TAPR #103 DCC 2007

PACKET STATUS REGISTER

President's Corner

The TAPR-ARRL DCC is just around the corner, September 28-30, 2007, in Hartford, CT. The TAPR Board of Directors meeting is being held the day before, and observers are welcome to attend. There will be further announcements regarding the time and meeting room.

Details are available on the web-site at http://www.tapr.org/dcc. Please check the site frequently for updates.

Our featured speaker this year is Bruce Perens, K6BP. Bruce is a long-time friend of TAPR and is well-known as an Open Source advocate in the Linux community. Bob McGwier, N4HY, will be giving the Sunday seminar, and will touch on practical topics like software-defined radio, information, theory, and practical applications.

We will be fortunate to have an unprecedented number of presenters from among the papers published in this year's proceedings. You will also get updates on the HPSDR project – how the Ozy and Janus project turned out and what new projects are in the pipe. ARRL HQ is nearby – some folks plan to partake of the W1AW experience before and after the DCC.

The TAPR annual meeting will also be held on Saturday afternoon. Come and hear what we are up to and give us some idea of where we should go. We'll give an update on finances (come roast the treasurer) and offer a Q&A session with your board and officers.

Your BoD is also starting an initiative to get more of the membership engaged in TAPR activities by formalizing a volunteer program. We will have some ideas to present to you and we will be using the web site and these pages to bring you updates on this initiative. We will be looking for ways to plug volunteers into existing and developing projects. We will be offering guidance to first-time project developers as well.

So, please make an effort to join us at YOUR DCC, September 28-30, at the Doubletree Hotel, Bradley International Airport (BDL). It won't be the same without you.

73,

Dave, VE3GYQ/W8

Spencerville, OH

Mail to: ve3gyq@tapr.org

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DCC Speaker Schedule

The ARRL/TAPR Digital Communications Conference, scheduled for September 28-30 in Hartford, Connecticut, has released its slate of speakers. The three-day conference is an international forum for radio amateurs to meet, publish their work and present new ideas and techniques.

Presenters and attendees will have the opportunity to exchange ideas and learn about recent hardware and software advances, theories, experimental results and practical applications.

Registration for the DCC is still open and will be available at the door.

Friday's speakers include Bob Bruninga, WB4APR, speaking about "The APRS Local Voice Repeater Initiative;" Ev Tupis, W2EV, speaking about "Growing APRS' Value within the Emergency First Responder Community;" Paul D. Wiedemeier, PhD, KE5LKY, will talk about "Performance Modeling of TCP and UDP over Packet Radio Networks Using the ns-2 Network Simulator."

Also on Friday, ARRL Chief Technology Officer Paul Rinaldo, W4RI, will speak about "Results of HF Digital Protocol Survey;" Mel Whitten, K0PFX, will speak about "DRMDV for HF;" Bob McGwier, N4HY, will talk about "TPSK31: Getting the Trellis Coded Modulation Advantage;" Milton Cram, W8NUE, and George L. Heron, N2APB, will speak about "NUE-PSK31: A digital modem for PSK31 field operations without using a PC;" Bill Tracy, KD5TFD, will give an HPSDR update.

Saturday's line-up starts off with Steven Bible, N7HPR, and Robert McGwier, N4HY, giving an update on SuitSat-2; McGwier will also speak on AMSAT's Phase IV and "On a Method for Automatic Image Balancing in IQ Mixer Based Software Defined Receivers," as well as sharing presenting duties with Gerald Youngblood, K5SDR, with "The Flex 5000 and SDR Software." Roderick D. Mitchell, KL1Y, will speak about "The Integration of Amateur Radio and 802.11."

Also on Saturday, Martin Ewing, AA6E, will present "SurgeForge, Hamlib and Rigserve: Free Beer, Free Speech and Rig Control"; Frank Brickle, PhD, AB2KT, will talk on "The FSM Virtual Radio Kernel: Why, What and How (in that order)"; John A. Hansen, W2FS, will speak about "The Nordic nRF2401 Single Chip Data Transceiver," and Hank Javin and Jerry Newman will present "Transmission Lines, Parameters and Application in Communications Systems."

Two introductory forums are also scheduled on Saturday: Intro to Eagle CAD, given by Dan Welch, W6DFW, and Intro to HF Digital, given by Steve Ford, WB8IMY. The TAPR annual meeting is scheduled for Saturday afternoon.

Sunday's Seminar, a four-hour presentation led by McGwier on the topic of "A Stroll through Software Radio, Information Theory and Some Applications" will cover the basic building blocks of a simple software radio system, as well as a discussion of information theory and its practical use in communication systems. As time permits, McGwier plans to demonstrate several software radio systems ranging from the Softrock40 to the GnuRadio/USRP and the Flex5000. Attendees will receive packages containing tutorials and software.

For more information on the ARRL/TAPR Digital Communications Conference, please see the conference Web site.

(Editor's Note: This article originally appeared in The ARRL Letter, September 14, 2007.)

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Surfin': DCC at BDL

By Stan Horzepa, WA1LOU

The real big digital communications show is coming up just up the road.

The ARRL and TAPR Digital Communications Conference (DCC) is where all the bit-heads in Amateur Radio will be the last weekend of September.

Every year, ARRL and TAPR get together and sponsor the Digital Communications Conference (DCC). This year's installment of the conference takes place September 28-30 at a hotel just up the road from Bradley International Airport (BDL), which is just up the road from Hartford and ARRL Headquarters in Newington.

The digital hams submitted some exceptional papers for presentation at the conference. The banquet speaker is Linux advocate Bruce Perens, K6BP, and the conference's Sunday seminar, "A Stroll Through Software Radio, Information Theory and Some Applications" by Bob McGwier, N4HY, should be excellent. So, the 2007 DCC has all the makings of being one of the best.

It is not too late to make plans to attend the DCC. TAPR's Web site has all the information you need to make those plans, so do not pass go, go directly to the Web site and sign up for the DCC. I want to see you there!

Until next time, keep on surfin'.

(Editor's Note: This article originally appeared September 7, 2007, on ARRLWeb.)

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The ARRL and TAPR Digital Communications Conference (DCC) is where all the bit-heads in Amateur Radio will be the last weekend of September.

DCC Proceedings Submitted Papers

The following lists the papers that have been submitted for the proceedings of this year's DCC. Many, but not all will be presented at the DCC:

The FSM Virtual Radio Kernel: Why, What, & How (In That Order) by Frank Brickle, PhD, AB2KT

The APRS Local Voice Repeater Initiative by Bob Bruninga, WB4APR

NUE-PSK31: A digital modem for PSK31 field operation without using a PC! by Milton Cram, W8NUE, and George L. Heron, N2APB

SourceForge, Hamlib, and Rigserve: Free Beer, Free Speech, and Rig Control by Martin Ewing, AA6E

The Nordic nRF2401 Single Chip Data Transceiver: High Speed, Short Range Data Communication At An Extremely Low Cost by John A. Hansen, W2FS

Transmission Lines, Parameters, and Application in Communications Systems by Hank Javan and Jerry Newman

Direct Conversion Receiver With Computerized SSB Demodulation by Patrick Lindecker, F6CTE

APRS and D-STAR = D-PRS by Peter Loveall AE5PL

AMSAT's Phase IV (lite)? by Bob McGwier, N4HY

On A Method for Automatic Image Balancing in IQ Mixer Based Software Defined Receivers by Bob McGwier, N4HY

TPSK31: Getting the Trellis Coded Modulation Advantage by Bob McGwier, N4HY

The Integration of Amateur Radio and 802.11 by Roderick D. Mitchell, KL1Y

Results of HF Digital Protocol Survey by Paul L. Rinaldo, W4RI

Ranking Digital Modes for a "Stealth" QTH by Ed Sack, W3NRG

Bringing New Life in Old Computers by Miroslav "Misko" Skoric, YT7MPB

Alternate Uses for the APRS Data Stream Using APRS Mobile Trackers for Distributed Site Surveys by Darryl Smith, VK2TDS

Growing APRS' Value within the Emergency First Responder Community by Ev Tupis, W2EV

Performance Modeling of TCP and UDP over Packet Radio Networks using the ns-2 Network Simulator by Paul D. Wiedemeier, Ph.D., KE5LKY

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Use It or Lose It, SHF Edition

By David Josephson, WA6NMF

There's been a lot of action in the past few years on the amateur 13 cm band (2300-2310 and 2390-2450 MHz) using gear that was originally made for Part 15 unlicensed service (802.11b/g). It's possible to build point-to-point or broadcast links to carry serious bandwidth for very little money, but there is so much non-amateur activity in much of the country that it's practical only in fairly remote areas or for short distances.

Companies are putting a lot of pressure on the FCC to allow unlicensed operations over a wider frequency range (some money-making operations like PCS cell phones are actually Part 15 unlicensed transmitters). There is much more amateur spectrum to lose if we don't use it more actively. All sorts of point-to-point and point-to-multipoint networks can be constructed in these bands if there is interest. There are two other frequency bands, much less crowded than 2.4 GHz, where hams can build systems using modified Part 15 gear.

Part of our 5 cm band is shared with Part 15 users, like it is on 13 cm. The main overlap is with the high power ISM band, 5725-5850 MHz, where anyone can operate point-to-point links under Part 15 with 1 watt of transmitter output, and antennas with any amount of gain. This leaves 5650-5725, in which low power unlicensed operation is permitted, and 5850-5925 which is quiet but for some military users. The FCC has only in the past year begun approving Part 15 radios in the lower band (5470-5725) because it took them a long time to work out the details of the Dynamic Frequency Selection (DFS) process needed to avoid military radar.

The other band of interest is 9 cm, 3300-3500 MHz. In other countries, most of this band is a commercial, licensed allocation used to deliver broadband Internet and TV to the home. Many manufacturers make gear for this frequency but can't sell it in the US – except to hams. The Ubiquiti SR3 radio covers this range by using an on-board heterodyne converter and a standard Atheros 2.4 GHz chip set. Similar converters are available as standalone units from Teletronics and Hyperlinktech.

The 9 cm band is particularly critical to defend, because it's adjacent to licensed spectrum and used as a commercial band in much of the rest of the world (making it a much more attractive target for companies who would like to make it part of their business plan). At this writing, there are two radio cards in production in this band, one from Wavesat and one from Ubiquiti. Those concerned with the security of Wifi type links on 2.4 or 5.8 GHz should look into this band. All of the boards and software packages described later in this article also function with at least the Ubiquiti 9 cm card.

There are a couple of techniques to QSY existing Part 15 equipment from is factory-programmed unlicensed frequencies to Part 97 frequencies. One is to change the master clock oscillator crystal, and this approach works well to open up the 2390-2400 MHz range in commercial units. The other is to enable the chip sets' inherent ability (if it's

made by Atheros, one of the more common suppliers) to operate over a wider frequency range. The remainder of this article concerns the operation of 802.11a type gear on amateur frequencies in the Part 97 5 cm band.

8021.11a is not spread spectrum, but rather Orthogonal Frequency Division Multiplex (OFDM) consisting of 52 subcarriers or "tones" (48 for data and 4 pilot) spaced 312.5 kHz apart. Each tone carries symbols 4 microseconds long with 0.8 microseconds between symbols, and the symbols may be encoded using BPSK, QPSK, 16QAM or 64QAM modulation. Higher modulation modes result in more bandwidth capacity in the same 20 MHz cluster of carriers, at the expense of higher signal-to-noise requirements. Some modern chip sets also allow the transmission of the number of data subcarriers, to allow the same total power to be concentrated among fewer carriers, making the entire transmission 5 or 10 MHz wide instead of 20.

One of the common "physical layer" chip sets in 802.11a wireless LAN equipment today is the Atheros, and current versions cover around 2300-2700 and either 4900-5850 or 4900-6100 MHz. Companies using Atheros chip sets have to sign very restrictive agreements about the use of Atheros firmware, since much of the chip set's functionality is provided by an external processor through a "hardware abstraction layer" or HAL. Atheros licenses a specific version of HAL to each manufacturer, which generally prevents its use outside the Part 15 bands.

Some companies (http://www.ascom.ch is one) have licensed a more permissive version of the HAL, which permits them to provide drivers to other companies in which the full range of the Atheros chip set can be used. These other companies in turn (and others, who get their drivers from who knows where) offer a whole driver package that allows a mini-PCI wireless radio card based on the Atheros chip set to be used over its whole range.

At least three companies, Mikrotik in Latvia (http://www.mikrotik.com), Valemount in Canada (http://www.star-os.com) and Antcor in Greece (http://www.antcor.com), sell router software packages based on Linux that use Atheros-based wireless cards which can be operated over their whole frequency range including Part 97-only frequencies. We have been using Mikrotik for several years in a public safety (Part 15 compliant) system with very good results. This software isn't free or open source, but it's not expensive, particularly when bundled with the hardware that each of these companies sells.

A package of a 22 dBi flat panel antenna, processor board and radio operating from 5.2 to 5.8 GHz is under $300 from Mikrotik. Other packages of board, software and radio can be as little as $150. Most of these packages will also support 900 MHz, 2.4 GHz and 3.4 GHz radio cards. Comparing the features and claims of the three companies mentioned, and running their demo versions, will give

you a good education on how this whole router/HAL/radio package works. At the end of the day, you can build point-to-point and point-to-multipoint systems on Part 97 frequencies and construct your own wireless area network.

One of the most appealing features of high capacity point-to-point systems is their ability to bring Internet connectivity from a region where it's functional to an area where it's not, due to isolation or disaster. The public safety system mentioned above provides connectivity, surveillance, VoIP telephones, telemetry and equipment control over three hops on 5.8 GHz spanning more than 50 miles in total, and it's been in reliable operation for more than a year now. It would be simple to outfit a go-kit with a couple of hops of this gear on amateur frequencies and be able to span similar distances on short notice.

The legal issue of operating 802.11-type systems connected to the Internet under Part 97 generates a lot of discussion, and many assertions have been made about what an FCC judge would determine to be the intent of the Rules. ARRL and FCC seem to have reached an understanding that it's not "encryption" if you use publicly-described codes such as WEP, and publish your password. The issue of handling third-party Internet traffic over a Part 97 link is a little more complex, but that's for another time.

73 de WA6NMF

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Surfin': If It Looks Like A Ducting...

By Stan Horzepa, WA1LOU

Every evening after work, I drop off my briefcase in my home office/ham shack and check the status of propagation on 2 meters, which my computer running APRS dutifully displays at least with regards to what is happening on 144.39 MHz. Wednesday night was no different, except that there must have been a nice band opening on 2 meters during the day.

It looked like a classic summer troposphere-ducting event with loads of stations received by my APRS station all clustered along the East Coast down to the Virginia-North Carolina border. The most distant station received was WB4YNF-4 in Ahoskie, North Carolina, approximately 430 miles away!

Then there was one station I received that was a bit of an anomaly: K3ARL-1 near State College, Pennsylvania, approximately 267 miles west-southwest of my station. It is inland, far from the other stations huddled along the coast, and there are lots of hills and mountains between Downtown Wolcott and State College, whereas the stations along the coast are basically all downhill from me. So, I am not sure how my reception of K3ARL-1 fits into the troposphere-ducting model.

In addition to waiting until I get home from the salt mine to find out what I missed on 2 meters during the day, I can check the Internet to see what my APRS station is hearing and which stations are hearing it, courtesy of Jon Harder, NG0E, and his Propagation Web page.

According to NG0E, "APRS Internet System servers gather information from networks of VHF and HF Amateur Radio packet stations. This information gateways into the Internet and made available as a constant stream of real-time data from a set of network servers.

"Packet radio stations provide two bits of information that are useful for studying propagation. A station's latitude and longitude is typically transmitted with each data packet, pinpointing the transmitter's location. Also included in packet radio transmissions is the path, a list of hops between stations that a message takes before reaching an Internet gateway.

"By saving the location of each station, we can use that information to determine the distance and direction between hops in the packet path. There are a sufficient number of packet radio stations on VHF frequencies in much of Europe and North America (typically on 144.39 MHz) to show real-time propagation over large portions of these continents."

NG0E's Web page displays the pertinent packets received by a particular APRS station and the pertinent stations receiving that APRS station's packets. The display includes the date and time of the packet, call sign of the station heard or hearing the packet, its grid square, compass direction, distance (in km) and occasionally, the actual packet.

If you run a base APRS station, simply substitute your station's call sign and SSID (if any) for W1AW here and view the results.

If you are not running a base APRS station, you can still use NG0E's Web page by plugging in the call sign and SSID of a nearby APRS station. If you don't know any nearby APRS stations, you can find one at the Brian Riley, N1BQ's wulfden APRSQuery Web page. Simply type your ZIP code or latitude and longitude in

the appropriate fields and N1BQ's Web page will return a long list of nearby APRS stations, whose call and SSID you can use with NG0E's Web page.

Or you can simply visit NG0E's VHF Propagation Web page and view the propagation footprint maps created by using the data collected from the APRS Internet network.

Until next time, keep on surfin'.

(Editor's Note: This article originally appeared July 27, 2007, on ARRLWeb.)

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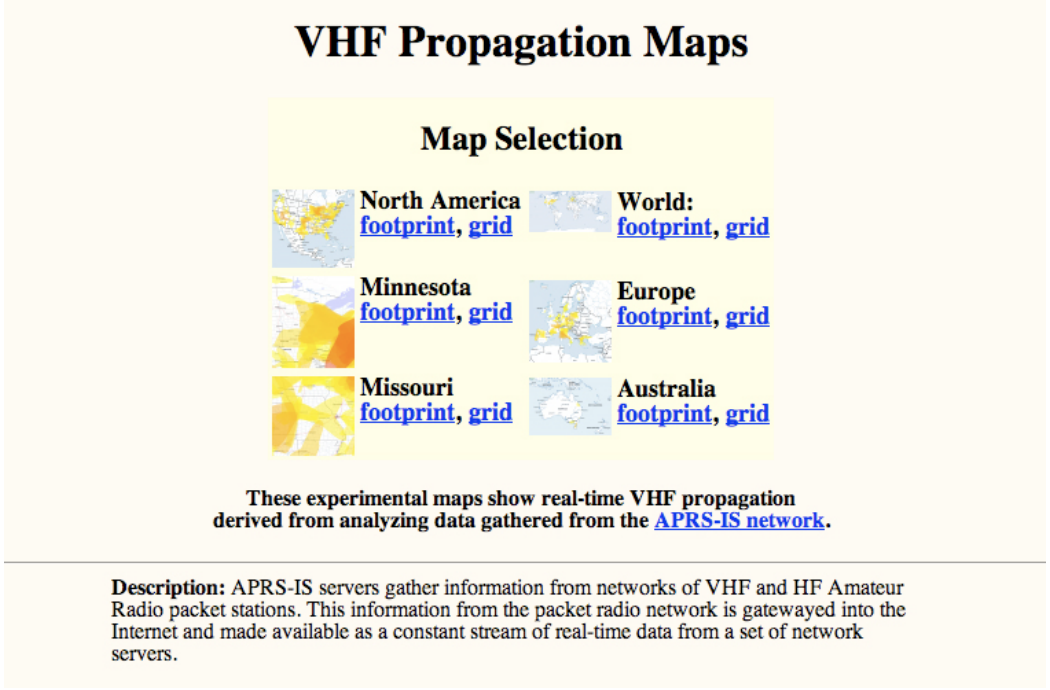

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