Systems engineering: Tools to avoid making critical trade-offs in silos

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As engineers and scientists, we spend years building our toolkit of design and analysis methods. As projects grow, however, they reach a scale of complexity where one or two experts cannot mentally hold an entire system in their heads. The challenge in building complex systems comes from capturing and communicating requirements, interactions, interdependencies and trade-offs between the different teams: design, test, and field users.

Systems engineering is a design layer that highlights the relationships between subcomponents in complex systems so that inherent problems can be discovered early, before a prototype is damaged or fails in field testing. This talk will introduce and explain the use of fundamental systems engineering tools such as functional decompositions, fault cascades, relationally-linked requirements trees, and technical storytelling via Concept of Operations documents. Practical examples from general research will be used to illustrate how to capture relevant requirements and identify critical interdependencies between subsystems and components.

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