For Apr 20, 2021, SoSECIE webinar:

Title:

Leveraging Set-Based Practices to Enable Efficient Concurrency in Large Systems and Systems-of-Systems Engineering

Abstract:

Whether “just” a large Systems Engineering project with multiple subsystems or a true Systems-of Systems scenario, working out the optimal system-level trade-offs will typically involve significant engineering effort in each of the subsystems, which each have their own significant trade-offs to work out while concurrently feeding the knowledge required for the system level trade-offs.

With traditional point-based development practices, trying to have the system and subsystem teams work concurrently inevitably results in a tremendous amount of rework. Typically, the different subsystems will make trade-offs that are best for their subsystem, but not for the dependent subsystems, nor for the system as a whole. To avoid that, they may try to make the system-level trade-offs first, but that typically involves a lot of educated guesses on what the subsystems will be able to pull-off with their future design work (which is, in turn, waiting on the system-level trade-offs to be made). That often ends up resulting in just as much rework.

This presentation will discuss how Set-Based practices can enable the higher level system to proceed concurrently with its subsystems, coordinating their efforts, and allowing their decision-making to converge together. The presentation will introduce three key enablers of that coordination: Decision-Based Scheduling, Integrating Events, and Causal Mapping.

*Decision-Based Scheduling* – larger milestone dates determine when the key decisions need to be made. Knowledge gaps must be closed to make these decisions. This defines the minimum knowledge that must be learned and by when.

1. *Integrating Events –* enable a decision-making process that integrates the team around the decisions and that identifies the knowledge that needs to be learned in order to make those decisions.
2. *Causal Mapping and Decision Mapping* – enables most of the above, making visible the causal relationships between the decisions and the targets. It breaks down the complexity into its individual relationships, greatly simplifying each element that needs to be learned, increasing focus, and reducing workload.

Applied together, those Set-Based practices enable a fundamental paradigm shift in how the front end of Systems Engineering is done, resulting in tremendous acceleration of the learning and coordinated decision-making, with the potential to cut project times in half.

We have begun applying these enablers at a number of DOD and DOE suppliers and have seen significant positive impact. We have captured some of that experience in the form of an extensive example in our new book, *Success is Assured*. We may use a shorter example in this presentation; but the audience can get a copy of our book if they’d like to see the more extensive example.

Biography:

Brian is an author of the book *Success Is Assured* and is an INCOSE Certified Systems Engineering Professional (CSEP) who has spent more than 25 years designing complex software systems. He was Chief Architect of i2 Technologies’ Supply Chain Planner and Demand Fulfillment applications, applying Toyota lean manufacturing, Theory of Constraints, and advanced optimization to the planning and scheduling of the larger supply chain, helping to establish a new market space (Supply Chain Management) and generating billions of dollars of value for i2’s customers. Brian was named the first i2 Fellow and holds more than a dozen patents on the inventions that were the basis for those software systems. As co-founder and CTO of Targeted Convergence Corporation, Brian is responsible for the systems engineering of TCC’s Success Assured® software and the associated training, which are both designed for superior systems and mission engineering in the early conceptual stages of development.