NASA's Wideband Multilingual Terminal Efforts as a Key Building Block for a Future Interoperable Communications Architecture

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Abstract

NASA's long-term vision is to provide a resilient space and ground communications and navigation infrastructure in which space mission users can seamlessly "roam" between an array of space-based and ground-based networks. This infrastructure will enable high speed, robust, secure, and cost-effective communications and navigation (C&N) services to future science and exploration missions. NASA seeks to realize this vision through the creation of an interoperable architecture that relies on mixture of existing NASA assets and commercial networks and services in the near-term and supports a smooth transition to fully commercialized communications services for near-Earth users in the long-term, consistent with United States National Space Policy objectives.

It is an opportune time to pursue this vision, as private and public space sector activities are flourishing, with increasing diversity and volume of missions. The modern-day private sector offers previously unavailable access to network capabilities to satisfy space user communications and navigation mission support requirements. This represents an opportunity for NASA to develop a service portfolio with multiple vendors that results in a robust and flexible architecture for the user community while simultaneously contributing to market stimulation and growth.

This vision is currently not achievable; the divide among space communication architectures must be bridged by a combination of three interoperability building blocks: (1) standards development, (2) technology development, and (3) spectrum regulatory changes. This paper focuses on one of the key technology development activities underway at NASA – wideband and multilingual user terminals. Such terminals will be capable of connecting to network services across NASA, commercial, or Department of Defense (DoD). This technology mitigates the risk associated with vendor lock-in stemming from user terminals only compatible with single networks and provides a more robust support network for the user missions once on orbit. NASA is currently pursuing several parallel development efforts to ensure a viable multilingual terminal is available for mission use in the mid-to-late 2020's. This paper more fully introduces the wideband and multlingual user terminal concept, defining the component technology (wideband front-end technology, software defined radios, wideband antennas, wideband power amplifiers and wideband low-noise amplifiers), provides the technical approach, and overall status of these efforts.