaches, and the cross-domain integration challenges that define modern datacenter design.

The session concludes with a discussion of the engineering skills and mindsets needed for the next generation of infrastructure engineers—where systems thinking is as essential as domain expertise.