

Amateur Radio and SDR

BSDCan – BOF

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Introduction

Aaron Poffenberger

- Software developer
- OpenBSD user since ~3.2
- First ham license, Novice in late 70s
 - 5 wpm CW (w00t!)
- Technician at DefCon22
- General Class 2 weeks later
- Working on Amateur Extra

What is Amateur Radio?

- Radio service operated by amateurs, *i.e.* non-professional
 - Not for monetary gain
 - Typically a real person
 - Clubs can organize for amateurs to work together
- Amateur Radio Service
- Established by the International Telecommunications Union
- Regulated by international agreement
 - Regulations implemented through harmonizing of laws by national governments

What is Amateur Radio?

- Three regions:
 - Region 1 (Europe, Middle East, CIS, Africa)
 - Region 2 (Americas)
 - Region 3 (South and East Asia, Pacific Ocean)
- Hobby
- License to experiment with radio:
 - Somewhat dependent on region and country
 - US, very open and mostly hands off due to internal “policing” by hams
 - Many innovations from amateur sphere

When Did Amateur Radio Start?

- Officially, early 1900s
- However, amateurs have operated since the beginning

Why “Ham”?

- Believed to have begun as pejorative because amateurs were “ham fisted” on their key (Morse Code)
- Adopted by amateurs as badge of honor

Notable Accomplishments by Amateur Radio

- One of the oldest radio associations in the world, American Radio Relay League (ARRL)
 - Begun in 1914 by Hiram Percy Maxim
- Numerous satellite launches
- Led development of packet radio

Notable Accomplishments by Amateur Radio

- Long-distance transmitting around the world using various
 - Skip propagation
 - Moonbounce (Earth-Moon-Earth EME)
 - Meteor scatter
- Development of Slow-Scan and Fast-Scan Television
 - Shortwave radio equipment to send television images using normal voice bandwidth
 - Amateur radio operators were online in many cities before commercial stations came on the air

Notable Accomplishments by Amateur Radio

- Local, regional, national and international relay networks
- Quick mobilization during disaster
 - Supplementing and often replacing local phone systems (wired and wireless)
 - Work to send gear and people around the world during major disasters

Privileges – What Can a (US) Ham Do?

- Transmit in numerous bands
 - Depends on license class
- Transmit using various modes of communication
 - Voice
 - Image
 - Text and Data
 - Continuous Wave (CW) – Morse Code
 - Packet Radio
 - Phase-Shift Keying
 - Spread Spectrum
 - Digital

Privileges – What Can a (US) Ham Do?

- Operate stations in other countries
 - If reciprocal licensing in place
 - Limited by country laws, not US
- Build and use unlicensed equipment
 - Within regulation
 - It's the operator who's licensed in amateur, not the equipment!!!
- Help license other hams!
 - Volunteer Examiner
- Help enforce FCC regulations and volunteer band plans

Getting a US License

- 3 License classes in US:
 - Technician
 - General
 - Amateur Extra
- License good for 10 years
 - Renewal fee, no additional testing

Getting a US License - Technician

- 35-multiple-guess-question exam
- No Morse code required
- Voice privileges
- Various modes allowed
- Limited in high-frequency bands

Getting a US License - General

- 35-multiple-guess-question exam
- All privileges of Technician
- Access to 83% of all amateur HF bands

Getting a US License - Amateur Extra

- 50-multiple-guess-question exam
- All privileges allowed to amateurs

Getting a License in Other Countries

- [Audience participation]
- Canada (RAC - Radio Amateurs of/du Canada)
- France
- Germany
- UK
- Other

Getting Started

- Shoot for Technician class license first
 - Learn some basic electronics
 - Learn how to use Ohm's Law
 - Memorize some band-plan information
- Get a study guide
 - ARRL books very good helpful
 - Numerous online resources
 - <http://hamexam.org>

Once You Pass

- Get an inexpensive radio
 - No easier way to lose interest than to not have a radio
 - BaoFeng handy talkies are cheap (~\$35.00 on Amazon)
- Look for a club
- Join ARRL
 - QST Magazine has tons of info and articles

Hardware – What Do I Need?

- Technically, nothing...but that's no fun
- A receiver, better than nothing, but still no fun
- A transceiver...ahh
 - A handy talkie like the BaoFeng
 - A mobile rig – not (!!!!) a CB
 - A portable rig
 - A beast

Hardware – What Do I Need?

- Handy Talkies
 - Battery powered
 - Typically 1 to 3 bands (70 cm, 2 m, 6 m)
 - 1 to 5 watts
 - 100 or so memories
 - DTMF keypad
 - “Rubber-ducky” antenna

Hardware – What Do I Need?

- Mobile and portable
 - Dual band to all band
 - Voice modes to all mode
 - Microphone
 - Serial or other computer interface
 - 13.8 VDC, sometimes internal batteries
 - Antenna connected by feed line
 - Perhaps an antenna tuner
 - Internal or add-on

Hardware – What Do I Need?

- Beast
 - Require AC or perhaps converter
 - Usually all band, not always
 - Some purpose-built rigs, especially DXing
 - Serial or other computer interface
 - Antenna connected by feed line
 - Often an antenna tuner
 - Internal or add-on

Hardware Other

- Antenna
- Antenna tuner
- Computer
- Sky's the limit

What is SDR?

- Software-Defined Radio
- Replaces purpose-specific circuits with general purpose computing and software algorithms

SDR - What Do I Need?

- Get an RTL SDR
 - About \$20.00
- Get a HackRF, BladeRF or AirSpy
 - (US)\$150 - (US)\$650
- Get the software
 - rtl-sdr
 - fldigi
 - gqrx
 - GNU Radio

State of SDR on BSD: OpenBSD

- fldigi
- rtl-sdr
- GnuRadio

State of SDR on BSD: FreeBSD

- [Audience participation]

Conclusion

- Questions - You have them, I may have answers

Support OpenBSD

- <http://www.openbsdoundation.org/>

Contact Details

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Ham Radio Clubs - US

- FCC
- ARRL
- ARRL Club Finder

Ham License Info - US

- Gordon West
- HamExam
- QST

Ham Radio Clubs and License Info - Canada

- RAC - Radio Amateurs of/du Canada
- Government of/du Canada
- Canada Ham FAQ

Radio Gear

- BaoFeng
- Icom
- Kenwood
- Motorola
- Yaesu

SDR People and Resources

- rtl-sdr: <http://www.rtl-sdr.com/>
- HackRF and YardStick: <https://greatscottgadgets.com/>
- BladeRF: <http://nuand.com/>
- AirSpy: <http://airspy.us/>