

Software Defined Radio Concepts



Software Defined Radio Concepts

- Definition
- History
- Components/Devices
- Software - Receiver / Transceiver
- Usage
- Other capabilities
- Demonstration

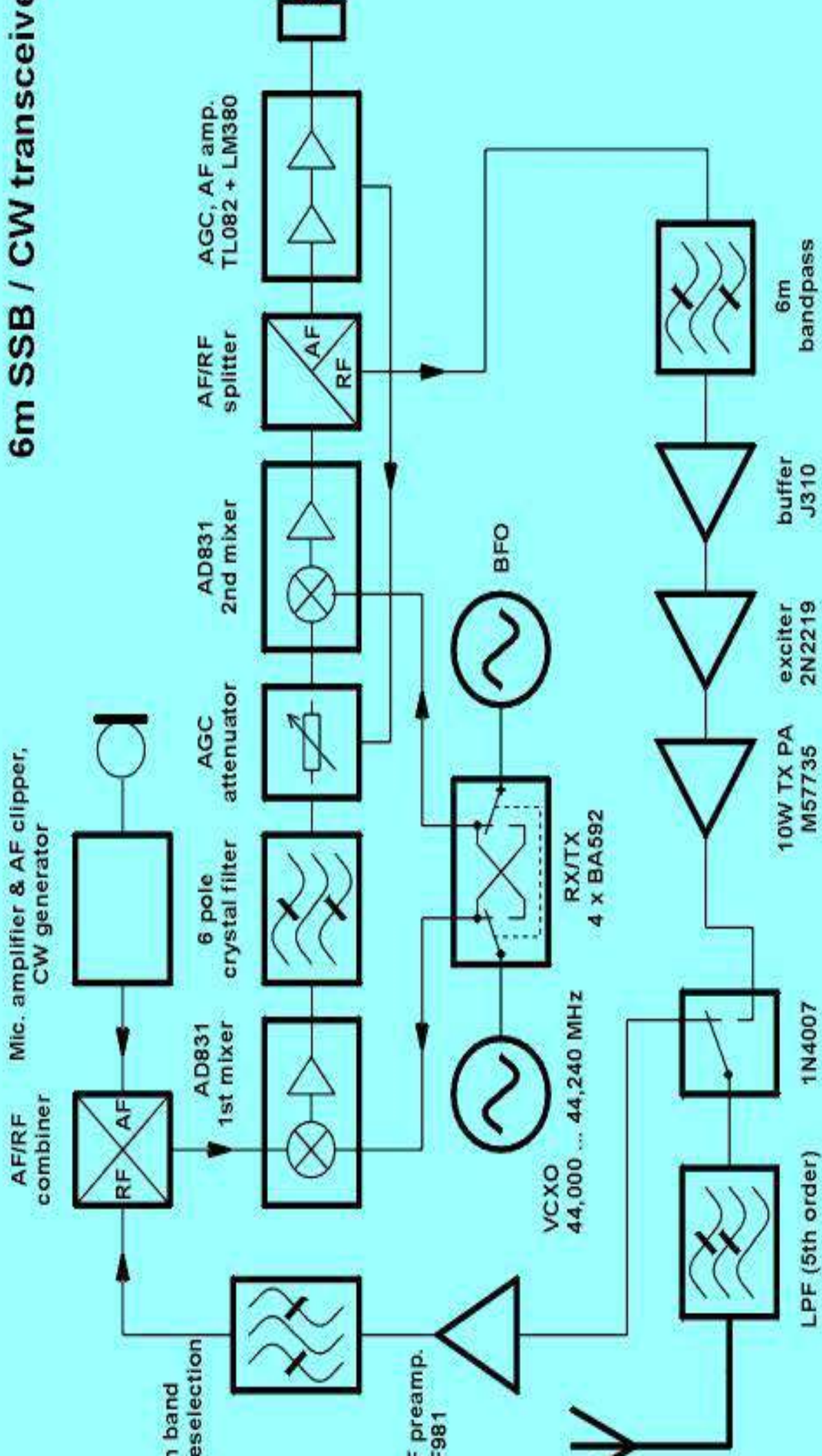
Software Defined Radio Concepts

- Software Defined Radio (SDR) is a way of handling many of the functions of ordinary receivers and transmitters by converting the signal from AD/DA and processing them through a computer. It can be a DSP function in a transceiver or a computer (PC/MAC/Micro Processor-Raspberry Pi)
- The basics of radio design has not changed since the 1930's and the introduction of the superheterodyne receiver.
- Transistors and integrated circuits took the place of vacuum tubes in the 1970's and 80's, but the basic block diagram still remains the same at the hardware level.

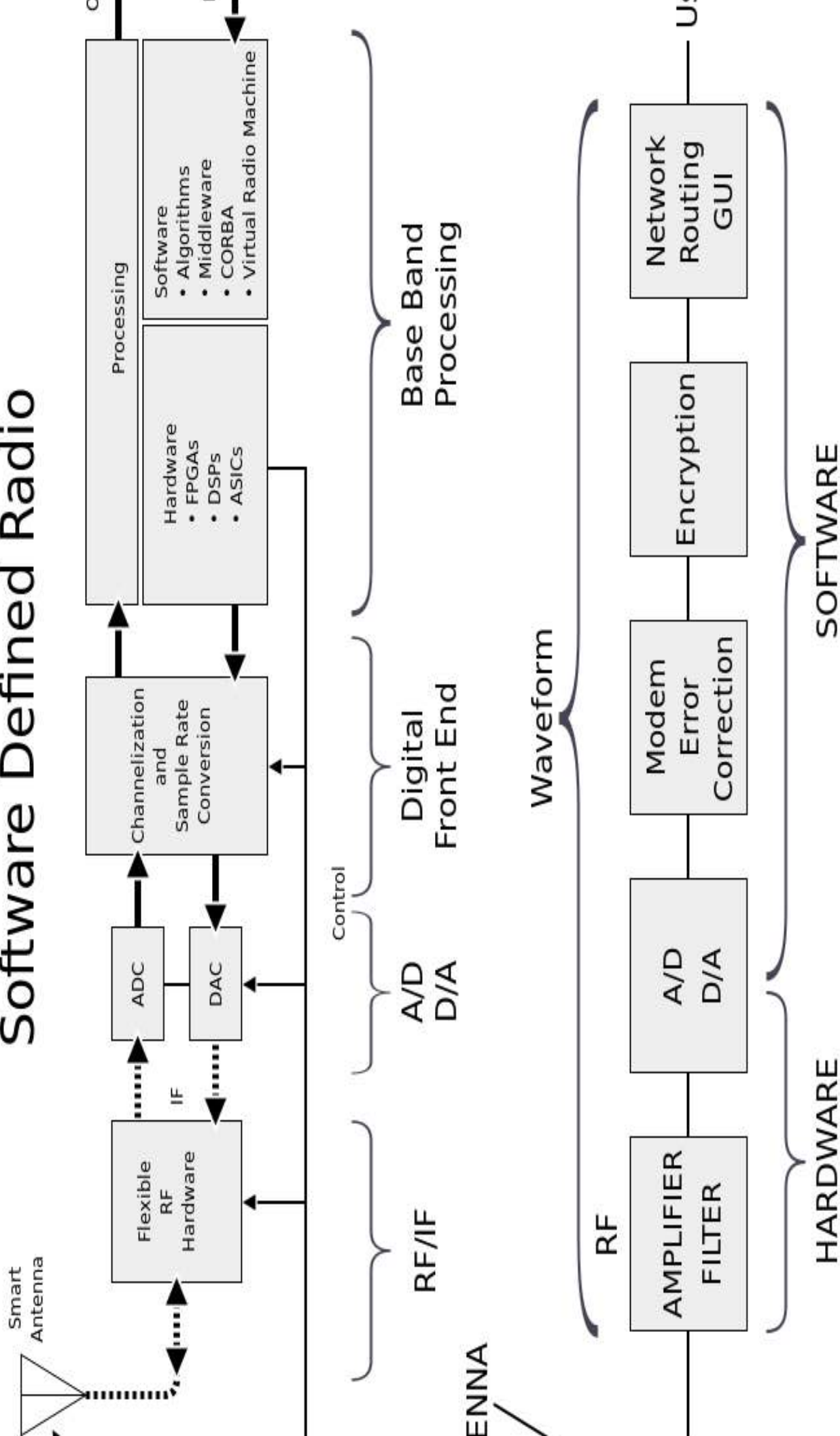
Software Defined Radio Concepts

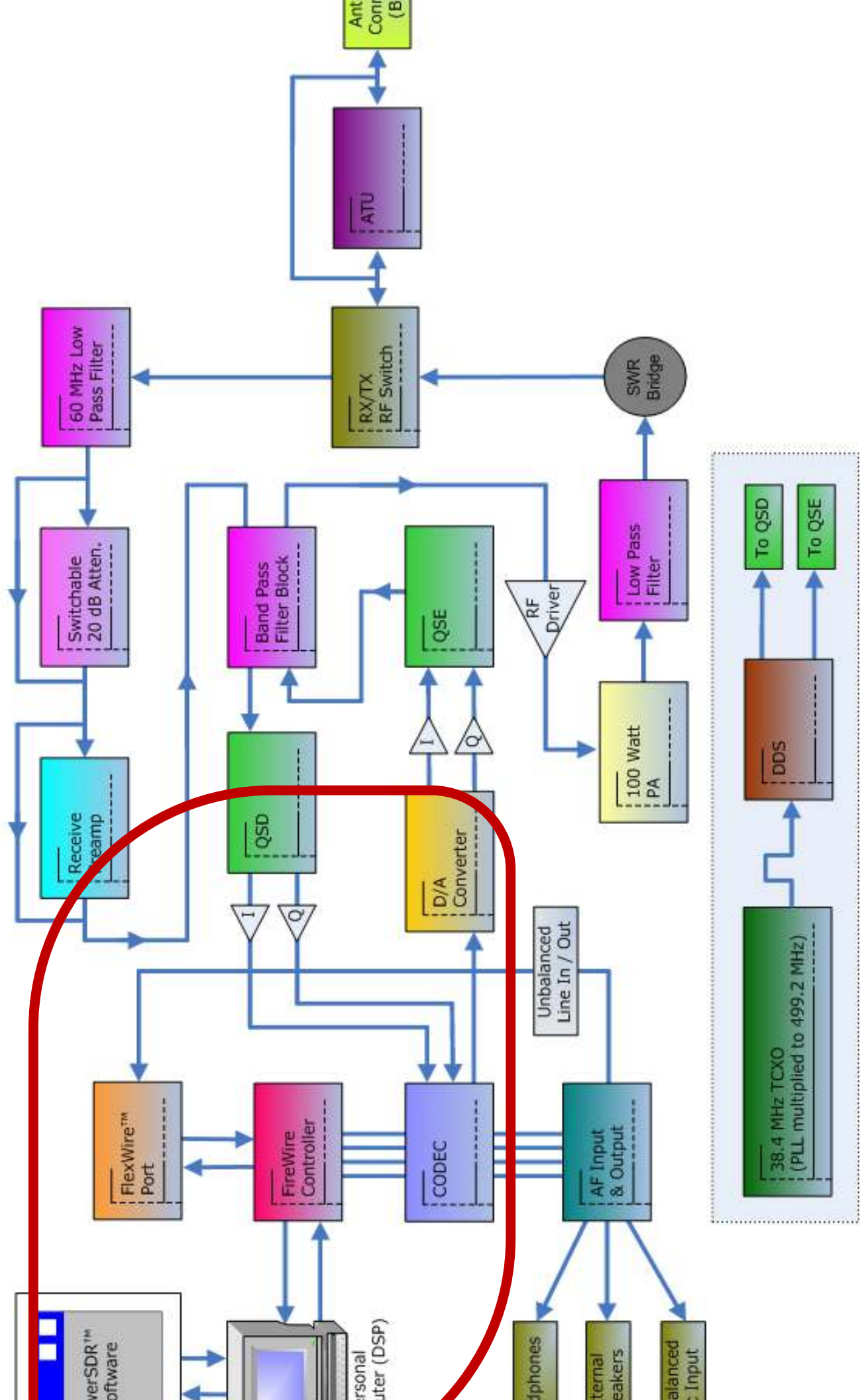
- In the 1984 QST magazine published article on Digital Signal processing.
- Mostly limited to audio filtering due to limited performance of processors.
- Some modern processors are able to digitize the entire HF spectrum at or near the antenna; filtering and detecting functions are handled by the DSP software in the computer.
- The basic feature of SDR is powerful software which is much cheaper than hardware.

6m SSB / CW transceiver



Software Defined Radio





Software Defined Radio Concepts

Receive Only



RTL-2832 \$10.00



FunCube \$10.00



AirSPY-Mini \$10.00



Software Defined Radio Concepts

Receive Only

SDRPlay RSP1



\$149.00

SDRPlay RSP2



\$169.00

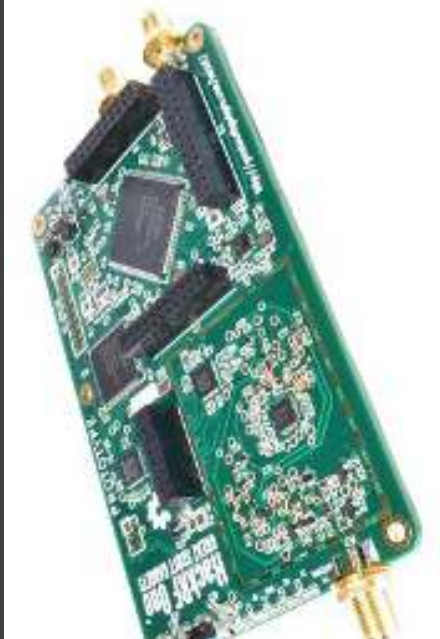
AirSPY RP1



\$169.00 (+HF \$218.00)

Software Defined Radio Concepts Transceivers

Hack RF



\$299.00

USRP 1



\$700.00

Blade RF



\$650.00

Software Defined Radio Concepts

Transceivers

Flex Radio®



6300

6500

6700



\$2,299.00



\$3,999.00



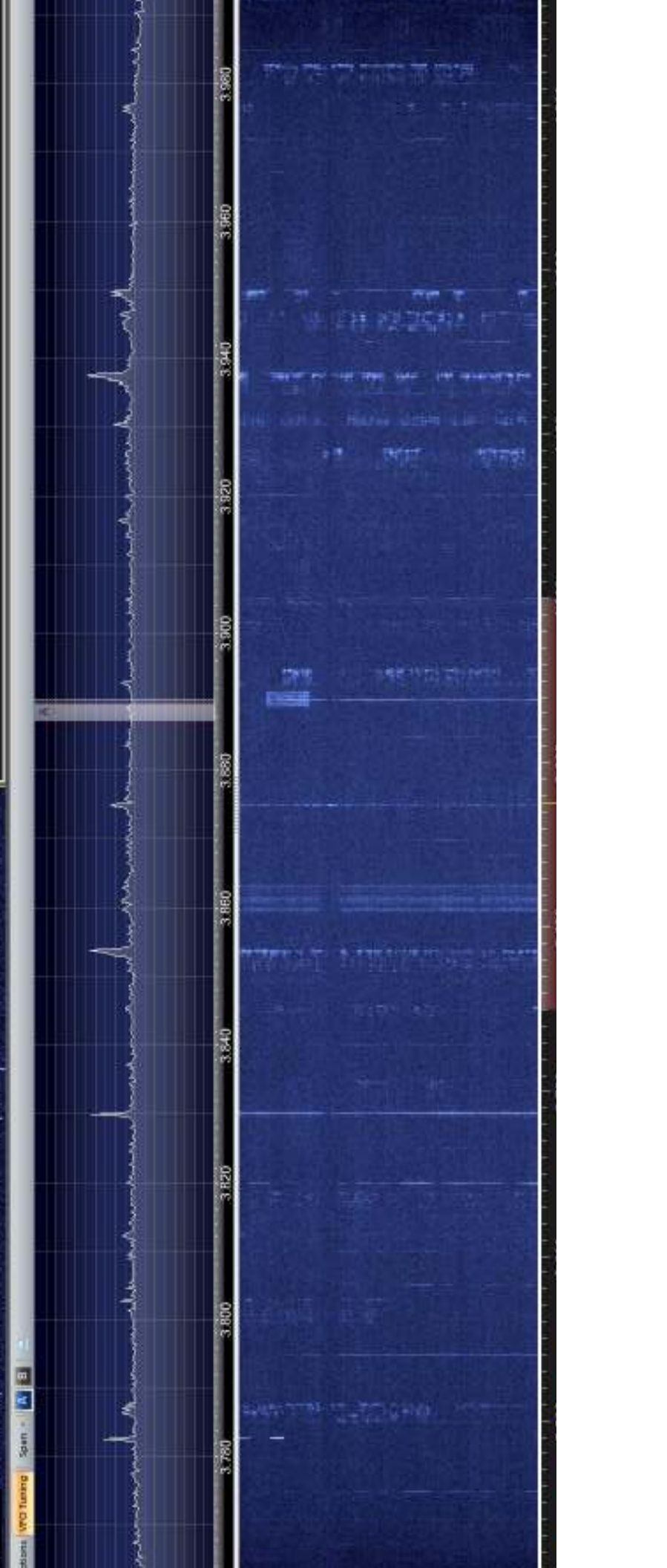
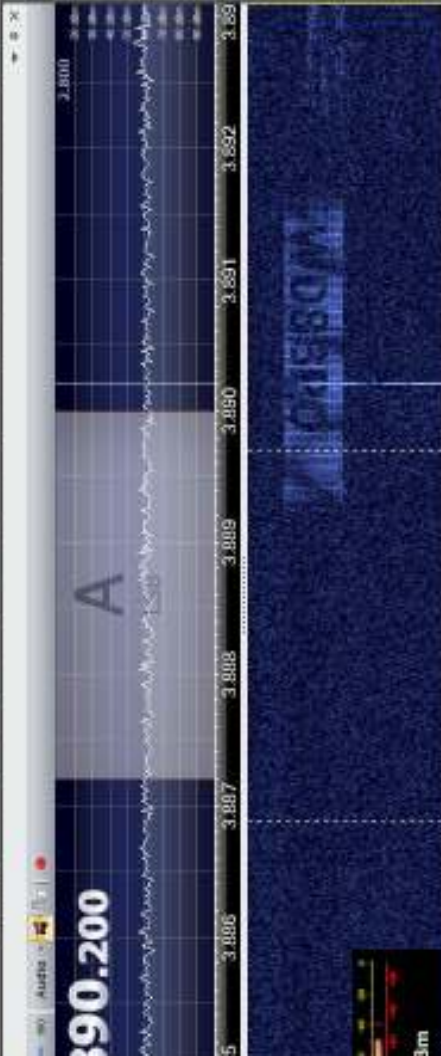
\$6,999.00

SDR	Tune Low (MHz)	Tune Max (MHz)	RX Bandwidth (MHz)	ADC Resolution (Bits)	Transmits/No	Price (\$USD)
L-SDR (820T)	24	1766	3.2	8	No	\$10-\$20
cube Pro+	0.15	260	0.192	16	No	\$200
cube Pro+	410	2050				
Wierpsy	24	1800	10	12	No	\$199
RRPlay	0.1	2000	8	12	No	\$149
hackRF	30	6000	20	8	Yes	\$299
bladeRF	300	3800	40	12	Yes	\$400 & \$500
USRP 1	DC	6000	64	12	Yes	\$700

Software Defined Radio Concepts

- Software Availability (Freeware)
- SDR # (AirSpy) Airspy.com
- SDR Console
- CUBE SDR
- HD SDR
- Studio 1 (SDR UNO for SDRPlay)
- PowerSDR (Flex Radio products)
- RTL-SDR Website

- Originator: Unpop
- CPAS ADI 1.000 USB
- 3.600.000 USB
- 7.175.000 USB
- 14.225.000 USB
- 18.110.000 USB
- 21.275.000 USB
- 24.590.000 USB
- 28.300.000 USB
- CPAS PDF 28.505 AM
- 3.725.000 AM



Software Defined Radio Concepts

- Other capabilities:
- ADB-S (Flight following)
- AIS (Maritime vessel position following)
- Land Mobile Radio Trunking
- Real time spectrum analyzer
- Weather Balloon tracking
- Designing SDR packages
- Amateur Satellite tracking
- IMARSAT Decoder
- FM DBS Digital Broadcast

Port has not been enabled

Take Offline

Put onto Internet

IP	User	Last Request	Bytes Sent	Last URL
		4/20/2017 23:06:14	1,815,972	/images/web-markers/top/Width-68/Hght-...

Default Version Offline mode

VirtualRadar

is:

Connection Status	Total Messages	Bad Messages	Aircraft Tracked
Connected	6,942	0	33

Server status

None

IP Address	Port	Bytes Buffered	Bytes Sent	Bytes Discarded

Latest version of this program available

OPEN RTL1090 - (c) jetvision.de - B:103 BETA

1090.000 MHZ

```
*00 E6 14 98 AC 7E 54; [ 37]
*02 E1 98 1B 2A 6C 32; [ 32]
*5D A3 E9 4E 00 00 02; [ 17]
*02 E1 96 90 AC 6E 84; [ 17]
*5D A3 E9 4E 00 00 02; [ 16]
*8D A3 2E B6 50 E7 03 81 F1 26 FF 00 00 00; [ 21]
*02 E1 96 90 2D 24 45; [ 9]
*5D AC 6E 84 00 00 00; [ 21]
*8D A9 AC B8 60 C9 23 9A B6 D5 CF 00 00 00; [ 27]
*8D A9 AC B8 99 09 B9 17 F0 04 2F 00 00 00; [ 13]
*5D A3 2E B6 00 00 00; [ 20]
*02 E1 99 12 A9 AC B8; [ 28]
*02 E1 99 12 A9 AC B8; [ 24]
*00 E1 96 3F A7 2B 6B; [ 20]
*02 E6 18 1B 2A 6C 32; [ 31]
*02 E6 18 1B 2A 6C 32; [ 18]
*02 E1 99 12 A9 AC B8; [ 23]
*5D A9 AC B8 00 00 04; [ 32]
*00 E1 94 98 AC 7E 54; [ 55]
*59 AC 7E 54 00 00 04; [ 53]
*20 00 18 1B 2A 6C 32; [ 38]
*02 E6 19 12 A9 AC B8; [ 30]
*02 E6 18 1B 2A 6C 32; [ 34]
*00 E6 14 98 AC 7E 54; [ 50]
*02 E1 98 1B 2A 6C 32; [ 37]
*02 E6 19 12 A9 AC B8; [ 27]
*8D A9 AC B8 60 C9 23 9A D8 D5 F4 00 00 00; [ 29]
*02 E1 99 12 A9 AC B8; [ 30]
*02 E1 98 1B 2A 6C 32; [ 19]
*5D A3 E9 4E 00 00 00; [ 16]
*00 E1 96 90 A7 2B 6B; [ 17]
*8D AA 6C 32 58 C1 B3 A9 16 DF B3 00 00 00; [ 24]
*02 E6 18 1B 2A 6C 32; [ 38]
*00 E1 94 98 AC 7E 54; [ 59]
*20 00 14 98 AC 7E 54; [ 61]
*00 E6 16 90 A7 2B 6B; [ 16]
*59 AC 7E 54 00 00 00; [ 49]
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List Table Stats I/SI

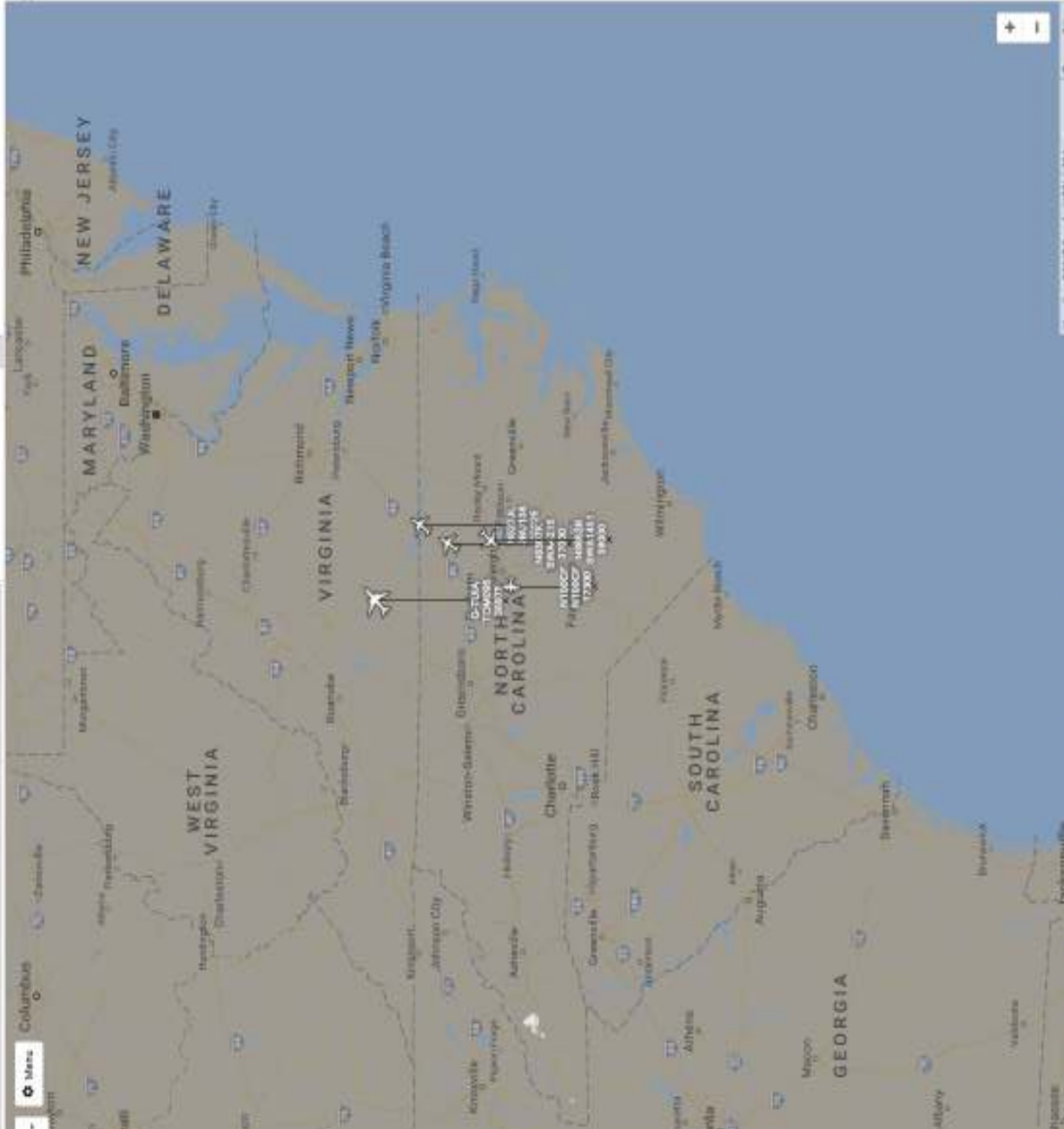
< 80 > 20 > X0 > 80 > 120 > 180

110 ms 53/sec THR: -79db [8] Port:31001 ...

UDP BS

R820T-0000000

KADAR



09-0540 B648D9
 Air Mobility Command
 Unknown or unassigned country
 Boeing C-40C
 Altitude: 35000 ft
 Speed: 467 Kts
 Heading: 200
 Distance: 120 NM
 Squawk: 7000
 Engines: 2
 Species: Lockheed L-100 Super Hercules
 Wake Turbulence: Medium

Radar: Aircraft is not transmitting its call sign



www.airframes.net : www.airframes.net
 Enable auto-select

Tracking 14 aircraft

Shortcode	Flag	Reg	ICAO	Category	Route	Pos	Altitude
PL-BQE		48435C				349300	38000
H870L		ADMF31				38000	38000
N672AM		AC6630				104	104
B6653B		ASE48A	SAMA451	SRG-A-MCO		38000	38000
N0007K		AS98BT	SWA4270			37000	37000
N527JL		ASA023	JBU13M	MCO-BDL		35000	35000
M022WN		A51087				39000	39000
NAR0WN		A61219				39000	39000
M15AW		A4E6CB				2575	2575
N500US		A37003				25950	25950
N100CP		A00450	M1092P			17000	17000
U-TUBA		408795	TOR0035	MEL-LDW		38075	38075
Z004		AET18A	CS004			3925	3925
09-0540		B648D9				35000	35000

Powered by Virtual Radar Server

Software Defined Radio Concepts

- WHY SDR?
- A low-cost entry level option into experiencing radio
- Giving access to those who are not ready to spend a lot of money on gear
- A great way to learn and possibly develop new techniques for radio design

Software Defined Radio Concepts

- Additional Benefits?
- Advanced Visualization and Tuning
- Noise reduction
- Receiver Bandpass
- Automatic Gain Control
- Open source/Development community
- Software updates extend the life of your hardware investment.
- Cost (EI Cheapo)

Software Defined Radio Concepts

- Time delays and CW issues: potential lack of sidetone. processing delay may affect full-break in CW, the delay can be misleading. 15-70ms as opposed to 5-10ms.
- OS compatibility
- US Cellular Bands are blocked

Software Defined Radio Concepts

Reference and links:

The ABC's of Software Designed Radio, Martin Ewing - AA6E

Cognitive Radio Technology. Bruce Fette.

RTL-SDR/<http://www.rtl-sdr.com/>

Flex Radio /www.flexradio.com/

<http://opensdr.org>

Software Defined Radio Concepts

? Questions?

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