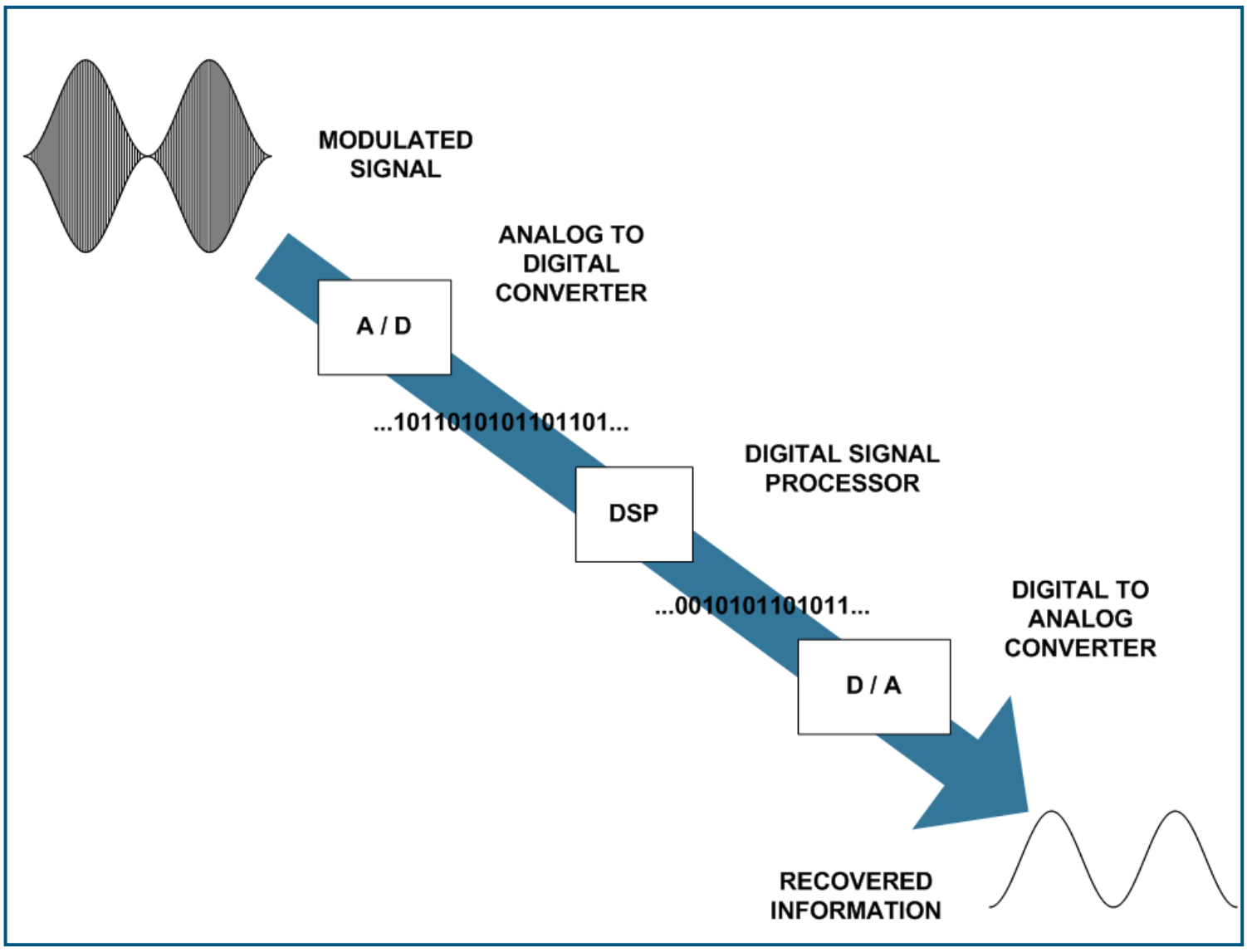
Not Your Grandpa's Ham Radio!

Software Defined Radio



An analog signal is digitized, manipulated through digital signal processing and converted back to an analog signal.

Advantages

- Provides for very complex modulation schemes
- Examples – GSM telephony, WiFi networking
- Easily adapted to new modulation schemes

Disadvantages

- Power consumption, overall cost

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Software Defined Radio Terms

- **A to D Converter:** A device that samples an analog signal at regular intervals, producing a discrete digital representation.
- **Quadrature Sampling:** The key to software defined radio. Samples are in the form of In-phase (I) and 90-degrees phase shifted (Q) values. The IQ pairs form a complex value – a vector.
- **DSP - Digital Signal Processor:** A specialized device used to process a digital data stream. DSP devices can provide filtering, compression, modulation, demodulation, etc of the digital stream. Modern DSP devices are optimized to support functions such as the *Fast Fourier Transform* and to perform vector math.
- **D to A Converter**: A device that converts discrete digital data into a representative analog signal.

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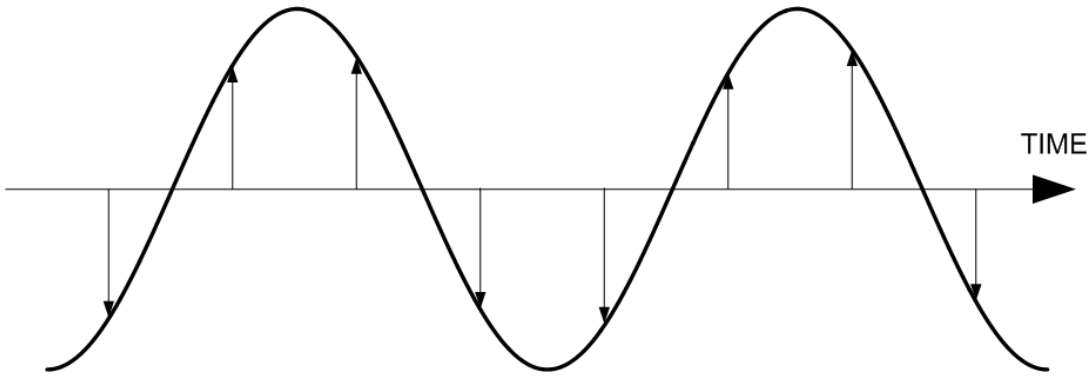
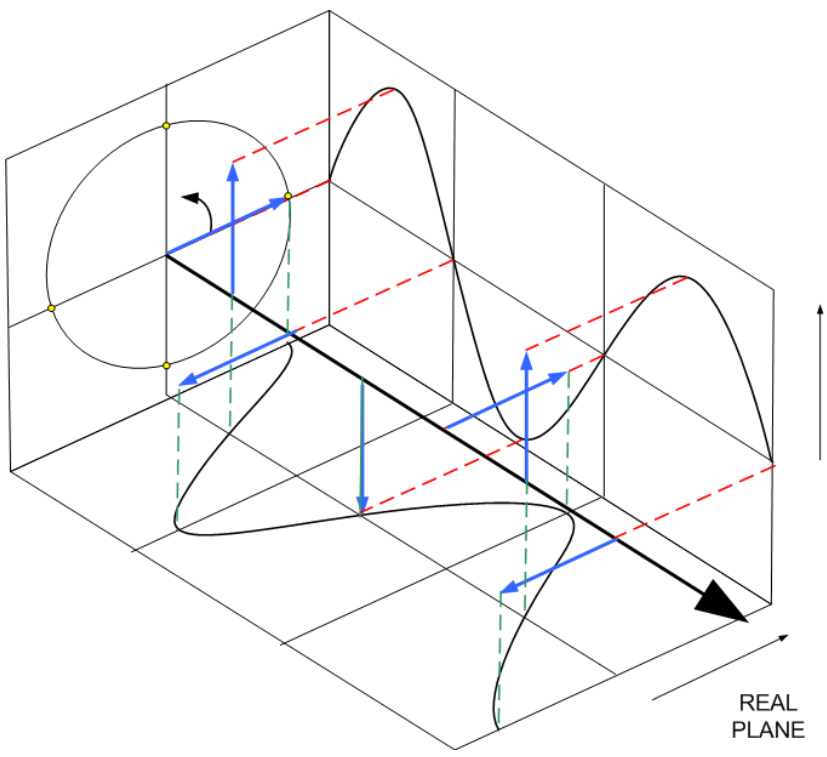
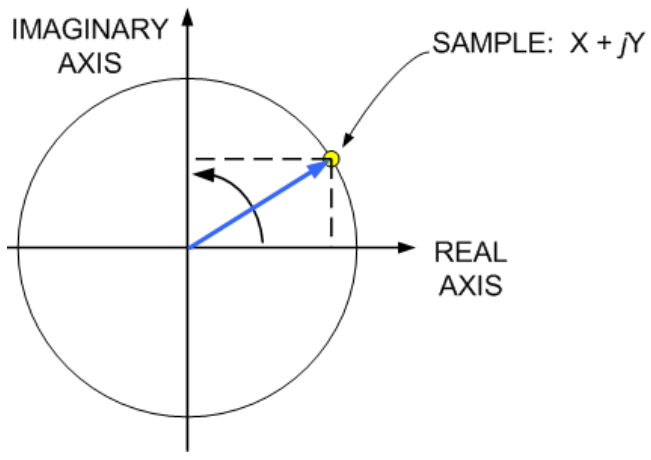
SDR: Analog to Digital Conversion



An incoming waveform is quadrature sampled, producing I and Q values of a complex vector.

The next two illustrations show how the values change over time. On the left, a sine wave in the real and imaginary planes. Notice the two waveforms are shifted 90 degrees. On the right, looking end-on to the time axis, a sine wave produces a series of sampled points that form a circle. The magnitude of the vector is constant; the angle changes with time, hence the x and y (I and Q) values vary accordingly.





The complex vector, (x + *j*y), is passed to the DSP for further processing.

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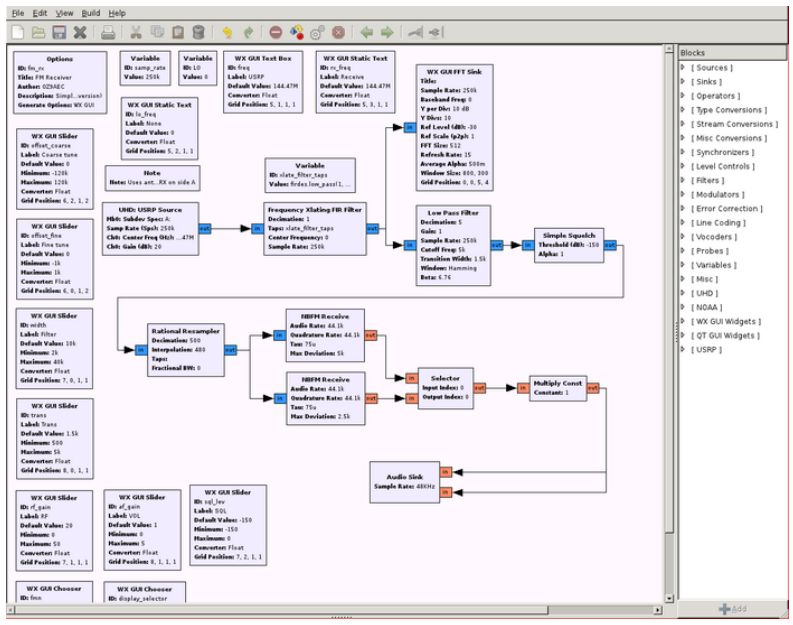
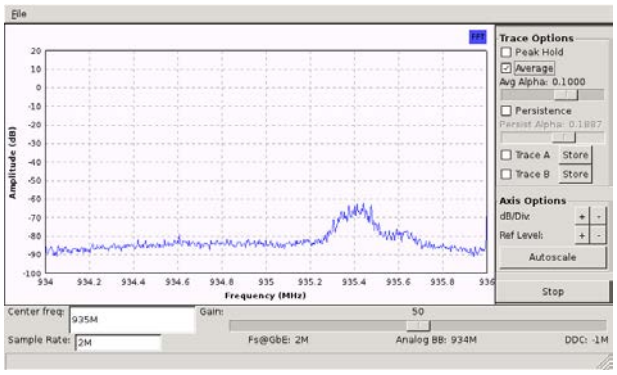
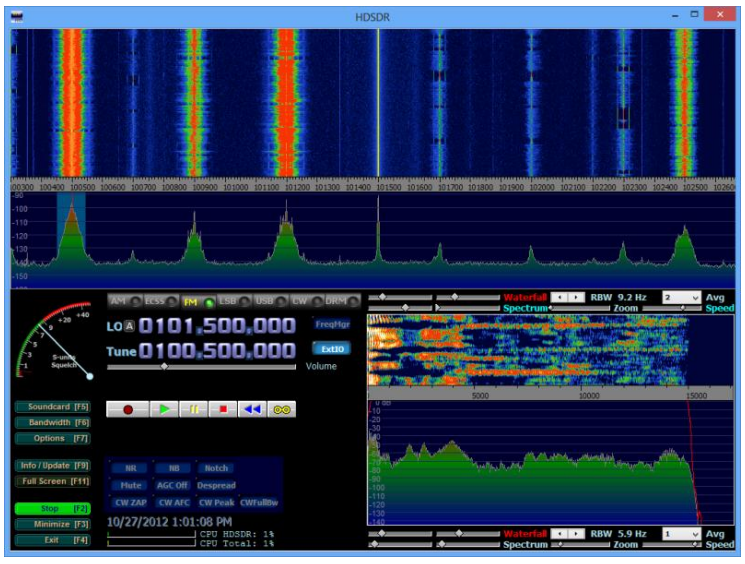
SDR Examples

Software Shown in this Demo

- GNUradio-companion
- HDSDR
- SDR#
- PowerSDR







Hardware Shown in this Demo

- FlexRadio 1500
- HackRF One
- FunCube Pro+
- NooElec RTL-SDR
- RTL-SDR dongle

Excellent Tutorial on Software Defined Radio

http://greatscottgadgets.com/sdr/

or scan the QR code to the right …

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