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SPACE COMMUNICATIONS BASED ON DIGITAL TWINS, BUILT FROM MODELS, SIMULATIONS AND KINEMATICS

Abstract

Best-in-class companies are rapidly adopting a digital workflow. Digital twins are a key component, as they enable early insight through simulation. Creating high-fidelity simulations of space-based communication systems has proven rewards in speeding development by reducing design turns. The early insight provided can also reduce cost and risk critical in "space 2.0". This paper presents an overview of the process utilized to build digital representations of space systems, specifically SATCOM payloads and earth station links that form a dynamic satellite communication network. Including motion kinematics of low earth orbit (LEO) satellites and the RF implications, phased arrays, wideband amplifiers, and OFDM modulations. Finishing with a quick overview of how the resulting multi-domain simulations (kinematics, rf electrical and higher layers) can be used to examine the critical system design tradeoffs.