

**Michigan Interoperable Communications Conference**

**“The Homogeneous AMPRnet  
Data Network”**

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**ARRL Michigan Section ASM for Digital Technologies**

**February 19-22, 2019**

**Traverse City, MI**

# [ The Homogeneous AMPRnet Data Network ]

- We will provide insight into the capabilities of using *"Packet Radio"* combined with various automatic routing protocols, such as NetROM/BPQ and Static IP routing, in support of passing Data Packets and any of the familiar "Internet Protocol Suite (TCP/IP)", end-to-end over the Amateur airwaves.
- **HOMOGENEOUS:** similar, comparable, equivalent, like, analogous, corresponding, correspondent, parallel, matching, kindred, related, correlative, congruent, cognate

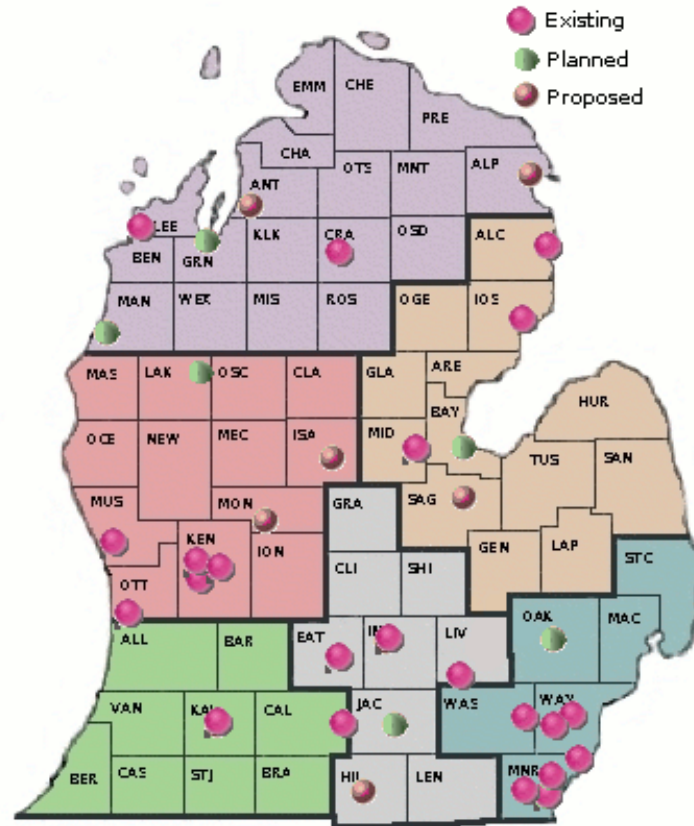
## **FOUR networking styles using TWO networking protocols**

- 1) **AMPRnet TCP/IP** – JNOS / HamGate nodes linked via a mix of Internet & RF
- 2) **BPQ** – BPQ32 nodes linked via a mix of Internet & RF  
(Access to WinLink RMS)
- 3) **Mi7 BPQ** – LinBPQ nodes linked via Mi6 backbone  
(Access to WinLink RMS)
- 4) **Mi6 “MikroTik”  $\mu$ Wave** – 2.4/5.8GHz WiFi, linked via the Mi6 backbone

# What would we use it for?

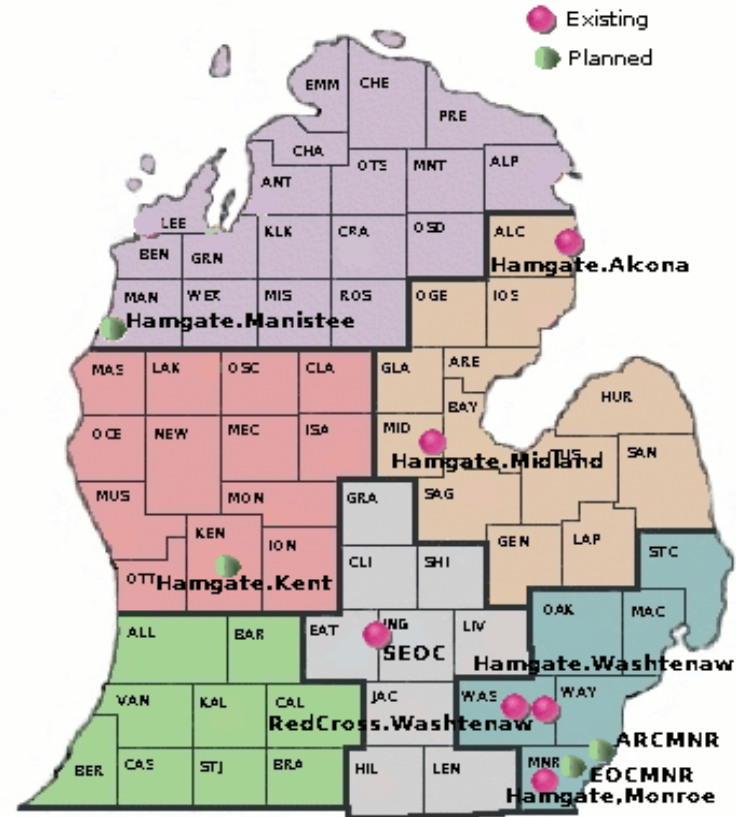
- The point is not JUST to reach the SEOC, but to reach neighboring counties, EOC's, NGO's, Red Cross, and Key stations.
- Moving ICS forms to/from other facilities, stations, or Incident Command positions.
- Move traffic from a busy EOC to a Key station who can then RELAY the traffic to the desired destination via a Radio or Data Network.
- More detailed information such as:
  - Resource lists
  - Personnel logs/info
  - Equipment/Personnel availability
  - SQL Database updates & queries
  - Status reports
  - PIO announcements
  - Weather reports/conditions
  - Images/Maps
  - Red-X Shelter Manager Daily Reports

# Michigan AMPRnet circa May 2007 (and it was still growing through 2010)



## Michigan AMPRnet (circa Dec 2018)

- The pendulum swung, but it is now swinging back
- Users can connect in via AX.25 (TNC), NetROM (BPQ), NetROM (Knet) or TCP/IP (JNOS), over the air.
- Nodes are linked via TCP/IP over AX.25, TCP/IP over NetROM (IPNR), Internet links, or by NetROM.
- Uses 44.102.x.y addresses  
44.102.0.0/16 reserved for Michigan and is linked with the Worldwide 44.0.0.0/8 network.
- Carries any of the TCP/IP Protocol "Suite".  
(Telnet, FTP, SMTP, ICMP, HTTP, Finger, SNMP, etc.)



## **BPQ Nodes:** Sorry...no pretty map

- EATON:N8HEE                      Charlotte                      Eaton County  
Mi7 routed
- OTTAWA:WA8RSA                      Zeeland                      Ottawa County  
Mi7 routed
- MIPOINT:K8VEB                      Portland                      Clinton County
- BTLBBS:KC8KPM                      Battle Creek                      Calhoun County
- ALBION:KB8OAK                      Albion                      Calhoun County
- MIRJP: N8RJP                      Brooklyn                      Jackson County

# **BPQ/NetROM Paths into Ohio and Indiana (FEMA Region-5)**

- **INDIANA Network**
  - Mitchell
  - Indianapolis
  - Marion
  - Gas City/Marion
  - Freemont
  - Goshen
  - Columbia City/Ft.Wayne
  - LaGrange/Elkhart/Angola
- **OHIO Network**
  - Cleveland
  - Fairview Park
  - ...and more...



# Mi7 BPQ Network Map



- Primary purpose is to reach CMEN operated WinLink RMS servers
- Currently 9 nodes (multiple names)
- Each offers 2-meter and 70cm user access
- Mi6 2.4 or 5.8 GHz user access w/MikroTik node within L.O.S. (~10 miles) collocated at each site
- DHCP of 44.103.x.y address
- First node (Mi7SAG) installed July '18

# Mi6 Network

- **Backbone** made up of  $\mu$ Wave, wired data circuits, LTE cellphone, fiberoptic, etc.
- Primary purpose was to connect DMR repeaters together (Mi5)
- 2.4 or 5.8 GHz user access using MikroTik node with L.O.S path (~10 miles)
- Serves up 44.103 address via DHCP
- **POP locations:** *Well, we really don't know because they haven't released a network map...*
- Mayville, Mt. Holly, Mt. Clemens, White Lake, Denton Hill, Southfield, Detroit, Plymouth, Southgate, Fenton, Baycrot, Dansville, Lansing, Hamilton, Grand Rapids, Alanson

# INTEROPERABILITY

- **“The ability to foster collaboration with open, interoperable protocols that work just fine across organizational boundaries”**
- Much like the early days of the “Internet”, passing traffic over differing network topologies and transport mechanisms seamlessly, is what we strive for.
- We have **FOUR** distinct networks with **TWO** protocols (**TCP/IP** and **NetROM**) that can get traffic anywhere in those networks.
- The goal is to avoid creating "Walled Gardens" where you have no choice but to use just one technology.
- **The AMPRnet, BPQ, Mi7-BPQ, and Mi6 networks play well together because of two common protocols.**

# Who Are the Networks Managed By?

- **JNOS AMPRnet**
- ARRL Michigan Section “Digital Radio Group” (DRG) rallies Individuals and County ARPSC groups to build out the Network and work collectively.
- [WWW.MI-DRG.ORG](http://WWW.MI-DRG.ORG)
- **Mi6 & Mi7-BPQ**
- Central Michigan Emergency Network (CMEN) has a small group of Board Members who call all the shots.
- [WWW.W8CMN.NET](http://WWW.W8CMN.NET)
- **BPQ**
- Private Individuals and County ARPSC groups who build out nodes as they see fit. This includes **Knet** nodes which speak NetROM.

# Dependability:

- **Automated Monitoring**
- **“You Cannot Manage What You Cannot Measure”**
- Important that you **KNOW** the health of the network and what is broken.
- Amateur Radio is “volunteers”, not commercial businesses with deep pockets. So things break.
- **TCP/IP:** Ping and Uptime tests every 2 hours with a “nag” email sent to the node owner (alert them to please fix it)
- Report of network status is available on DRG website
- **NetROM/BPQ:** Presume that Mi6/Mi7 does similar network health monitoring. We will work on a way to monitor the NetROM/BPQ networks.

# DOH!!!



# How Do We Use These Networks?

- We use them to move data from Point-A to Point-B.
- We move such things as NTS traffic as well as status reports, resource requests, queries, and ICS forms to/from the SEOC as well as to neighboring EOC's and NGO's.
- Text and NTS messages are easily done via plain AX.25 Packet
- ICS forms can be done in plain AX.25 or via FORMATTED data using FLMSG, OutPost and WinLink/AirMail-Express/Pac
- All support Custom forms

# User Interfaces (UI) currently being used:

*Consider what UI your operators need to work with and have them train on it.*

- **Dumb Terminal**      cmd: prompt & BPQ/JNOS “*Alphabet-Soup*” prompt
- **OutPost**              Email client w/ICS forms & dumb terminal mode
- **FLMSG**                Email client w/ICS forms
- **AirMail**                WL2K / RMS Email client (Express / Pac)

# Dumb Terminal mode using a TNC

*(Dumb Terminals programs such as: HyperTerm and MiniCom)*

## The **BPQ** and **JNOS** “*Alphabet-Soup*” command lines

cmd: connect n8hee-5

\*\*\* connected to EATON:N8HEE-5

Enter 'INFO' for connection information.

EATON:N8HEE-5} BBS RMS CHAT CONNECT BYE INFO NODES ROUTES PORTS USERS MHEARD

cmd: connect wb8tkl-3

\*\*\* connected to WB8TKL-3

Escape character is '^'.

JNOS (HamGate.Washtenaw.AMPR.org)

For login {callsign} & your name for password.

login: wb8tkl

Password:

[JNOS-2.0k.2-B1FHIM\$]

You have 11 messages - 0 new.

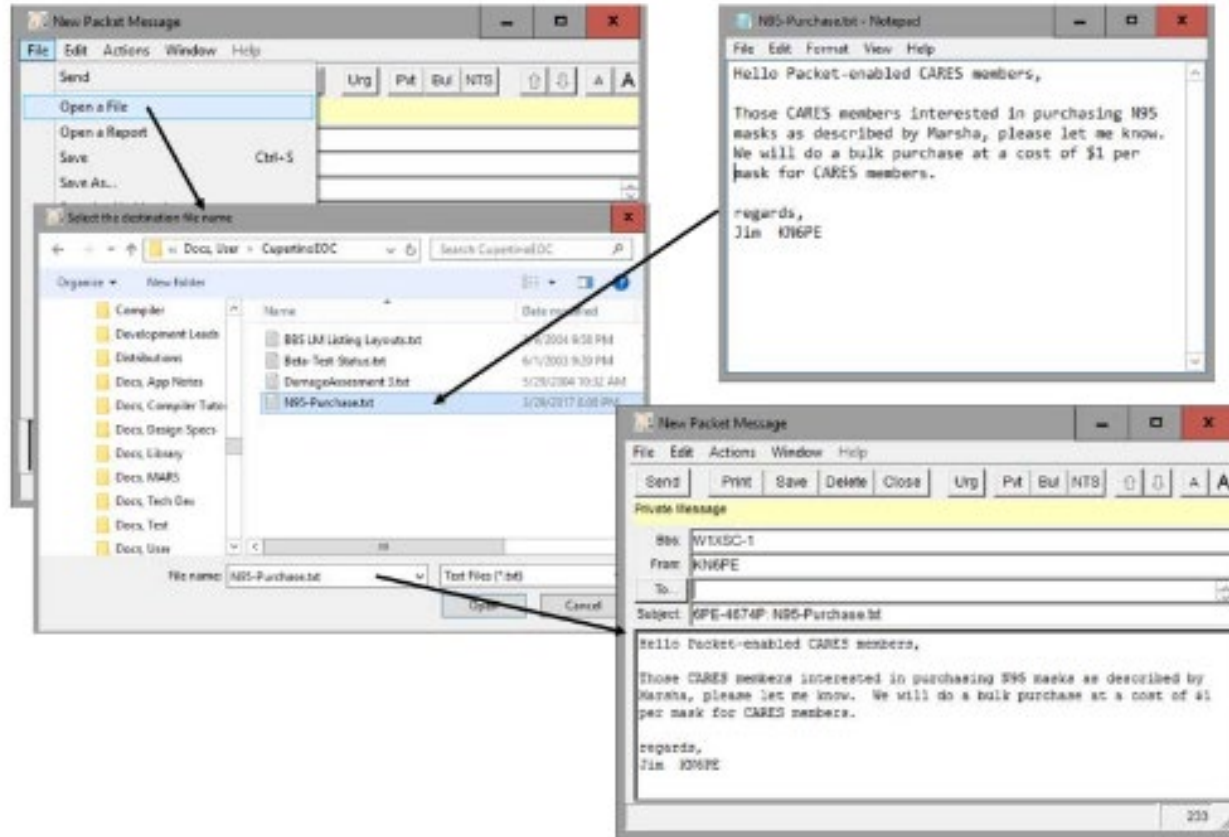
Area: wb8tkl Current msg# 1.

CHAT,SEOC,?,A,B,C,CONV,D,E,F,H,I,IH,IP,J,K,L,M,N,NR,O,P,PI,R,S,T,U,V,W,X,Z >



# OutPost Email & Terminal Client (Windows / Linux under Wine)

Handles all the handshaking in the background so you don't have to.



**FLMSG** includes ICS forms for easy entry & transmission  
Good for HF (FLDIGI) but requires Cut-n-Paste for Packet.

The screenshot shows the FLMSG 2.0.16.01 application window. The title bar reads "FLMSG: 2.0.16.01". The menu bar includes "File", "Form", "Template", "Config", "AutoSend", and "Help". The main window contains a form for creating an ICS-213 report. The form has a tabbed interface with "Originator" selected. The "file:" field contains "default.213". Below the tabs are fields for "Inc:", "To", "Pos.", "Fm", "Pos.", and "Sub.". The "Message:" field is a large text area with a cursor. To the right of the message field are "Date" and "Time" fields with calendar and clock icons. At the bottom, there are "App'd" and "Pos." fields. The status bar at the very bottom shows "Comp base64" and "BPSK125" with dropdown menus and a "\*" button.

# WinLink AirMail also supports ICS forms (Store on the RMS server for later retrieval)

**TO ORIGINATE A MESSAGE WITH AIRMAIL STEPS 4 - 9**

**4. Address from address book or manually entered. The address may be a [call sign]@winlink.org, [tactical address]@winlink.org, or a complete internet address. Multiple mixed entries separated by commas are permitted.**

**5. Enter the same kind of addresses for copies in the "Cc: " block.**

**6. Enter Subject information.**

**7. Complete the text information.**

**8. For Winink 2000 operation check that "WL2K " appears in the "Post Via: " block (when the mouse is in the text area).**

**9. When message completed click the mailbox icon to post the message for transmission. The message is not sent until a connection is made through the HF, Packet, or Telnet module by manual forced connection or timer induced connection.**

# Things that *YOU* can do:

- Educate your COML/COMT to include Packet in their Operations Plan
- Remember - You don't have to get to the SEOC on 145.76 MHz, let the Network do the work. High-Profile Digipeaters cause "Hidden Transmitter" problems for everyone.
- **Build NODES !!!**
- Kantronics KPC3+ does "Knet" NetROM by setting only two parameters

See the [WWW.MI-DRG.ORG](http://WWW.MI-DRG.ORG) website for further information on:

- "HowTo" PDF for installing JNOS on a Raspberry-Pi3 with a TNC-Pi
- Example of the AUTOEXEC.NOS configuration file.
- RCR Pidora/JNOS image for the Raspberry-Pi "B" with a TNC-Pi

# JNOS on Raspberry-Pi w/ TNC-Pi (Can just as easily run LinBPQ)



# Who should you work with?

- **District 1** DEC- Timothy Crane, WM8A      PRI- Jeff Frank, N8HEE      SEC- Fred Moses, W8FSM
- **District 2** DEC- Shanon Herron, KA8SPW      PRI- Jay Nugent, WB8TKL      SEC- Randy Love, WF5X
- **District 3** DEC- --vacant--      PRI- Jim Smith, N8AVX      SEC- Bob Winchester, W8LSS
- **District 5** DEC- Carl Flickinger, KB8FQJ      PRI- Shane Feek, KC8BRO      SEC- Dennis Furrenes, KB8OAK
- **District 6** DEC- David Robertson, N8UKH      PRI- Dave Lamer, WA8RSA      SEC- Tom Bosscher, K8TB
- **District 7** DEC- Michael Dell, K8LMJ      PRI- Rick Mark, WZ8N      SEC- --none--
- **District 8** DEC- Pete Costa, K8PDC      PRI- --none--      SEC- --none--
- **Section Traffic Manager [STM]**      Mark Shaw      K8ED
- **QMN Net**      Ron Schubot, N8CML

# With regard to the AUXCOM “SCIP”

- **Statewide Communications Interoperability Plan**
- Every COML should KNOW about the Michigan networks that are available to them, in order to make good communications planning decisions.
- Every COMT should know how to route traffic over a mix of Networks and Protocols, and how to relay messages between different VHF, HF, Voice and Data networks.
- This requires \*\*\*EFFORT\*\*\* and \*\*\*TRAINING\*\*\*
- Networking and Data Comm requires a reasonable level of SKILL. Or do we only expect our COMT's to be skilled to the level of saying: *“Would you like fries with that?”*
- The networks we build should be well documented and the information shared with all DEC's and EC's so that they can TRAIN their teams and add this information to their OPERATIONAL PLANS.
- **Deciding whether to use AX.25, TCP/IP, or NetROM/Knet/BPQ in your area is YOUR choice!**

**THANK YOU !!!**

**“A brilliant mind is useless without a fighting heart because in life’s challenges, you make an impression with what you say, but you make a name with what you do”**



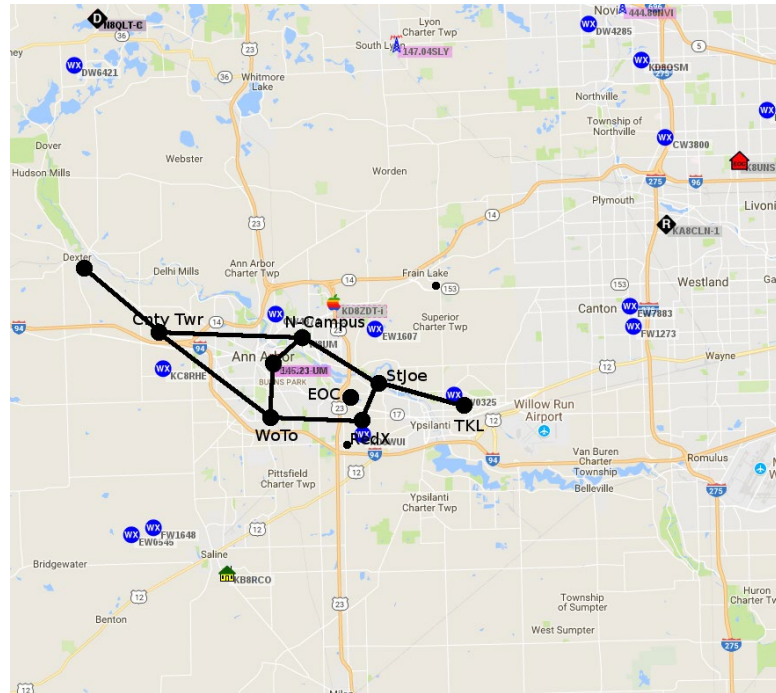


# How did we do in the October 13th S.E.T.?

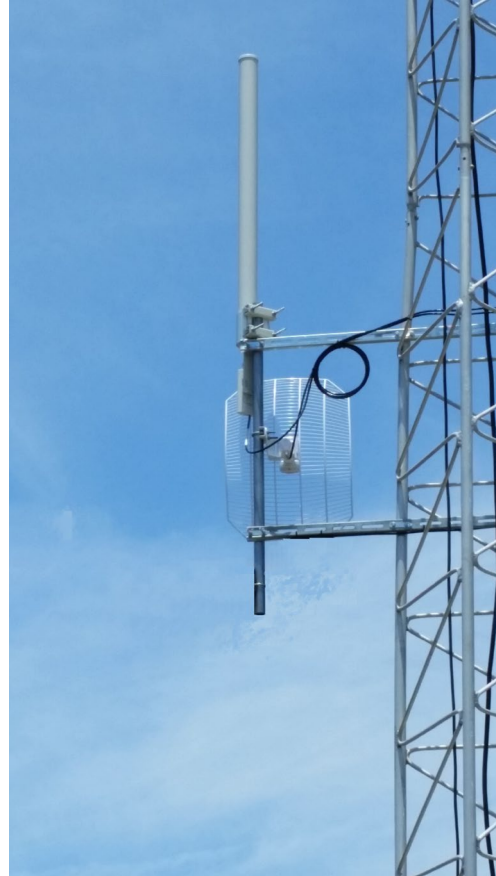
- Did we have enough nodes?
- Did we have enough TRAINED operators?
- Only THREE counties accessed the SEOC via Packet. They were MONROE (via HGWASH), INGHAM (via AX.25 on 145.76), and SAGINAW (via SAGINAW-12)
- 08:53:05 44.102.104.8:smtp - SMTP sent job 190 To: seoc From: kd8dxv @ seoc.ampr.org

# AREDN Network(s) circa December 2018

- Washtenaw County (shown)
- Monroe County awaiting grant for 4 node sites
- What others are out there, AREDN or HSMM or HAMNET?????



# Uwave Antennas



# Mi7 NetROM Node List:

(9 Mi7 nodes plus SEOC, HGALC, HGWASH, EATON, OTTAWA)

- MI7GRN:KD8RXD} CONNECT CHAT BYE  
INFO NODES RELAY ROUTES PORTS  
USERS MHEARD
- n
- MI7GRN:GRNVLE-7} Nodes
- **HGALC:N8AVX-7**                      **EATON:N8HEE-5**  
**HEEBBS:N8HEE**                      **HEECHA:N8HEE-11**  
**HEERMS:N8HEE 10**                      **HGWASH:WB8TKL 7**

# BPQ “MAP” Route Table:

## ● OTTAWA BPQ NODE MAP TABLE:

- MAP KB8OAK-7 KB8OAK.NO-IP.ORG UDP 10093 B
- MAP KA9LCF-7 69.1.147.35 UDP 10093 B ;
- MAP N9LCF-4 67.199.254.150 UDP 10093 B
- MAP W5DMH-7 DETROITPACKET.DVRDNS.ORG UDP 10093 B
- MAP AE5E-14 DXSPOTS.COM UDP 10093 B

# JNOS “ENCAP” Route Table:

- route addprivate 44.102.168/24 encap 216.245.237.54
- route addprivate 44.102.166/24 encap 216.245.237.54
- route addprivate 44.102.200/22 encap 74.85.194.5 ←----- Hamgate.Midland
- route addprivate 44.102.1/24 encap 23.115.92.204 ←----- Hamgate.Washtenaw
- route addprivate 44.102.48/24 encap 23.115.92.204 Wayne county subnet
- route addprivate 44.102.56/24 encap 23.115.92.204 Monroe county subnet
- route addprivate 44.102.238/24 encap 75.128.180.129 ←----- Hamgate.Alcona
- route addprivate 44.102.132/24 encap 97.84.3.42
- route addprivate 44.102.134/24 encap 68.66.199.196
- route addprivate 44.102.1.112/30 encap 68.40.58.30
- route addprivate 44.102.204.32/28 encap 172.56.11.246
- route addprivate 44.102.175/27 encap 47.26.247.18
- route addprivate 44.102.49.128/29 encap 68.36.144.45
- route addprivate 44.102.129/24 encap 74.204.50.102
- route addprivate 44.102.172/22 encap 107.77.192.80
- route addprivate 44.102.128/24 encap 74.204.50.102
- route addprivate 44.103/19 encap 198.105.224.44 ←----- Mi6WAN