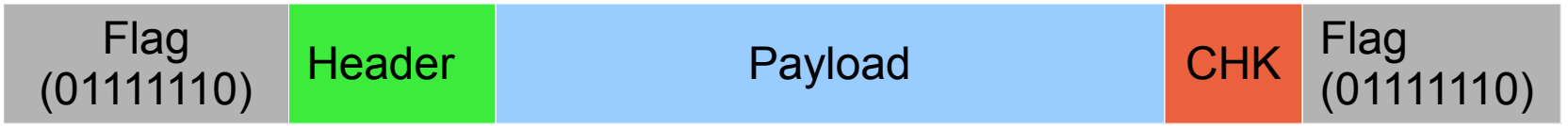
Packet Radio Overview

Presented by Matt VK2RQ

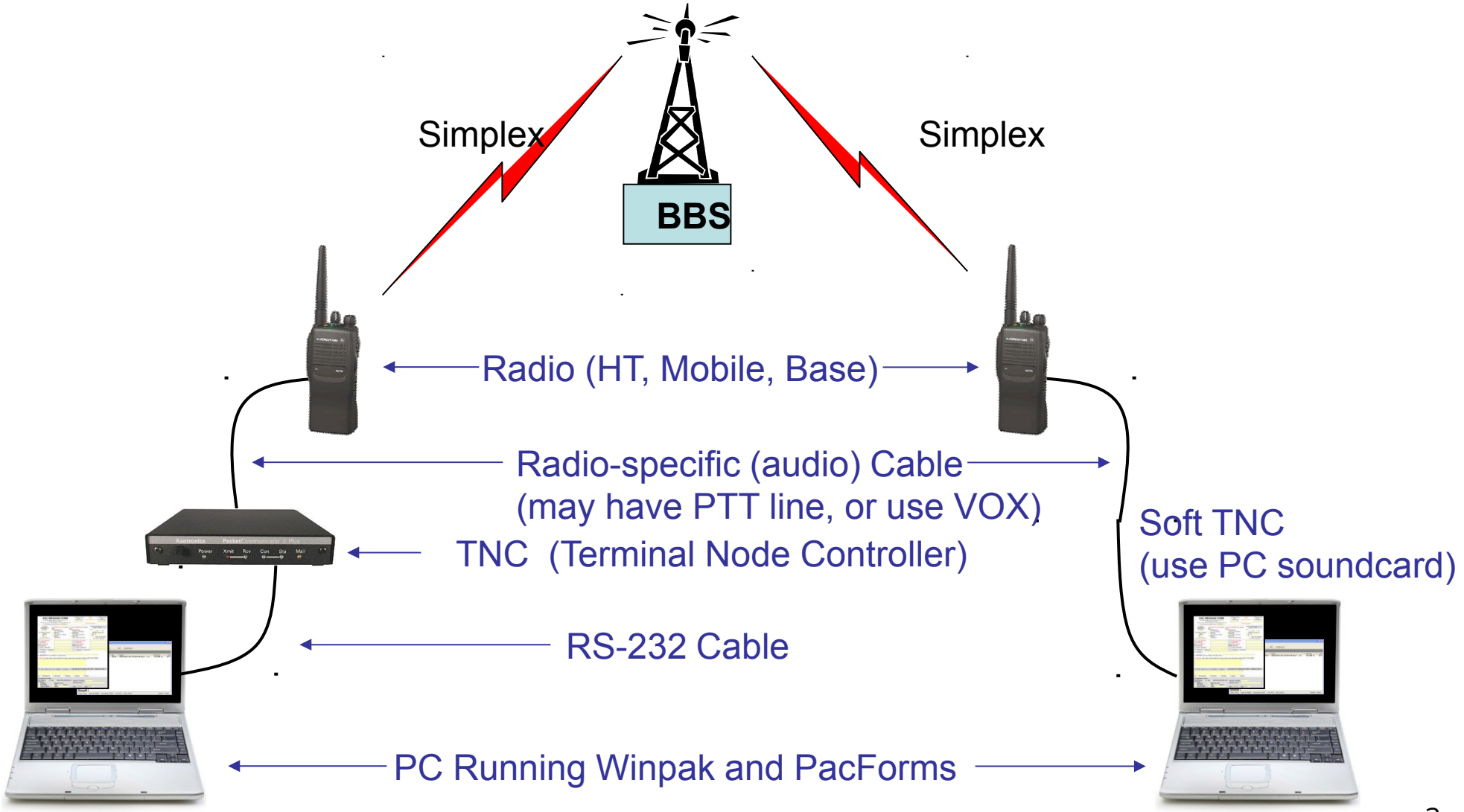
What is Packet Radio?

- One of many digital modes available in Amateur Radio
- Transmitted information is received 100% error free!
- Divide data stream into bite-sized packets
- Sends a “packet” of data (envelope + payload) at a time
- At VHF/UHF, typically operates at 1200 baud (AFSK on FM) or 9600 baud (G3RUH FSK)
- At HF, typically operates at 300 baud (FSK/AFSK on SSB)



High level structure of a packet

Typical Packet Stations



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AX25 Frames

- Can have Information (I), Unnumbered (U) and Supervisory (S) frames
- I-frames use sequence numbers to ensure packets are received in the right order and are retransmitted if needed (like TCP). A connection must first be established between the two stations.
- UI-frames allow packets of information to be sent without first establishing a connection. Correct ordering of packets and retransmission requests not supported (like UDP). APRS uses this type of frame.
- Fully described in the AX.25 Link Access Protocol standard: http://www.tapr.org/pdf/AX25.2.2.pdf

Address						Control				Proto	Info	FCS
DST CS	DST SSID	SRC CS	SRC SSID	Digi1 CS	Digi1 SSID	7 6 5	4	3 2 1	0	eg. text	payload	CRC
VK2DOT	2	VK2RQ□	0	VK2MB□	7	N(R)	P	N(S)	0	0xF0	blah blah...	0x NNNN

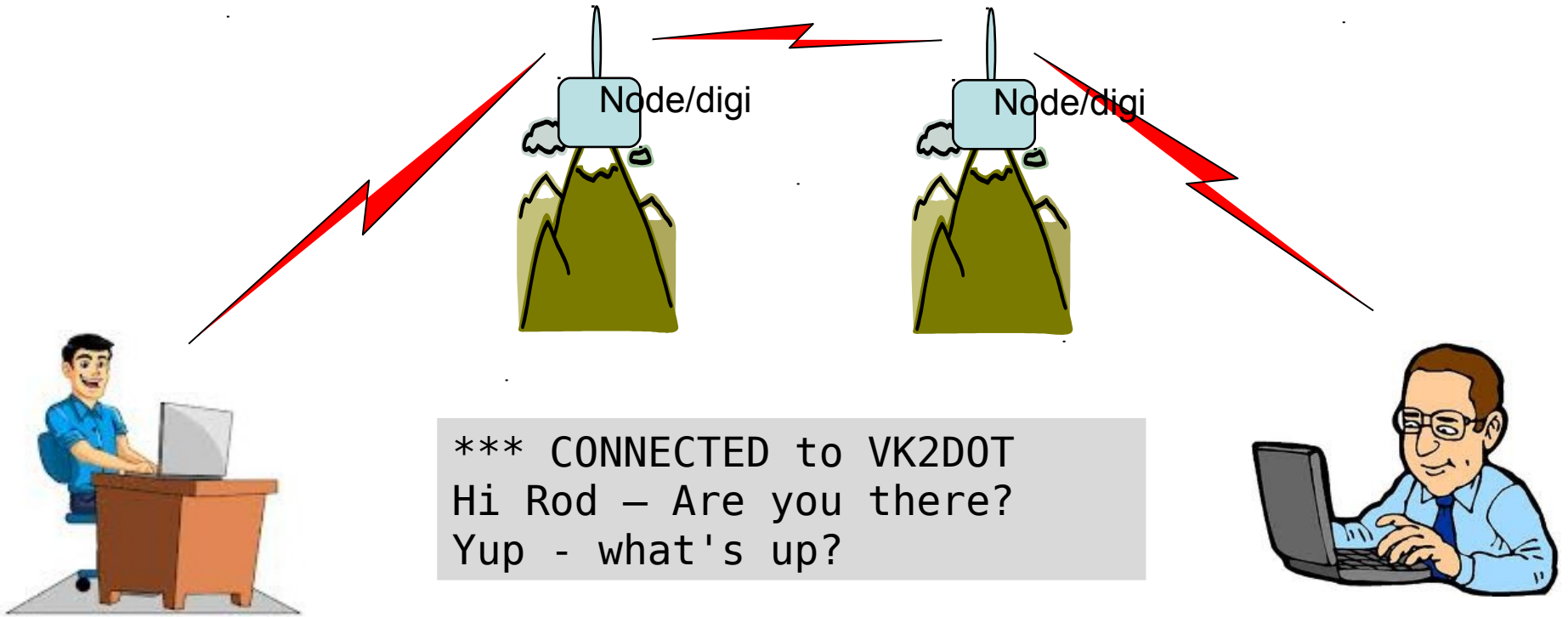
Packet Applications: Keyboard

Keyboard – to – keyboard

Similar to text messaging

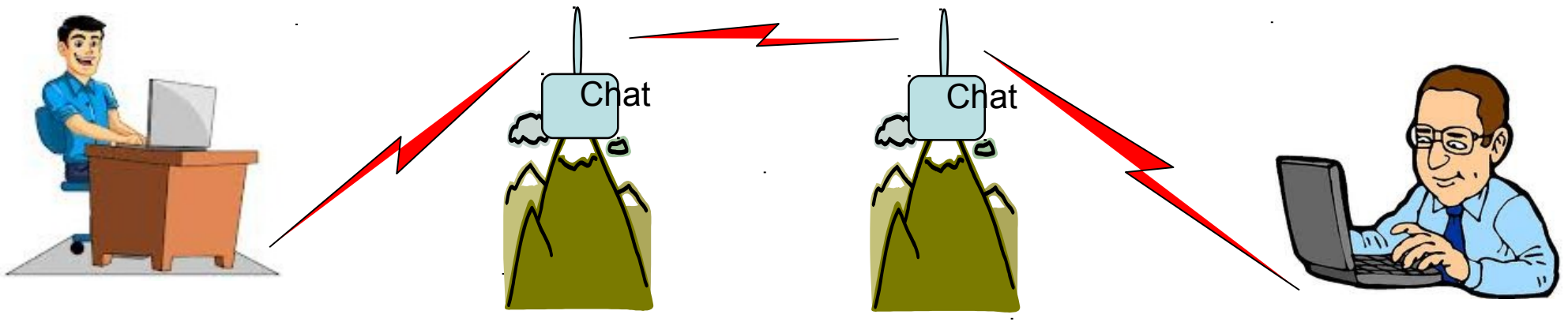
Short, interactive messaging between individuals

Can use nodes/digipeaters to extend range



Packet Applications: Chat Server

- Connect to a Chat Server
- Similar to Internet Relay Chat (IRC)
- Supports several multi-way conversations using "channels"
- Chat Server may be linked with other servers (similar to IRC)

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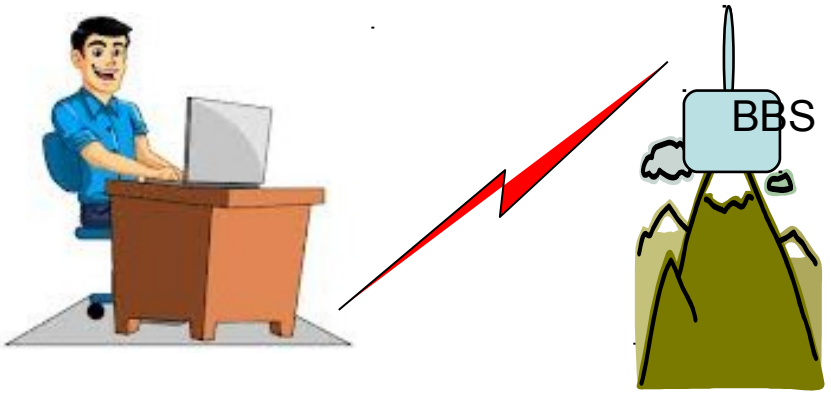
Welcome to the chat server at DOTXR.  There are 1 users
Type /HELP if you need help

[1000] 13:40 *** VK2RQ-7@DOTCHT (Matt) has joined the channel

[1000] 13:40 <VK2RQ-7@DOTCHT> (Matt): Hi Rod
```

Packet Applications: BBS

- Similar to Email and USENET

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Connected to VK2DOT-2
[FBB-7.00i-AB1FHMRX$]
VK2DOT BBS, QTH QF56Q0.
Hello Matt, you are now on channel 16.
Here are 829 active messages, 20854 is last message and
19585 is the last you have listed.

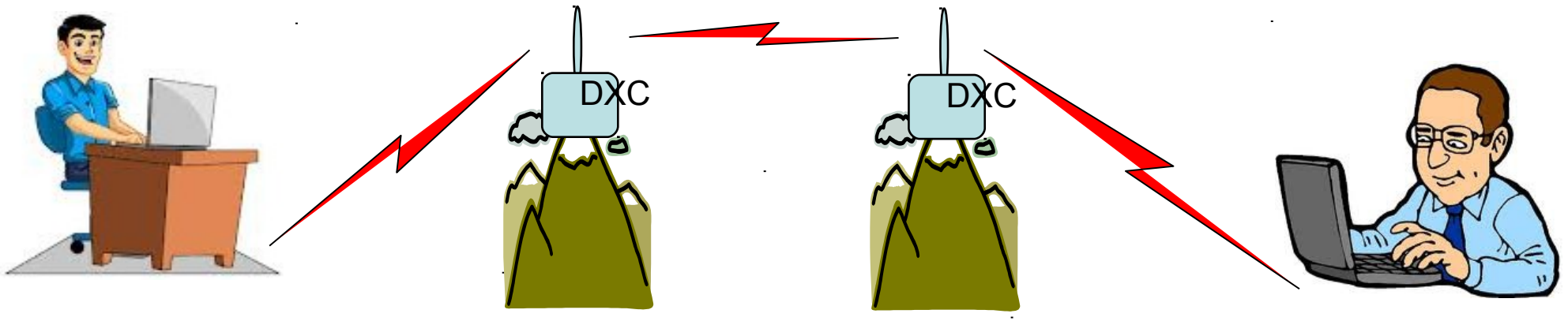
Assigned channels:
Ch. 16     (BPQ) :  VK2RQ-0  - Wed 15/01/14 13:55

Msg#   TSLD  Dim  To    @ BBS   From   Date/Time Title       (LC-choice: *)
20853  PNL     51 VK2RQ @VK2RQ  VK2ACL 0115/1355 Greetings

You have 1 new (unread) message(s).
(1) VK2DOT BBS (H for help) >
```

Packet Applications: DX Cluster

- Used to send messages/announce DX spots
- One DX Cluster Server may be linked with other servers

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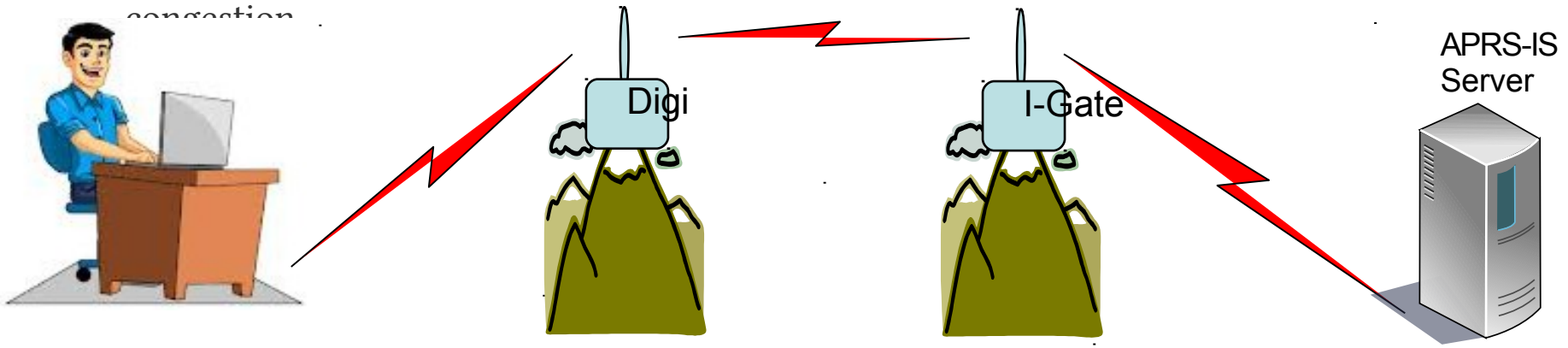
Hello Matt, this is VE9SC-2 in Moncton, New Brunswick, Canada
running DXSpider V1.55 build 0.82
.
Sysop Stephen (VE9SC) VE9SC@RAC.CA
Web Page ve9sc.no-ip.org
Lat. N46 07 17 Long W064 51 33
.
Cluster: 4 nodes, 1 local / 2 total users  Max users 2  Uptime 3 08:31
VK2RQ-7 de VE9SC-2 15-Jan-2014 0306Z dxspider >
DX de R7HL:       3510.5  RY22RZ       tnx QSO                          0309Z
DX de N4JTE:      3786.0  G0EVY        band flat but dave and group     0310Z
DX de WA4YYM:     3526.9  W1AW/0       up 2                             0313Z
```

Packet Applications: APRS

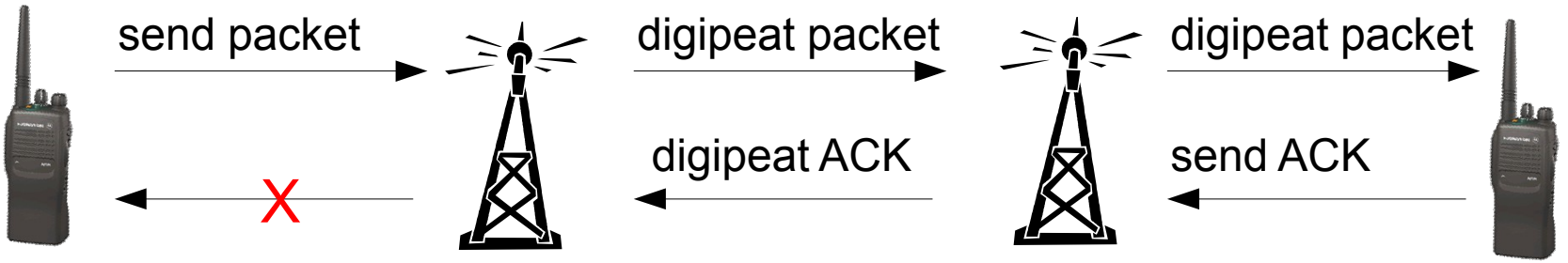
- Used to report information such as position, weather, text messages, etc.
- This information is exchanged locally via packet radio UI frames, or can be relayed onto the Internet by an I-Gate
- Destination "callsign" is normally in the form "APxxxx", where the "xxxx" indicates the model and version of TNC.
- Digipeaters extend the range, and all have the same callsign (eg. WIDE1 for fillin digis, WIDE2 for wide area digis). The SSID is used an a sort of "hop counter" to limit range and avoid congestion




```
2014-01-15 17:11:55 EST: VK2KFJ-9>S3T2R5,VK2AMW-1*,WIDE2-1,qAR,VK2MB-1
:`O(qmJq>/"5l}
2014-01-15 17:12:00 EST: VK2KFJ-9>S3T2R6,WIDE1-1,WIDE2-1,qAR,VK2BEN:`O(mn,H>/"5j}
2014-01-15 17:12:22 EST: VK2KFJ-9>S3T2R9,WIDE1*,WIDE2-1,qAR,VK2MB-1:`O(els'>/"5a}
2014-01-15 17:12:27 EST: VK2KFJ-9>S3T2R7,WIDE1-1,WIDE2-1,qAR,VK2MB-1
:`O(fm\1>/"5a}TT3 on 2m
```

Extend the range: Digipeating

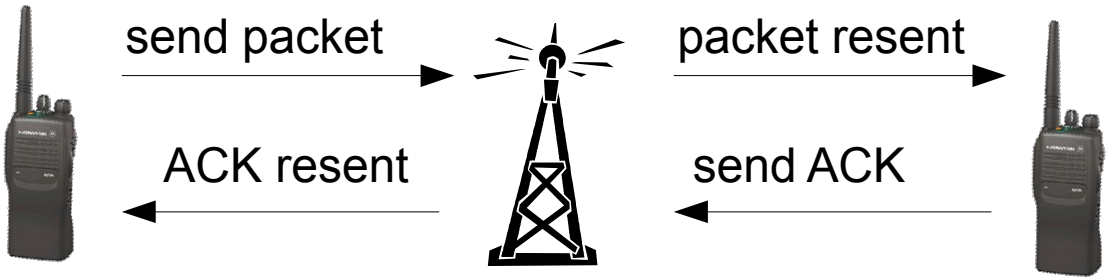
- If a packet station has digipeating enabled, you can request it to retransmit your packets.
- You can use a string of digipeaters to reach your destination, but you need to manually specify the exact callsigns of the digitpeaters in the right order.
- If a packet or the acknowledgement of the packet is clobbered on any of the hops, then the originating station needs to resend the packet. Since each hop increases the chance of a collision, it is normally not practical to string together more than 2 digipeaters.



Oh no, packet lost! Must start over from the beginning :-(

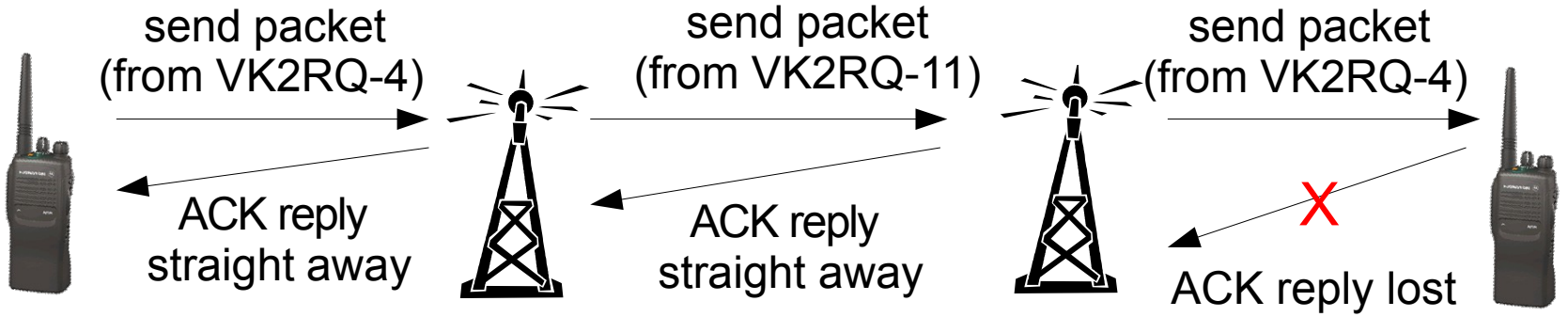
Extend range: Data regenerator

- Works like a repeater: listens on input frequency, regenerates the frame and sends it on the output frequency.
- Unlike a digipeater, repeats everything it hears, does not process or modify the AX25 headers at all.
- An example is VK2RAG at Somersby, which listens on 434.150MHz and retransmits on 439.150MHz



Extend the range: NET/ROM Node

- Unlike a digipeater, you connect to a node first, then initiate a new connection to the remote node/station.
- Nodes announce to each other which other nodes then can reach, and maintain a node routing table (similar to RIP on IP routers). This means you don't need to know the exact path needed to connect to the remote end, the network will select the best quality path.
- Packets are acknowledged on a hop-by-hop rather than end-to-end basis, so performs better than digipeating.
- Node uses originator's callsign when retransmitting packets, but uses a different SSID (new_SSID = 15 – old_SSID)

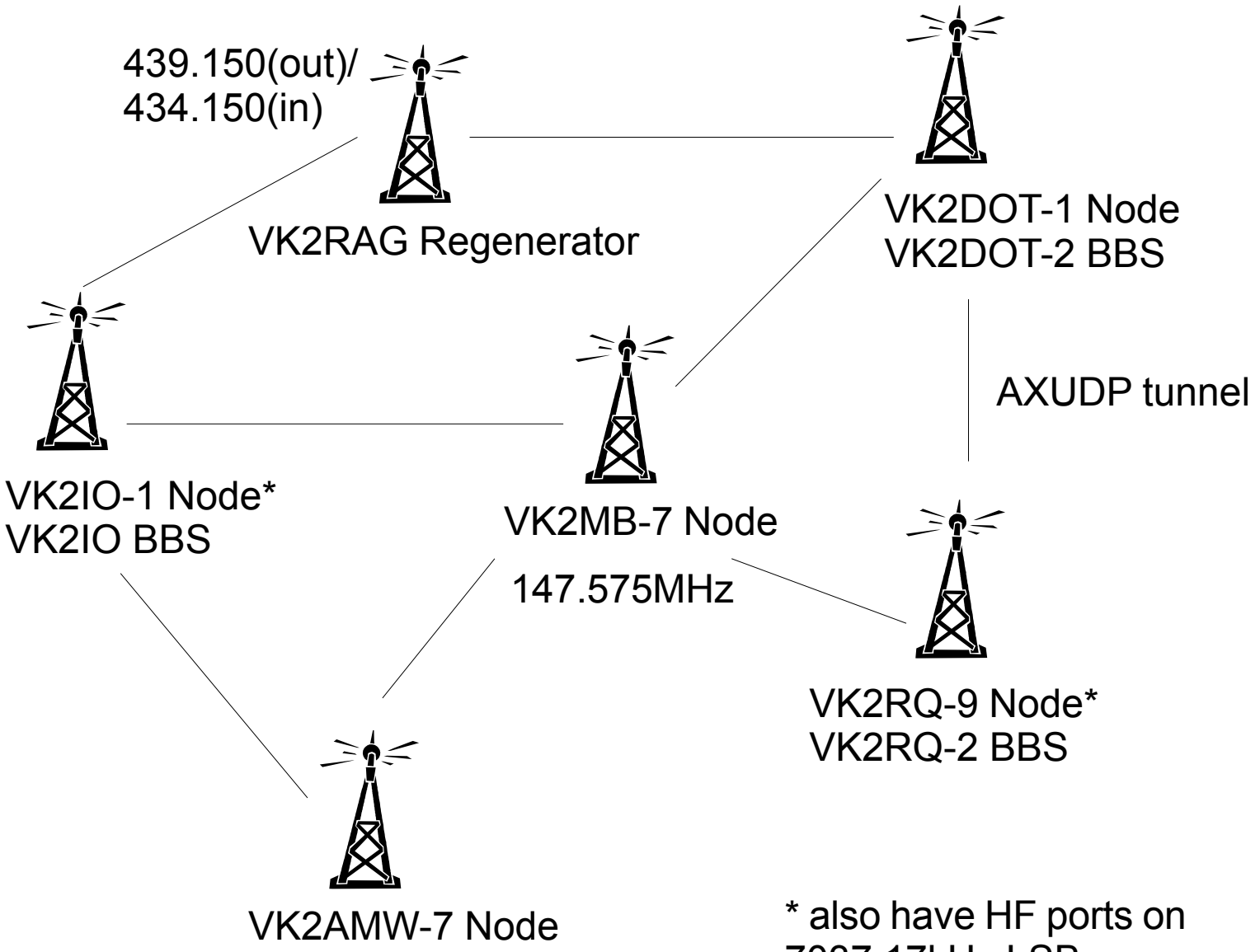


Packet lost! No worries, just resend the packet for this hop

Extend range: AX.25 over Internet

- As well as running AX.25 over an RF channel, we can bundle the AX25 frame into an internet IP packet or UDP/IP packet, and send the packet to a station on the other side of the world.
- For all intents and purposes, this AXIP or AXUDP tunnel looks exactly the same as an RF link.
- Allows us to join "islands" of packet networks together into a global packet network.

Local Packet Infrastructure



Other topics

- Encapsulate IP over AX.25 (browse the web over your packet network :-))
- Encapsulate AX.25 over IP or UDP/IP (packet networks can tunnel to each other through the internet)
- AMPRNet (44/8 network) transported by IP over AX.25 or by IPIP tunnels
- For more info, check out some of the links on my web page: http://www.vk2rq.ampr.org/packet.html