A Model-Based Inter-Domain Requirement Management Approach for Acknowledged System of Systems

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Abstract:

System of Systems (SoS) are a major part of the global technological landscape. Managerially and operationally independent systems, referred to as Constituent Systems (CS), are the building blocks of every SoS. The capabilities of the SoS are achieved via its CSs; but these capabilities cannot be achieved by the individual CSs. In an increasing order of the independence of their CSs, SoS are categorized as Directed, Acknowledged, Collaborative, or Virtual SoS. The evolution of an SoS and its CSs, and the CSs independence and ability to belong to more than one SoS, can lead to requirement changes in the System of Systems Engineering (SoSE) and System Engineering (SE) domains of the SoS and the CSs respectively. These inter-domain requirement changes, occurring when the SoS and CS are in distinct phases of their respective lifecycles, can generate conflicting requirements between SoS and CS. Late detection of conflicting requirements yields waste of time and funds on CSs considered irrelevant and/or detrimental to the SoS. This problem exists in defense, communication, transportation, and healthcare systems, amongst others. Our research proposes that Model-Based Systems Engineering (MBSE), through modelling and inter-domain requirement comparison, be used for timely continuous detection of conflicting requirements in Acknowledged SoS.