System of Systems Engineering Collaborators Information Exchange (SoSECIE)

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A Scientific Approach to Consistent Functional Analysis: The System Capabilities Analytic Process

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Abstract
Functional analysis is a key process of systems engineering, of which many other subsequent analysis activities will reference or utilize when completed. However, there are few standard practices and formats for functional analysis, which limits the ability of the work to be transferred across organizations. There also appears to be limited ability to transfer a product of functional analysis into dissimilar fields of study, such as reliability and human factors engineering.

To provide a standardized format, functional analysis could utilize the Army Research Laboratory's (ARL) System Capabilities Analytic Process (SCAP). SCAP is a system analysis methodology that is analogous to the main tenets of functional analysis: decompose operational objectives into required functions, and in turn allocate these functions to the physical entities of the system. A product of utilizing SCAP is the development of a system architecture that describes the functional performances of a system of interest: the Functional Skeleton. This Functional Skeleton (FS) is both a mathematical and graphical construct that relates how a system is built in the physical context, and how the measurable performances of the elements within the physical context aggregate to produce the capabilities performed by the system. These capabilities are able to aggregate even further to form a rigorous map to both a system of systems (SOS) and also to the utilization of systems within standardized tasks such as the Army Universal Task List (AUTL). As the FS is a quantifiable and scientific construct of the system and its performance, it is possible to utilize this methodology in efforts such as test and evaluation, reliability analysis, human factors studies, and verification of system requirements.

This presentation will discuss what SCAP is and how it is utilized to generate a FS. Once the FS is generated, it will be shown how the FS can correlate to testing of systems, correlation to systems of systems, and potential utilization by formerly disjointed efforts such as reliability analysis. The presentation will conclude with an overview of where SCAP is already undergoing trials within human factors efforts and within the Army's Mission Based Test and Evaluation (MBT&E) in support of Title 10 live-fire test and evaluation.

Biography
Mr. Agan is a mechanical engineer for the U.S. Army Research Laboratory's Survivability/Lethality Analysis Directorate. His primary responsibilities include criticality analysis of ground combat systems, vulnerability / lethality analysis of ground combat systems, and live fire damage assessments in support of Title X. He started his career with ARL/SLAD in 2008 after a twelve year career in the private sector.