

Software Defined Radios - Architectures, Systems and Functions

Abstract

Software Defined Radio is an industry term describing a method of utilizing a minimum amount of Radio Frequency (RF)/analog electronics before digitization takes place. Upon digitization all other functions are performed in software/firmware. There are as many different types of SDRs as there are data systems.

Software Defined Radio (SDR) technology has been proven in the commercial sector since the early 90's. Today's rapid advancement in mobile telephone reliability and power management capabilities exemplifies the effectiveness of the SDR technology for the modern communications market. In contrast the foundations of transponder technology presently qualified for satellite applications were developed during the early space program of the 1960's. SDR technology offers potential to revolutionize satellite transponder technology by increasing science data through-put capability by at least an order of magnitude. While the SDR is adaptive in nature and is "One-size-fits-all" by design, conventional transponders are built to a specific platform and must be redesigned for every new bus. The SDR uses a minimum amount of analog/Radio Frequency components to up/down-convert the RF signal to/from a digital format. Once analog data is digitized, all processing is performed using hardware logic. Typical SDR processes include; filtering, modulation, up/down converting and demodulation. This presentation will show how the emerging SDR market has leveraged the existing commercial sector to provide a path to a radiation tolerant SDR transponder. These innovations will reduce the cost of transceivers, a decrease in power requirements and a commensurate reduction in volume. A second pay-off is the increased flexibility of the SDR by allowing the same hardware to implement multiple transponder types by altering hardware logic – no change of analog hardware is required - all of which can be ultimately accomplished in orbit. This in turn would provide high capability and low cost transponder to programs of all sizes.