

OVERVIEW OF SOFTWARE RADIOS

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As advances in technology provide increasingly faster and less expensive digital hardware, more and more of the traditionally analog functions of a radio will be replaced with software or digital hardware. The term *software radio* is becoming popular in describing these advanced radios. There are differing opinions as to what the definition of a software radio really is. One such (very broad) definition is best described in terms of the receiver and transmitter separately. In a software radio receiver, the received signal is digitized and then processed using digital signal processing techniques. Digitization may occur at the RF, IF, or baseband. Inherent in the definition is some level of programmability to change the way the received signal is processed.

In a software radio transmitter, the modulated signal to be transmitted is generated as a digitized signal using digital signal processing techniques. The digitized signal is then converted to an analog signal for transmission. The conversion to analog may occur at baseband, IF, or RF. Analogous to the receiver, some level of programmability to change the way the transmitted signal is processed is implied.

The benefits of software radios are derived from the replacement of analog hardware with digital signal processing and the associated potential for some level of programmability. Radios can be designed for transmission and reception in different frequency bands with different modulation types and bandwidths simply by changing software. Product development time can be potentially reduced. Radio functions can be implemented that cannot be implemented in analog hardware (such as finite impulse response filters). Digital signal processing can offer a more ideal performance for implementing radio functions. The repeatability and temperature stability can be substantially better. Another advantage is that radio functions implemented with digital signal processing do not require the tuning or tweaking typically required in analog implementations.

The key factors in software radio receivers are analog-to-digital conversion and digital signal processing whereas the key factors for software radio transmitters include digital signal processing and digital-to-analog conversion. Practical software radio architectures are dependent on the constraints placed on the design by available hardware to implement these key factors.

The software radio portion of the 1998 International Symposium on Advanced Radio Technologies consists of two primary half-day sessions. In the Software Radio Technologies Session software radio architectures will be discussed along with RF interface issues, analog-to-digital converters and digital-to-analog converters, and digital signal processing techniques and hardware implementations. The Software Radio Applications Session will include presentations on cellular and PCS, GPS receiver, HF/VHF/UHF, and wireless network applications in addition to a presentation on the Speakeasy military software radio. During the Opening Session, a presentation on the Modular Multifunction Information Transfer Systems (MMITS) Forum activities will be given.