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Test-driven Systems Engineering for Netcentric Systems of Systems

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Abstract
The fundamental basis of all systems engineering (SE) activity in system development is a comprehensive articulation of requirements for the system. Regrettably, real-world requirements documentation is often incomplete, out-of-date, asynchronous with current technology capabilities, in dispute among stakeholders, and otherwise less than ideal as a driver of the SE function. Exploiting a domain understanding of test and evaluation (T&E), the systems engineer can utilize processes and tools enabling SE to create systems which will "automatically" meet their intended goals and thresholds, i.e., the systems will "work". The basic concept is to drive the SE function "backward" from the T&E Master Plan (TEMP) to a System Engineering Plan (SEP) and System Engineering Management Plan (SEMP) consistent with system success against the TEMP criteria.

In practice, the inherent "Test-Analyze-Fix" nature of complex system development guarantees that much program activity after DoD acquisition Milestone A, including SE, is actually driven by T&E events. The described processes and tools allow this to take place in a disciplined, organized manner, rather than as a series of reactions to unanticipated emergencies. Users will comprehend and appreciate the valuable ROI, since success in verification and validation testing is "baked in". As with all SE efforts, this approach can be viewed as a risk reduction enabler (with respect to cost, schedule, technical performance, safety, etc.). This perspective is particularly appropriate and valuable in the domain of netcentric systems of systems, for example in the subdomain of electronic warfare (electronic attack and electronic protection), where the underlying "chess game" of move and countermove demands a system development process which incorporates a continual scrutiny of the success of system characteristics against the adversary, together with nimble assessment, recovery and improvement capabilities.

Biography
Don Greenlee is a senior systems engineer with American Systems Corporation in San Diego. Prior to this position, he was a principal systems engineer with Science Applications International Corporation (SAIC) and chairman of the SAIC Systems Engineering Community of Practice. He is also a member of the instruction faculty in the Systems Engineering Program at the University of California, San Diego. Don is a member and past president of the International Test and Evaluation Association, a senior member of the International Council on Systems Engineering, where he was Founder/Chairman of its Test and Evaluation and Verification and Validation Working Groups, and a member of the National Defense Industrial Association (NDIA) Systems Engineering Division. Before joining SAIC, he served in a Deputy Assistant Secretary of Defense position with responsibilities for operational test and evaluation within the Department of Defense. Earlier, he held technical and managerial positions with The MITRE Corporation, the Johns Hopkins University Applied Physics Laboratory and the General Electric Company. He holds Bachelor's and Master's degrees in physics, mathematics and engineering.