

17th IAA SYMPOSIUM ON BUILDING BLOCKS FOR FUTURE SPACE EXPLORATION AND  
DEVELOPMENT (D3)Systems and Infrastructures to Implement Sustainable Space Development and Settlement - Technologies  
(2B)

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A GAME-CHANGING SPACE SYSTEM INTERFACE ENABLING MULTIPLE MODULAR AND  
BUILDING BLOCK-BASED ARCHITECTURES FOR ORBITAL AND EXPLORATION MISSIONS**Abstract**

The upswing of innovative and commercial NewSpace ventures and general space industry trends suggest a move toward higher lot sizes of systems, subsystems and components, thus, series production. Moreover, on-orbit servicing (OOS) and active debris removal (ADR) have become hot topics in the space arena with potential paradigm shifts in the long-term - all the way to space exploration. At large, these developments and concepts will be enabled by cooperative design and plug-and-play (PnP) principles, which in turn are centered around standardized interfaces per se - as well as modularity.

Modular concepts and standardization of space infrastructure elements have been investigated for decades and are now gradually becoming a reality as the CubeSat revolution has shown in a first step. Standard interfaces are considered instrumental enablers for new dimensions of flexibility and entirely new space systems, operations and business in particular. New standards are intended to provide the foundation for a new commercial repertoire of robust space-based capabilities and a future in-space economy. This is e.g. the rationale of the (US DARPA-initiated) international industry consortium CONFERS. Moreover, with modular systems and standards, space sustainability aspects can be addressed by new design and operation philosophies and thereby help mitigate space debris and increase the lifetime or re-usability of space systems, subsystems and components.

This paper addresses these issues from multiple angles based on the patented and multi-functional intelligent Space System Interface “iSSI” as a self-standing solution and standard option (while initially developed in the course of the 8-year iBOSS program funded by the German Aerospace Center DLR Space Administration). Following an introductory snapshot of the technological and functional key features, specific applications are being presented and discussed regarding future building blocks followed by a trade-off based on selected solutions and additional modularity considerations. The ground-qualified iSSI is already matured regarding series production and is currently considered by numerous system concepts, agencies and industry around the globe as one potential future standard and enabler.

The authors and partners involved have longstanding experiences, background and visibility in the global commercial space arena with involvement in multiple innovative new business endeavors, comprising dedicated expertise in space commercialization and innovation, new business creation and finance, international partnerships, commercial prototyping and series manufacturing.