DigiRig + Direwolf + YAAC APRS Training Guide
Kansas City Northland ARES

1. APRS Software & Hardware Stack

Components Working Together
- **FT-3DR**: Radio transceiver for RF transmission/reception
- **DigiRig**: Audio interface that connects radio to computer
- **Direwolf**: Software TNC (Terminal Node Controller) for encoding/decoding packets
- **YAAC**: User interface for APRS operations

Hardware Connections
- Computer → DigiRig: USB-C cable
- DigiRig → FT-3DR: 3.5mm TRRS cable to speaker/mic port
- Note: The SERIAL port on DigiRig is not needed for basic APRS with FT-3DR

2. Setting Up the DigiRig

Physical Setup
- Connect USB-C cable from DigiRig to computer
- Connect 3.5mm TRRS cable from DigiRig to FT-3DR speaker/mic port
- Set FT-3DR to 144.390 MHz (North America APRS frequency)
- Adjust radio volume to 25-50% for optimal decoding

3. Direwolf Configuration

Basic Configuration Elements
```
ADEVICE "USB Audio Device"   # For macOS (device name varies by OS)
CHANNEL 0
MODEM 1200
MYCALL WA0TJT-10           # Replace with your callsign-SSID
PTT /dev/tty.usbserial-1110 RTS   # Serial port for PTT control
TXDELAY 30
TXTAIL 10
```

Network Interfaces
```
AGWPORT 8000    # For older software applications
KISSPORT 8001   # For YAAC and modern software
FIX_BITS 1 AX25 # Helps with error correction
```

IGate Configuration
```
IGSERVER noam.aprs2.net   # Regional APRS-IS server
IGFILTER m/50           # Filter for messages within 50km
IGLOGIN WA0TJT 24227     # Your callsign and passcode
PBEACON sendto=IG via=WIDE2-1 delay=0:30 every=60:00 symbol="/" overlay="A"
lat=39.202953 long=-094.602885
IGTXLIMIT 10 20          # Limits IGate transmissions to prevent flooding
```

APRS Path Selection Guide
- **WIDE1-1**: Local coverage only (1 hop, limited range)
- **WIDE2-1**: Wider coverage (good for portable/mobile stations)
- **WIDE1-1,WIDE2-1**: Maximum coverage (use sparingly)
- **No Path**: For IGate-only stations

APRS Symbol Selection
- **"/" with "A" overlay**: ARES symbol (person with A)
- **"/["**: Handheld radio symbol
- **"/" with "Y" overlay**: Yaesu radio
- **"igate"**: Dedicated IGate station

4. Testing Direwolf

Command Line Options
```bash
# Basic startup
direwolf -c /path/to/direwolf.conf

# Test mode (without actual radio transmission)
direwolf -t 0 -c /path/to/direwolf.conf

# Debug mode (for troubleshooting)
direwolf -d p -c /path/to/direwolf.conf
```

Sending Manual Beacons
```bash
# Using netcat to send a manual position report (in zsh shell)
echo -e '!3920.177N/09436.173W-ARES Training Class{01}' | nc localhost 8001
```

5. YAAC Configuration

Creating a KISS Interface
1. Go to "Configure" → "Interface Manager"
2. Click "Add" to create a new interface
3. Select "KISS-over-TCP" interface type
4. Configure network settings:
   - Host: localhost
   - Port: 8001
5. Configure TNC settings:
   - TNC Type: KISS
   - TNC Model: NORMAL (not ACKMODE)
6. Set station information:
   - Callsign: WA0TJT-10 (matching Direwolf)
   - Symbol: / with overlay A (for ARES)
   - Enter your coordinates

YAAC Interface Types
- **KISS-over-TCP**: For software TNCs like Direwolf
- **AGWPE**: Alternative protocol for some TNCs

- **Serial KISS**: For hardware TNCs
- **AX.25**: For Linux kernel APRS support

6. Understanding Beacon Locations

- YAAC's manual beacon uses its configured location
- Direwolf's PBEACON uses its configured location
- These are independent of each other
- For mobile operations, update YAAC's position regularly

7. Troubleshooting

Audio Device Issues
- **Linux**: Uses "plughw:1,0" format
- **macOS**: Use device name like "USB Audio Device"
- **Windows**: Uses sound card names or numbers
- Common Issue: Device names with spaces need quotes

PTT Problems
- Verify correct port name: `/dev/tty.usbserial-1110` on macOS
- Check RTS vs DTR selection in config
- Verify permissions on the serial port
- Test PTT with `direwolf -t 0`

8. APRS Best Practices

Network Etiquette
- Beacon only as often as needed
- Use appropriate paths for your station type
- Keep messages concise
- Set message expiration appropriately
- Don't flood the network

ARES-Specific Considerations
- Consider tactical callsigns where appropriate
- Balance frequency vs. information needs
- Use message templates for standardized reporting
- Understand WIDE path impacts during emergencies

9. Additional APRStt Configuration in Direwolf

The APRStt system allows operators with DTMF-capable radios to participate in APRS without needing a TNC. Key configuration elements include:

```
# Send R in Morse Code for successful receipt
TTERR  OK              MORSE  R
TTERR  D_MSG           MORSE  D ?

# Location for the corral (default location)
TTCORRAL 39.183506 -94.729280 0.02N

# Points and Macros for Northland ARES Locations
#00 W0KCN Net Control EM29qi97UI
```

```
TTPOINT B900 39.36392 -94.584721
TTMACRO 00 B900*AC{W0KCN}*AB113
```

10. Resources

- Direwolf documentation: github.com/wb2osz/direwolf/tree/master/doc
- YAAC website: ka2ddo.org/ka2ddo/YAAC.html
- DigiRig: digirig.net
- APRS.org for general APRS information
- Kansas City Northland ARES resources

Complete Direwolf Configuration Example

```
##################################################################
#                                                #
# YAAC-->DigiRig-->FT-3DR Configuration file               #
#               Kansas City Northland ARES              #
#               Last Modified: 2025/02/26               #
#                                                #
##################################################################

#############################################################
#                                           #
#            CHANNEL 0 PROPERTIES                   #
#                                           #
#############################################################
ADEVICE "USB Audio Device"
CHANNEL 0
MODEM 1200
MYCALL WA0TJT-10
PTT /dev/tty.usbserial-1110 RTS
TXDELAY 30
TXTAIL 10

# Send R in Morse Code
TTERR  OK             MORSE  R
TTERR  D_MSG          MORSE  D ?

# EM29 All Gridsquare locations are presumed to be EM29..
TTMHEAD BAxxxxxx 326129

#############################################################
#                                           #
#            VIRTUAL TNC SERVER PROPERTIES             #
#                                           #
#############################################################

AGWPORT 8000
KISSPORT 8001
FIX_BITS 1 AX25
```

```
#############################################################
#                                           #
#            INTERNET GATEWAY                       #
#                                           #
#############################################################

IGSERVER noam.aprs2.net
IGFILTER m/50
IGLOGIN WA0TJT 24227
PBEACON sendto=IG via=WIDE2-1 delay=0:30 every=60:00 symbol="/" overlay="A"
lat=39.202953 long=-094.602885
IGTXLIMIT 10 20

#############################################################
#                                           #
#            APRStt GATEWAY                         #
#                                           #
#############################################################

DTMF

# Location for the corral.
#This is in Parkville
TTCORRAL 39.183506 -94.729280 0.02N

# Advertise gateway position with beacon.
OBEACON DELAY=0:15 EVERY=30:00 VIA=WIDE1-1 OBJNAME=WA0TJT-2 SYMBOL=APRStt
LAT=39.202953 LONG=-94.602885 COMMENT="APRStt Gateway w/Direwolf"

#Points and Macros for Northland ARES Locations

#00 W0KCN Net Control EM29qi97UI
TTPOINT B900 39.36392 -94.584721
TTMACRO 00yyyyyy BAyyyyyy*AC{W0KCN}*AB113
TTMACRO 00yyyyyyz BAyyyyyy*Cz*AC{W0KCN}*AB113
TTMACRO 00 B900*AC{W0KCN}*AB113
TTMACRO 00z B900*Cz*AC{W0KCN}*AB113
TTMACRO 00yy B9yy*AC{W0KCN}*AB113
TTMACRO 00yyz B9yy*Cz*AC{W0KCN}*AB113

#13 WA0TJT Keith Kaiser EM29qe78pq
TTPOINT B913 39.20300 -94.602907
TTMACRO 13 B913*AC{WA0TJT}*AB113
TTMACRO 13yyyyyy BAyyyyyy*AC{WA0TJT}*AB113
TTMACRO 13yyyyyyz BAyyyyyy*Cz*AC{WA0TJT}*AB113
TTMACRO 13z B913*Cz*AC{WA0TJT}*AB113
TTMACRO 13yy B9yy*AC{WA0TJT}*AB113

LOGDIR DW-log-files
```