“SEMANTICALLY-ENABLED MODEL-BASED SYSTEMS ENGINEERING OF SAFETY-CRITICAL NETWORK OF SYSTEMS”

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ABSTRACT
Our research seeks to develop new foundations, methodologies, and tools for the behavior modeling and design assessment of system of systems (SoSs) and complex cyber-physical systems (CPS). Both families of complex systems are cast as Network of Systems (NoSs). In this talk, we introduce and discuss a novel semantically-enabled approach to the development and integration of semantics to the model-based systems engineering and operation of safety-critical NoSs. Engineering models work directly with formal domain and meta-domain (especially time and space) knowledge that are determinate, provable (ambiguity free) and machine executable. Knowledge is encoded as semantic blocks, which are an integration of ontologies, rules, communication and computation interfaces. These concepts are exercised in a collision avoidance problem involving autonomous agents at a traffic intersection. Extensions and related projects are also briefly discussed.

BIOGRAPHY
Dr. Petnga is an Assistant Professor of Systems Engineering with the Industrial and Systems Engineering and Engineering Management (ISEEM) department. He holds a Masters in Systems Engineering and PhD in Civil Systems from the University of Maryland, College Park. He is a former Cyber-Physical Systems (CPS) Scholar at the US National Institute of Standards and Technology (NIST) and Postdoctoral Fellow at the US Army Research Laboratory (ARL) and the Institute for Systems Research (ISR) at the University of Maryland, College Park. He is a former Cyber-Physical Systems (CPS) Scholar in the Systems Integration Division (SID) at the National Institute of Standards and Technology (NIST). In 2013, he won the Best Paper Award at the 11th Annual Conference on Systems Engineering Research (CSER2013). His research focuses on knowledge structures for MBSE and integration of complex systems with an emphasis on CPS and System of Systems (SoS). His work involves the development of procedures for reasoning and integration of system behavior and structure across domains with applications in transportation (air, ground, water), aeronautic and Internet of Things (IoT).