Information Systems & Software

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The scope of the Information Systems and Software track broadly includes all aspects of architecture, design, development, operations and maintenance of information systems for space applications. Specific areas of interest include commercial offerings that provide communications and PNT for cislunar space; replacement for the Deep Space Network (DSN); computing platforms that enable large networks of autonomous systems to inter-operate; transition of commercial power (batteries, fuel cells) and electronics to space applications; and applications of AI, Machine Learning and Data Science to spacecraft operations.

Topics of interest include, but are not limited to:

» Communications Systems: Design, development and operation of communications systems for space applications, and associated architectures and technologies, including small, lightweight, low power, and COTS technologies for smallsat applications; software-defined radio and software-defined networking technologies; quantum communication advancements; RF, optical and combined component technologies to realize higher bandwidths; and security improvements from the physical to application layers. [Subtopic POCs: Peter Garland and Thomas Butash]

» Computer Systems: Theoretical and practical considerations involving the applications of computers and information processing techniques to space systems, including embedded and energy efficient (low power) computing systems; High-Performance Computing (HPC); parallel, GPU, and multicore processing; and hardened, secure, and fault-tolerant processor architectures. [Subtopic POCs: Mahyar Malekpour and Rick Tuggle]

» Cybersecurity: Application of cyber defense and security system technologies and methods to space systems, including cyber-security frameworks and architectures, cyber risk modeling and analysis for space assets, preemptive threat vector identification, security event management, cyber-security assurance using techniques like blockchain, security intelligence with data-driven analytics, and real-time security defenses with online anomaly detection. [Subtopic POCs: Sam Adhikari and James Paunicka]

» Digital Avionics: Design, development and operation of digital avionics systems and technology for space applications, including avionics technologies for safe and efficient space vehicle operation; flight critical avionics architectures; and safety and security impacts of complex electronic hardware. [Subtopic POCs: Douglas Abernathy and Denise Ponchak]

» Information and Command and Control Systems: Integrated application of data acquisition, data assessment, and data dissemination functions required for timely and efficient command and control of space systems, including unmanned satellites for both military and civilian applications, manned spacecraft, and integrated space, air, ground, and cyber systems. [Subtopic POC: Jimmie McEver]

» Intelligent Systems: Application of Intelligent System (IS) technologies and methods to space systems, and development, verification and validation, and operations of these systems – including automated planning and scheduling, fault/health management, model-based reasoning, machine learning, adaptive and intelligent control systems, and other technologies enabling effective, reliable and highly autonomous operation of complex space systems or sub-systems; and applications of IS to more effective, lower cost development of space systems. [Subtopic POCs: John Valasek and Daniel Selva]

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» Human-Machine Teaming: Design, development, verification, validation, certification, and deployment of human-machine systems where the "functions of humans and machines are integrated" – ranging from systems with machines designed to automate a finite set of tasks using predetermined rules to systems of self-governing machines that are able to both make decisions and operate independently of human supervision. [Subtopic POC: John-Paul Clarke]

» Model-Based Systems Engineering: Applications of Model-Based Systems Engineering (MBSE) to support system requirements, design, analysis, verification and validation activities, including innovative space-related applications, methodologies, tools, and analysis techniques. [Subtopic POC: Michel Ingham]

» Sensor Systems and Information Fusion: All aspects of space sensor systems and distributed sensor networks, including detection, collection, fusion, processing, storage, retrieval, distribution, and reception of information at the local sensing node and at the distributed sensor network level; space situational awareness; multi-sensor field/flight experiments; novel sensors for space applications. [Subtopic POC: Kent Engebretson]

» Software: Innovative software architectures and software engineering methodologies and tools for complex space systems, across the software engineering lifecycle, including requirements, design, code, test, verification and validation, evaluation, operation and maintenance. [Subtopic POC: Michael Rubin]