### **Packet Radio Overview**

2 October 2014 (Revised) Jim Oberhofer KN6PE

### Agenda

- 1. What is Packet Radio?
- 2. Why use it?
- 3. The Packet Radio Network
- 4. Outpost Packet Message Manager

## What is Packet Radio?

### What is Packet Radio?

... in a nutshell

- One of many digital modes available in Amateur Radio
- Transmitted information is received 100% error free!
- Uses the AX.25 protocol, an extension of the ITU X.25, with data transparency, error checking, and automatic control
- Divides data streams into *bite-sized* packets
- Sends a "packet" of data at a time: envelope + payload

Header Payload CHK

- Envelope contains a header at beginning and checksum at end
  - Header includes the From and To addressing information
  - Payload contains the data to be sent
  - Checksum determines if packet was received error free
- Data transfer speeds from 1200 baud to 19.6K Baud on VHF/UHF

### What is Packet Radio?

What are the components?



**Computer:** runs a "terminal emulation" program

- **TNC:** Terminal Node Controller; similar to a telephone modem; implements the AX.25 protocol, and is the interface between your radio and your computer. May be implemented in either hardware or software
- **Radio:** ... and antenna; transmits the digital data sent to the TNC to another packet station

The case for packet radio

#### 1. Message Store and Forward

- BBSs allow messages to be stored, retrieved, or forwarded throughout the connected BBS network.
- The recipient does not need to be on line to get the message, meaning that messages can be retrieved at the recipient's convenience.



The case for packet radio

#### 2. Communications Protocol – Error Free messaging

- Packet uses a protocol called AX.25. This is based on the ITU X.25 protocol for networked packet communications.
- AX.25 supports error correction and control that guarantees that all packets (and subsequently messages) are delivered correctly.



The case for packet radio

#### 3. Interoperability

- DHS suggested to the ARRL that the Amateur community should design, build, and maintain a national emergency communication digital network.
- Winlink 2000 (WL2K) was adopted as that solution.
- WL2K provides radio packet users and internet 3rd party users with transparent email access.



The case for packet radio

#### 4. Complex messaging

- Ideal for passing lists, addresses, instructions, forms, or complex words (i.e. pharmaceuticals or chemicals)
  - you do not want to confuse
     Hydrogen Sulphide (a gas) with
     Hydrogen Sulfate (an acid)
- Messaging by packet ensures...
  - 1. the originator can verify the content before it is sent,
  - 2. reduces transcription errors between the sender and receiver, and
  - 3. keeps the voice channel clear for other critical traffic.

	CUP-174: Shelter material Request - Packet Message									
F	File Edit	Actions Window H	elp							
	Print	Send Save	e Delet	te Cl	ose	Urg				
	Private Me	essage								
	Bbs:	XSCEOC								
	From:	CUPEOC								
	To:	SJREOC								
	Subject:	CUP-174: Shelter m	aterial Req	uest						
	City: Request	Cupertino, CA : Material reple	enishment							
	Item#	Desc	On-Hand	Units	Qty	Needed				
	1	cots	30	ea	25	18-Ma				
	2	blankets	45	ea battles	15	18-Ma				
	3	First Aid kits	200	bottles bite	12	19-M				
	5	Toilet namer	50	rolls	250	19-M				
	6	tooth brushes	10	ea	50	ASAP				
	7	tooth paste	5	ea	55	ASAP				
	8	note pads	0	ea	25	19-Ma				
	9	pencils	0	ea	25	19-Ma				
	10	MRE	10	cases	300	18-Ma				

The case for packet radio

#### 5. Wide range of message content

- Structured Text
  - Lists
  - Addresses
  - Tables
- Forms
  - ICS 213 messages
  - 9-1-1 requests
  - Status
  - Logistics
  - Others...
- Unstructured Text (informal message)
  - Health and Welfare
  - Simple text messages

The case for packet radio

#### 6. Reduces message handling

- Messages can originate from standard PC applications and sent directly to the packet application, or memory stick by *sneaker-net* to the radio room for loading and sending.
  - Spreadsheets using .csv (comma-delimited) files
  - Cut-and-paste docs
  - Direct import of text files



 Because packet is digital and relies on a computer, messages also can go directly to a printer.

The case for packet radio

#### 7. And finally...

#### 🖌 lt's fast

- When there is no Internet, it's fast
- 7 to 15 times faster than voice

#### 🖌 lt's easy

- Hardware: pre-built cables; straight-forward connections
- Software: if you can use e-mail, then you can use Outpost

#### 🖊 lt's deployable

 Virtually anywhere in the city, county, and most of surrounding counties; no specialized radios or antennas are required

#### It fits our served agencies' needs

Preferable for long, complex, and/or high volume messages; explicit acknowledgements

## **Packet Radio Network**

### **Packet Radio**

What can we connect to?



### **Packet Station**



#### • **PC**

- Laptop or larger network with at least Windows XP
- Battery runtime of at least 1 hour

#### • TNC

- Hardware TNCs preferred (such as a KPC-3+)
- Software TNCs will work, but they are tricky to set-up and operate

#### Radio

- Mobile radio with 25 or more Watts of output
- HTs will work, but you may become a hidden node

#### Antenna

Get the antenna up as high as possible

### **SCC RACES BBS Locations**



### SCC RACES BBS Network

#### **Operational Concepts**

- From anywhere/to anywhere in the county
  - Schools, shelters, hospitals, neighborhoods, parks, tents, ...
  - Even if: Internet, cellular and commercial power are all down!
- All cities/agencies can reach at least 2 BBSs
  - Provides backup in case of failure
  - All users in a city/agency can use the same primary & alternate BBSs
  - All BBSs have equivalent functionality; simplifies training
- The network is run like a commercial network
  - It is intended to work in an emergency
  - UPS, backup generators, physical and network security
  - Testing, automated monitoring, user communications
  - Avoid single points of failure
- Result: Zero service outage in 5+ years!

### SCC RACES BBS Network

#### Which BBS?

- Each city/agency has a primary and secondary BBS.
- All individuals within a City use the same BBS as their city.
- Use the primary BBS whenever possible.
- If primary fails, cities on that BBS are distributed across the other three BBSs.

#	Agency	Prefix	Primary BBS	Secondary BBS						
Santa Clara County Cities and Agencies										
1	American Red Cross	ARC	W1XSC	W4XSC						
2	CAL FIRE VIPs - Santa Clara Unit	SCU	W2XSC	W1XSC						
3	Campbell, City of	CBL	W1XSC	W4XSC						
4	Cupertino, City of	CUP	W1XSC	W4XSC						
5	Gilroy, City of	GIL	W2XSC	W1XSC						
6	Hospitals (all SCCo) & DEOC	HOS	W2XSC	W1XSC						

### SCC RACES BBS Network

#### **BBS Frequencies**

- Access is simplex with no tone
- 2m User access; typically individuals, some EOCs
- 220 User access; typically EOCs, some individuals
- 440 Future

	Call Sign	AX.25	User Access	BBS-BBS	Location
CUPERTINO PRIMARY BBS	W1XSC	W1XSC-1	145.750, 223.620		Santa Clara Co Office Bldg (San Jose)
	W2XSC	W2XSC-1	145.730, 223.560		Crystal Peak (South County)
	W3XSC	W3XSC-1	144.310, 223.540		Mountain View
CUPERTINO SECONDARY BBS	W4XSC	W4XSC-1	145.690, 223.600*	223.600	Frazier Peak (above Milpitas)
	W5XSC	W5XSC-1	varies	varies	Training, events, backup
	W6XSC	W6XSC-1	varies	varies	Testing, backup

### Northern California Packet Band Plan

http://ncpa.n0ary.org/ncpabandplan.html

#### 2 Meter Band Plan

- 144.31 EP
- 144.33 Telemetry & Experimental
- 144.35 Keyboard to Keyboard, mailbox
- 144.37 BBS forwarding
- 144.39 APRS (USA and Canada)
- 144.41 APRS (secondary channel)
- 144.43 TCP/IP (OK to run duplex with 145.65)
- 144.91 EP
- 144.93 NA
- 144.95 NA
- 144.97 Misc. Digital
- 144.99 TCP/IP
- 145.01 WL2K
- 145.03 Keyboard to Keyboard, mailbox
- 145.05 Keyboard to Keyboard, mailbox
- 145.07 NA
- 145.09 BBS

- 145.61 Duplex, cross-band
- 145.63 WL2K
- 145.65 TCP/IP 9600 baud (OK to run duplex with 144.43)
- 145.67 DX Spotting
- 145.69 EP
- 145.71 DX Spotting
- 145.73 EP
- 145.75 EP
- 145.77 DX Spotting

#### NOTES

- APRS Automatic Packet Reporting System.
- BBS Full-service Bulletin Board System,
- DX Spotting Northern California DX Packet Spotting Network
- EP Emergency Packet
- NA Not Allocated
- WL2K Winlink2000 message server or anything involving the Winlink network.

# Outpost Packet Message Manager

Packet Radio Overview

### **Overview** *Outpost Packet Message Manager*

#### What is Outpost?

- A Windows-based packet messaging client that hides the complexity of the packet world
- Supports ARES/RACES teams meet the needs of their local served agencies to pass digital message traffic
- Automates and manages all message handling between you and the BBS
- Lets you read, delete, create, reply to, or forward messages back to the BBS
- SCCo Packet Installer is available from County web site <u>http://www.scc-ares-races.org/packet.html</u>
- General purpose version is available from Outpost web site <u>http://www.outpostpm.org/</u>

Outpost Packet Message Manager

#### Why Outpost?

- Leverages the existing packet hardware, network, and BBS infrastructure
  - Uses your existing TNC and packet radio equipment
  - Compatible with many existing BBSs and TNC PBBSs
  - Only your packet client (end-user program) changes
- Hides the complexity of the packet operating environment
  - Similar look and feel to contemporary email programs
  - Shorter learning curve for packet operations
  - Allows users to ... "focus on the message, not the medium"
- Implements most local emergency management policies for digital communications

Outpost Packet Message Manager

### Feature highlights

#### Message support

- Private, NTS, and Bulletin messages
- Text formatting in a free-form message window
- NTS Message Maker with an ARL message wizard
- On-line report builder

#### Send/Receive Session (connection) control

- Serial, AGWPE, and Telnet interfacing with over 20 PBBS and BBSs
- Controls connecting, sending messages to and retrieving messages from the BBS

#### Configurations and Setups

- BBS, TNC, and Interface configurations
- message type and retrieval options
- supports 3 ways for automatically initiating send/receive sessions

Outpost Packet Message Manager

### Message support

- Familiar email-app look & feel
- Separate folders for message storage
- Clear message identification (unread=BOLD, urgent=Red)
- Formal message workflow
- BBS and interface setups
- Additional settings control how Outpost behaves

		-
🛛 Outpost Pack	ket Message Manager	
File Edit Setup	Tools Forms Actions Help	
New Op	Archive Delete Print Send/Receive Profile: K6FB on 145_050	
Folder List	In Trav	
In Tray	U Type From To BBS Local ID Subject	Date
	KN6PE KR6CO K6FB-2 6PE127: City Streams	4/4/2007
	NTS KNOPE 95825@NTSCA K6FB.2 OTC 1 R SACRAMENTO CA (916-55	4/0/2007 55) 4/6/2007
Out Tray	KN6PE +CARES LIST K6FB-2 6PE126: N95 Mask Purchase	4/9/2007
	KN6PE K6TEN K6FB-2 6PE128: Equipment Check	5/1/2007
Sent Msgs Archive Draft Msgs Deleted Msgs		
5 Items 5 Total	I KNEPE as CLIPEOC - LCARC - XSC Kantropics KPC3.Plus	00-00
o nems, o rotal		100.00

Outpost Packet Message Manager

### **Creating Messages**

- Supports Private, Bulletin, and NTS message types
- Message formatting before sending
- Set messages to Urgent
- Request delivery or read receipts
- Different ways for originating messages:
  - Freeform
  - Ics213mm
  - NTS Message Maker
  - PacFORMS
  - On-line reports

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Outpost Packet Message Manager

### Viewing messages

- Supports viewing, printing, deleting or saving a message to a local file
- Reply and Forward message formatting

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File	Edit !	Setup	Tools Fo	rms Action	ns Help								
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Outpost Packet Message Manager

### **Managing Setups**

- Sets up a TNC or I/O device, includes
  - Serial / Comm Port
  - AGWPE (for KISS devices)
  - Telnet
- Sets up a BBS definition
- Sets up the station identification.
   This section also enters telnet and Winlink account and password data.
- Sets up address book entries
- Manages Profiles specific configurations of settings
- Runs the PC Time Check Program

🔐 Outpost Packet Message Manager								
<u>File</u>	<u>E</u> dit	<u>S</u> etup	<u>T</u> ools	Forms	Actions			
	New	TNC		С	trl+T			
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		Address Book						
	le Tra	Prof	iles		• • •			

PC Time Check...

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Outpost Packet Message Manager

### **Program controls**

- Controls the flow of Send/Receive Sessions
- Sets how messages are created and handled
- Set various data fields to automatically populate on-line reports and messages
- Set up default directory names
- Various log settings
- Outpost Scripting
- Form sizing controls
- Separate Interactive Packet Windows for...
  - Ipserial.exe Serial TNCs
  - Ipagwpe.exe AGWPE
  - Iptelnet.exe Telnet



Outpost Packet Message Manager

#### Send/Receive Settings

- Selects different ways to automate the message send/retrieve sessions
- Select which message types are to be retrieved
- What to do when receiving messages
- Additional controls to manage printing, Alerts, and program settings

and series securings	
Automation Retrieving Receiving Printing Alerts Other	,
Automation	
O No Automation. Initiate each send/receive session manually.	
Schedule a send/receive every 15 minutes (1-999).	
C Schedule a send/receive at "X" minutes past the hour (0-59)	
6, 21, 36, 51	
Send/Receive Settings	
Automation Retrieving Receiving Printing Alerts Other	
Retrieve these Messages	
Retrieve Private Messages.	
Retrieve NTS Messages.	
Retrieve New Bulletins.	
Enter as a list of filter items (i.e.: OST_KERS_ARES) apparented by another	
XSCPERM, XSCEVENT	
Y	
Skip (do not retrieve) NTS Messages I send to the BBS.	
Skip (do not retrieve) Bulletins I send to the BBS.	
I/Receive Settings	
nation Retrieving Receiving Printing Alerts Other	
en Receiving Messages	
Play this sound on arrival: packet1.wav Browse Test	
Keep messages on BBS; do not delete after retrieving	

~1

Send

Autor

Wh

		🇱 Message Settings	X
<b>Overview</b> Outpost Packet Message Manag	ier	New Messages Msg Numbering Replies/Forwards Tracking Deleting Adv Setting up a new message © Set default to PRIVATE © Set default to BULLETIN © Set default to NTS © Create and send NTS messages as Private messages	v]
Message Settings		✓ Default Destination XSCEOC (Call Sign or Tactical Call)	
<ul> <li>Settings for new messages, include</li> <li>Default destinations</li> <li>Auto message numbering</li> <li>Add a Signature</li> </ul>	des	Signatures	
<ul> <li>Handling Message Numbering</li> <li>Set defaults for message receipts</li> </ul>	Outbo	Add message Identification Add message number to the Subject Line for outbound messages  without hyphenation "6PE4360P: "  with hyphenation "6PE-4360P: "	
	Ressage Settings	with DateTime Format "6PE160405212221P: "	
<ul> <li>Other Setting for deleting messages and setting up for PacFORMS &amp; Ics213mm</li> </ul>	New Messages Msg Num Tracking Messages Always request a De Always request a Re Auto-Receipts Auto-Delivery Receipt retrieving a message Auto-Read Receipt: newly arrived message	bering Replies/Forwards Tracking Deleting Adv livery Receipt ad Receipt ot: Always send back a Delivery Receipt after Always send back a Read Receipt after opening a ge.	
Amateur Radio Packet and the Emerger			



### What's next?

- 16-April: Hands-on Packet session, 9:00am, EOC
- 21-April: Hands-on Packet session, 6:00pm, EOC
- 5-May: General Meeting, Drill Prep
- 7-May: Comm Outage, Field Deployment w/ Packet

### Thank you Any Questions?



Packet Radio Overview



Packet Radio Overview