

Software Defined Radio Working Group

Report by Bob McGwier, N4HY, SDR Working Group Chair

During the past twelve months, remarkable progress has been made on a number of fronts in the inexorable march to software radio as the standard for radio in amateur radio circles.

Flex Radio

Flex Radio introduced the Flex 5000 models A and C. While it has been not been tested in the ARRL lab, Rob Sherwood has tested it and reported in *Passport* (available through the League store) that it was one of the best receivers on the market. Its dynamics properties continue to be a leader in most areas. The software, which after all makes it a software radio, continues to be a leading open source software project. Flex protected the all important frequency selection and transmit functions in a device inside the radio which runs a small offshoot of Linux call eCOS 2.0. This allows for closed source for critical pieces of code such as the frequency setting and transmit functions, while not running afoul of the Gnu Public License, version 2.0.

Flex has publicized that it is about to release the second plug in receiver and several "Flexwire" peripheral devices to run amplifiers (provide for hardware ALC, frequency selection), read off board SWR meters, and more. Dayton 2008 appears to be the target for several of these hardware upgrades and additions to the Flex family.

The software continues to evolve and has added many new features which will not be detailed here. A wholly new version, based on a serious system for distributed computing and robust service will allow easy remote operation and a separation of the GUI console from the hardware by inches to thousands of miles.

GnuRadio

Matt Ettus has announced the USRP 2.0 as being available by February 2008. The USRP differs substantially from the USRP in several important ways. It will use Gigabit Ethernet as its digital IF signal (I/Q) and command transport. But it will maintain the previous user base plug in modules which allows the USRP to become a 2 meter transceiver, a DBS satellite receiver, HDTV receiver, and more. The FPGA on the board is much more capable than the older Cyclone on the USRP 2.0 and since the USRP2.0 will have half as many plug in slots, the FPGA will be available for much more operation on the USRP 2.0 than the USRP could be counted on to support. In addition, the move from USB 2.0 to Gigabit Ethernet will allow much wider bandwidth signals to be processed. With the major evolution in computer processors on our desktops and even on our laptops, this is a welcome change.

uWSDR

The uWSDR working group, which is attempting to use modern RF ICs, the same software radio kernel as Flex Radio (DttSP), and some clever engineering, is ready to begin construction of its first microwave SDR prototype modules. This will be the 2m IF, which will, in and of itself be useful. The modern RF integrated circuits implementing mixers (usually SSB mixers or I/Q mixers) are showing better and better image rejection as well as LO suppression. I am expecting it to be very inexpensive for new amateurs to get on UHF through several microwave bands, using software radio and these RF modules. These will also be useful for amateur satellite operation as well.

AMSAT

AMSAT has been negotiating with Intelsat for a ride share package to be sent up on one or more of its launches. This will provide 15 years of serviceable life at geostationary orbit. Software Defined Radio is the entire premise for the mission. The Department of Home Security chief scientist came to the Software Defined Radio Forum in Denver in October and, as a keynote speaker, told us that with the collapse of all infrastructure in major disaster areas, and the desperate need for interoperability that software radio was really needed to solve many of these problems. It is the perception of this author that there is a significant change in software radio which is not atypical of things begun to fill a serious gap in the military capabilities in the U.S. There is a transition of the development from military contractors to small commercial companies, academic institutions, and all are heavily impacted by the open source efforts. This is to a large extent driven by the common need for software radio infrastructure, that is common to all of the radio efforts. Amateur Radio has been a leader in this area. AMSAT believes that we can provide a "infrastructure collapse-proof" communications system, with a digital "common carrier" where ANY digital signal, that fits into our channelization scheme, may be carried through the satellite. The smarts for the communications modes will be in the software radio systems built for the ground terminals. The necessary transcoding for interoperations with different services can then proceed on software radio equipment that will be generic across many different systems. Amateur radio, and software radio, has the potential to provide a major benefit for the public good through this effort.

HPSDR

HPSDR has been steadily delivering for the past few months. It has provided a very high quality IF interface for use with other software radio systems. Flex, in a move unlike any other company I can think of, has allowed its software based to include support for the HPSDR hardware and the much cheaper softrocks. The HPSDR audio IF interface, called Janus/Ozy, will provide the first serious IF interface for the Playstation PS3 and really awaken its potential for having a large impact on the use of this \$399 software radio supercomputer. The Cell processor in the PS3 is having a major impact on what can be done with software radio without the use of FPGA's.

Rocky

Alex Shovkoplyas, VE3NEA, continues to make major contributions. He has delivered a phased array based diversity reception mode for his Rocky software and the softrock radios (which appear to be becoming unavailable as Tony appears to be closing out his major involvement). This software and this approach to the use of software radio can, and will have a major impact on low band operations for the radio amateur.

Conclusions

Software radio has become main stream in 2007. The Flex 5000 has brought software radio into the arena of serious transceivers. We have not been exhaustive in this report, but we have hit what we believe are the major factors and occurrences pushing the inevitable evolution of amateur radio gear towards software radio.