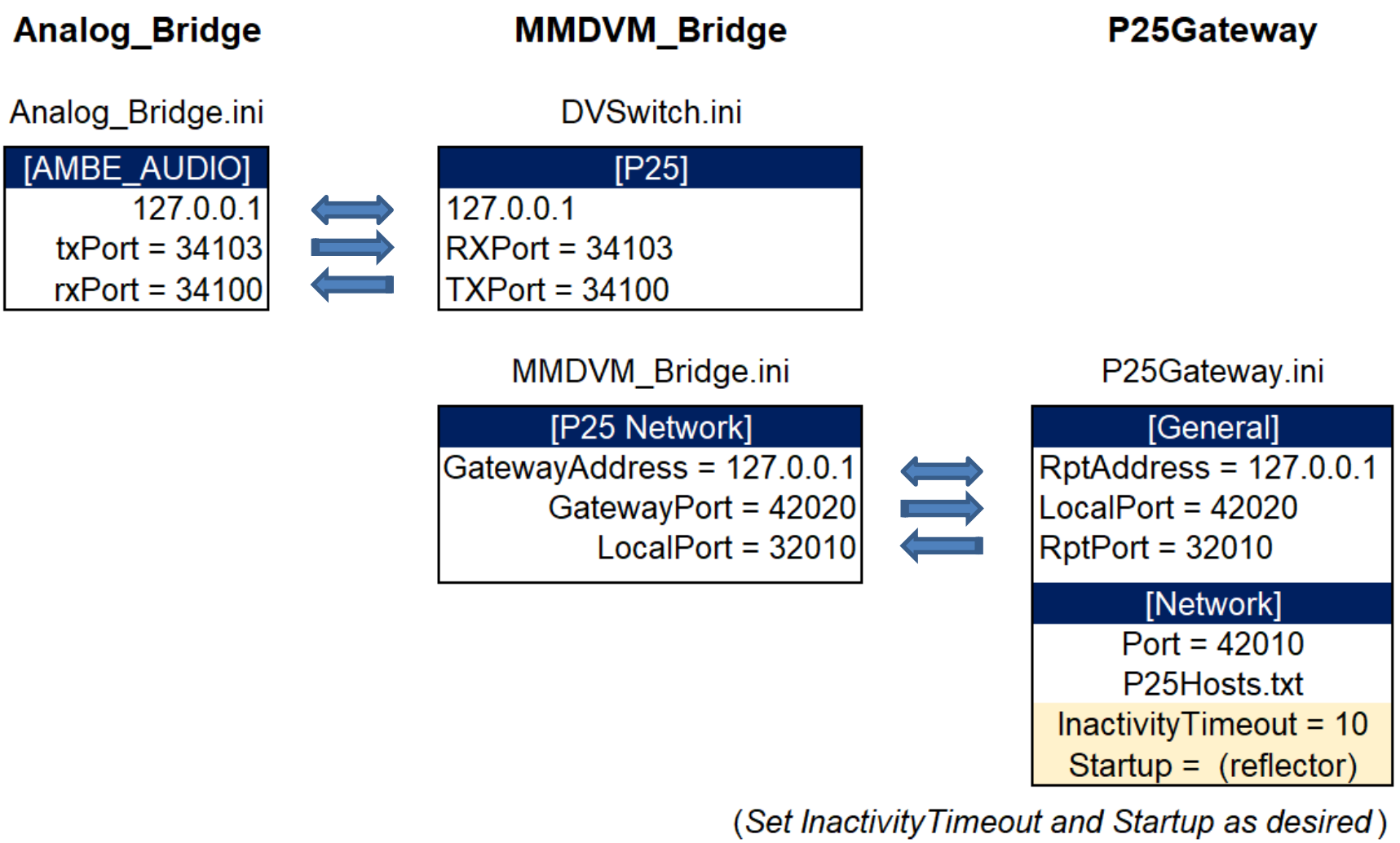
P25 - Analog_Bridge
and
P25 Reflector

DETAILS

P25 ANALOG BRIDGE and REFLECTOR

P25 – ANALOG BRIDGE FLOW CHART



(*Set InactivityTimeout and Startup as desired*)

Analog_Bridge.ini changes

INITIAL FILE

E:\Documents\ham radio\asterisk\K5TRA P25 reflector\opt\Analog_Bridge\Analog_Bridge.ini.init

```
useEmulator = false                 ; Use the MD380 AMBE emulator for AMBE72 (DMR/YSFN
emulatorAddress = 127.0.0.1:2470    ; IP address and port of the md380 server

; Information for xx_Bridge (Where xx is MMDVM, Quantar, HB, IPSC)
[AMBE_AUDIO]
address = 127.0.0.1                 ; IP address of xx_Bridge
txPort = 31103                      ; Transmit TLV frames to partner on this port
rxPort = 31100                      ; Listen for TLV frames from partner on this port
ambeMode = DMR                      ; DMR, DMR_IPSC, DSTAR, NXDN, P25, YSFN, YSFW (enc
minTxTimeMS = 2500                  ; Minimum time in MS for hang delay (0-10000)

; The metadata below is used when ASL is the source since it does not have any concept of
gatewayDmrId = 0                    ; ID to use when transmitting from Analog_Bridge
repeaterID = 0                      ; ID of source repeater
txTg = 9                            ; TG to use for all frames sent from Analog_Bridge
txTs = 2                            ; Slot to use for frames sent from Analog_Bridge -
colorCode = 1                       ; Color Code to assign DMR frames

; Information for USRP channel driver.  This interface uses PCM to transfer audio informat
; There are two typical configurations, ASL and Transcode.  ASL (AllstarLink) is for analo
; to a digital network.  Transcode is when Analog_Bridge actually points its PCM interface
; causing a TLV <-- (pcm <--> pcm) --> TLV type of architecture.
;   When using ASL, this matches the rpt.conf ASL file with a setting like:
;   rxchannel = usrp/127.0.0.1:34001:32001
;   When Transcoding, make two ini files and set txPort equal to the other instance rxPort
;   each instance with its own ini file.
[USRP]
address = 127.0.0.1                 ; IP address of USRP partner (Allstar/Asterisk or
txPort = 32001                      ; Transmit USRP frames on this port
rxPort = 34001                      ; Listen for USRP frames on this port
usrpAudio = AUDIO_UNITY             ; Digital -> Analog (AUDIO_UNITY, AUDIO_USE_GAIN,
usrpGain = 1.10                     ; Gain factor when usrpAudio = AUDIO_USE_GAIN (0.0
usrpAgc = -20,10,100                ; Set the agc threshold (db), slope (db) and decay
tlvAudio = AUDIO_UNITY              ; Analog -> Digital (AUDIO_UNITY, AUDIO_USE_GAIN,
tlvGain = 0.35                      ; Gain factor when tlvAudio = AUDIO_USE_GAIN (0.0

[MACROS]

; Where the macros are
; xxxx=yyyy
; xxxx is the dial string to match
```

FINAL FILE

E:\Documents\ham radio\asterisk\K5TRA P25 reflector\opt\Analog_Bridge\Analog_Bridge.ini

```
useEmulator = false                 ; Use the MD380 AMBE emulator for AMBE72 (DMR/YSFN
emulatorAddress = 127.0.0.1:2470    ; IP address and port of the md380 server

; Information for xx_Bridge (Where xx is MMDVM, Quantar, HB, IPSC)
[AMBE_AUDIO]
address = 127.0.0.1                 ; IP address of xx_Bridge
txPort = 34103
rxPort = 34100
ambeMode = P25                      ; DMR, DMR_IPSC, DSTAR, NXDN, P25, YSFN, YSFW (enc
minTxTimeMS = 2500                  ; Minimum time in MS for hang delay (0-10000)

; The metadata below is used when ASL is the source since it does not have any concept of
gatewayDmrId = 3148777              ; ID to use when transmitting from Analog_Bridge
repeaterID = 314877703              ; ID of source repeater
txTg = 10888                        ; TG to use for all frames sent from Analog_Bridge
txTs = 2                            ; Slot to use for frames sent from Analog_Bridge -
colorCode = 1                       ; Color Code to assign DMR frames

; Information for USRP channel driver.  This interface uses PCM to transfer audio informat
; There are two typical configurations, ASL and Transcode.  ASL (AllstarLink) is for analo
; to a digital network.  Transcode is when Analog_Bridge actually points its PCM interface
; causing a TLV <-- (pcm <--> pcm) --> TLV type of architecture.
;   When using ASL, this matches the rpt.conf ASL file with a setting like:
;   rxchannel = usrp/127.0.0.1:34001:32001
;   When Transcoding, make two ini files and set txPort equal to the other instance rxPort
;   each instance with its own ini file.
[USRP]
address = 127.0.0.1                 ; IP address of USRP partner (Allstar/Asterisk or
txPort = 32001                      ; Transmit USRP frames on this port
rxPort = 34001                      ; Listen for USRP frames on this port
usrpAudio = AUDIO_USE_GAIN          ; Digital -> Analog (AUDIO_UNITY, AUDIO_USE_GAIN,
usrpGain = 3.00                     ; Gain factor when usrpAudio = AUDIO_USE_GAIN (0.0
usrpAgc = -20,10,100                ; Set the agc threshold (db), slope (db) and decay
tlvAudio = AUDIO_USE_GAIN           ; Analog -> Digital (AUDIO_UNITY, AUDIO_USE_GAIN,
tlvGain = 0.30                      ; Gain factor when tlvAudio = AUDIO_USE_GAIN (0.0

[MACROS]

; Where the macros are
; xxxx=yyyy
; xxxx is the dial string to match
```

DVSwitch.ini

```
; Configure the P25 Partner
; Audio format is IMBE 88 bit
[P25]
Address = 127.0.0.1             ; Address to send AMBE TLV frames to (export)
TXPort = 34100                  ; Port to send AMBE TLV frames to (export)
RXPort = 34103                  ; Port to listen on (import)
Slot = 2                        ; Export slot
```

NO CHANGES NEEDED IN DVSwitch.ini

MMDVM_Bridge.ini changes

INITIAL FILE

E:\Documents\ham radio\asterisk\K5TRA P25 reflector\opt\MMDVM_Bridge\MMDVM_Bridge.ini.init

```
[P25]
Enable=0
NAC=293

[NXDN]
Enable=0
RAN=1
Id=12345

[D-Star Network]
Enable=0
GatewayAddress=127.0.0.1
GatewayPort=20010
LocalPort=20011
Debug=0

[DMR Network]
Enable=0
Address=hblink.dvswitch.org
Port=62031
Jitter=360
Local=62032
Password=passw0rd
# for DMR+ see https://github.com/DVSwitch/MMDVM_Bridge/blob/master/DOC/DMRplus_startup_o
# for XLX the syntax is: Options=XLX:4009
# Options=
Slot1=0
Slot2=1
Debug=0

[System Fusion Network]
Enable=0
LocalAddress=0
LocalPort=3200
GatewayAddress=ysfreflector.dvswitch.org
GatewayPort=42166
Debug=0

[P25 Network]
Enable=0
```

FINAL FILE

E:\Documents\ham radio\asterisk\K5TRA P25 reflector\opt\MMDVM_Bridge\MMDVM_Bridge.ini

```
[P25]
Enable=1
NAC=293

[NXDN]
Enable=0
RAN=1
Id=12345

[D-Star Network]
Enable=0
GatewayAddress=127.0.0.1
GatewayPort=20010
LocalPort=20011
Debug=0

[DMR Network]
Enable=0
Address=hblink.dvswitch.org
Port=62031
Jitter=360
Local=62032
Password=passw0rd
# for DMR+ see https://github.com/DVSwitch/MMDVM_Bridge/blob/master/DOC/DMRplus_startup_
# for XLX the syntax is: Options=XLX:4009
# Options=
Slot1=0
Slot2=1
Debug=0

[System Fusion Network]
Enable=0
LocalAddress=0
LocalPort=3200
GatewayAddress=ysfreflector.dvswitch.org
GatewayPort=42166
Debug=0

[P25 Network]
Enable=1
```

MMDVM_Bridge.ini station specific changes

```
[General]
Callsign=N0CALL
Id=1234567
Timeout=180
Duplex=0

[Info]
RXFrequency=222340000
TXFrequency=224940000
Power=1
Latitude=41.7333
Longitude=-50.3999
Height=0
Location=Iceberg, North Atlantic
Description=MMDVM_Bridge
URL=https://groups.io/g/DVSwitch

```

Highlighted items need your station specific data

P25Gateway.ini changes

INITIAL FILE

E:\Documents\ham radio\asterisk\K5TRA P25 reflector\opt\P25Gateway\P25Gateway.ini.init

```
[General]
Callsign=N0CALL
RptAddress=127.0.0.1
RptPort=32010
LocalPort=42020

Daemon=0

[Id Lookup]
Name=/var/lib/mmdvm/DMRIds.dat
Time=24

[Voice]
Enabled=1
Language=en_US
Directory=./Audio

[Log]
FilePath=/var/log/mmdvm
FileRoot=P25Gateway

[Network]
Port=42010
HostsFile1=/var/lib/mmdvm/P25Hosts.txt
HostsFile2=/var/lib/mmdvm/private_P25Hosts.txt
ReloadTime=60
ParrotAddress=127.0.0.1
ParrotPort=42011
# Startup=10200
InactivityTimeout=10

Debug=0

[Remote Commands]
Enable=1
Port=6074
```

FINAL FILE

E:\Documents\ham radio\asterisk\K5TRA P25 reflector\opt\P25Gateway\P25Gateway.ini

```
[General]
Callsign=K5TRA
RptAddress=127.0.0.1
RptPort=32010
LocalPort=42020
Announcements=1
Daemon=0

[Id Lookup]
Name=/var/lib/mmdvm/DMRIds.dat
Time=24

[Voice]
Enabled=1
Language=en_US
Directory=./Audio

[Log]
FilePath=/var/log/mmdvm
FileRoot=P25Gateway

[Network]
Port=42010
HostsFile1=/var/lib/mmdvm/P25Hosts.txt
HostsFile2=/var/lib/mmdvm/private_P25Hosts.txt
ReloadTime=60
ParrotAddress=127.0.0.1
ParrotPort=42011
Startup=10888
InactivityTimeout=0
# InactivityTimeout=10
Debug=0

[Remote Commands]
Enable=1
Port=6074
```

P25Reflector.ini changes

INITIAL FILE

E:\Documents\ham radio\asterisk\K5TRA P25 reflector\opt\P25Reflector\P25Reflector.ini.init

```
[General]
Daemon=1

[Id Lookup]
Name=DMRIds.dat
Time=24

[Log]
# Logging levels, 0=No logging
DisplayLevel=1
FileLevel=1
FilePath=.
FileRoot=P25Reflector

[Network]
Port=41000
Debug=0
```

FINAL FILE

E:\Documents\ham radio\asterisk\K5TRA P25 reflector\opt\P25Reflector\P25Reflector.ini

```
[General]
Daemon=0

[Id Lookup]
Name=/var/lib/mmdvm/DMRIds.dat
Time=24

[Log]
# Logging levels, 0=No logging, 1=Debug, 2=Message, 3=Info, 4=Warning, 5=Error, 6=Fatal
DisplayLevel=1
FileLevel=2
FilePath=/var/log/mmdvm
FileRoot=P25Reflector

[Network]
Port=41000
Debug=0
```

Installation

Start with a working ASL image and Debian 9 (Stretch) on microSD and perform the installation as root.

```
apt-mark hold raspberrypi-kernel-headers raspberrypi-kernel
apt-get update
apt-get upgrade -y
reboot
```

← This is important

File changes are needed in ASL for communication with Analog_Bridge :

1. Replace rxchannel driver with USRP:

   ```
   rxchannel = USRP/127.0.0.1:34001:32001  ; GNU Radio interface
   ```

2. Enable that channel driver to be loaded on modules.conf :

   ```
   load => chan_usrp.so
   ```

Restart asterisk: `astres.sh`

Verify that asterisk is running : `systemctl status asterisk.service`

Next install dvswitch repository

Installation

install dvswitch repository :

cd /tmp

wget http://dvswitch.org/install-dvswitch-repo

chmod +x install-dvswitch-repo

./install-dvswitch-repo

apt-get update

apt-get install quantar (gives you P25Gateway and the option for Quantar_Bridge interface)

apt-get install analog-bridge

apt-get install p25reflector

systemctl disable quantar_bridge.service (if you don't plan to use Quantar_Bridge)

Two metapackages are named dvswitch and quantar.

dvswitch contains:
dvswitch_base, Analog_Bridge, md380-emu and MMDVM_Bridge

quantar contains:
dvswitch_base, MMDVM_Bridge, Quantar_Bridge P25Gateway, P25Parrot

If you have any dahdi kernel related error in install, look in /usr/src. You should see both ASLarc_1.01 and asl-dahdi-linux-2.11.1, or similar. In your asl-dahdi-linux directory, is you see Makefile, then type make at CLI. If compile completes without errors, type make install.

Installation

The *.ini files must now be edited with your station information and proper ports.

The /opt directory contains subdirectories for each module. The initialization files can be found there:

Analog_Bridge	-	/opt/Analog_Bridge/Analog_Bridge.ini
MMDVM_Bridge	-	/opt/MMDVM_Bridge/DVSwitch.ini
	-	/opt/MMDVM_Bridge/MMDVM_Bridge.ini
P25Gateway	-	/opt/P25Gateway/P25Gateway.ini
P25Reflector	-	/opt/P25Reflector/P25Reflector.ini

Edit these files as follows:

1. Analog_Bridge.ini
   - Change txPort from 31103 to 34103 in [AMBE_AUDIO]
   - Change rxPort from 31100 to 34100 in [AMBE_AUDIO]
   - Do Not change txPort and rxPort from 32001 to 34001 in [USRP]
   - Change ambeMode from DMR to P25
   - Change gatewayDmrId to your ID (used as proxy from ASL)
   - Change repeaterID to your repeater's source ID
   - Change txTg to your desired reflector connection

Installation

2. DVSwitch.iniChange txPort from 31103 to 34103

   NO CHANGES NEEDED !

3. MMDVM_Bridge.ini

   Change [P25] Enable from = 0 to = 1

   Change [P25 Network] Enable from = 0 to = 1

   Add your Callsign and ID to [General]

   Add your RXFrequency, TXFrequency, Latitude, Longitude, Location and URL to [Info]

4. P25Gateway.ini

   Add your Callsign in [General]

   Set Daemon = 0

   Set [Id Lookup] to /var/lib/mmdvm/DMRIds.dat

   Set [Log] FilePath to /var/log/mmdvm

   Set Startup = to your desired reflector number

Installation

5. P25Reflector.ini

   Change Daemon = 1 to Daemon = 0

   Change [Id Lookup] to /var/lib/mmdvm/DMRIds.dat

   Change [Log] FilePath to /var/log/mmdvm

   Set FileLevel =2

Enable systemd services:

```
systemctl enable analog_bridge.service
systemctl enable mmdvm_bridge.service
systemctl enable p25gateway.service
systemctl enable p25reflector.service
```

Installation

Start systemd services:

systemctl start analog_bridge.service

systemctl start mmdvm_bridge.service

systemctl start p25gateway.service

systemctl start p25reflector.service

Audio levels can be set in Analog_Bridge.ini

A useful tool to change settings is /opt/MMDVM_Bridge/dvswitch.sh . Run it with no parameters to see the menu of options.

That's it. It should be running. If you run into difficulty, the next section will discuss some diagnostic tips.

Diagnostics

You can view the status of the systemd services:

systemctl status asterisk.service

systemctl status analog_bridge.service

systemctl status mmdvm_bridge.service

systemctl status p25gateway.service

systemctl status p25reflector.service

Log files can be found in /var/log/dvswitch and /var/log/mmdvm .

You should be able to see ASL PTT events in the logs. Start with ASL-AB interface and move outward.

If something's not working, it is sometimes useful to :

1) stop a service: systemctl stop (name).service,
2) delete it's log,
3) systemctl start (name).service,
4) view startup log for that service.

Diagnostics

An alternative to log viewing is to start the process in the foreground. This will give you the output to the console (and the log). If the program supports different log levels for file and console, you will get more output to the console.

Example: MMDVM_Bridge.ini

```
[Log]
# Logging levels, 0=No logging, 1=Debug, 2=Message, 3=Info, 4=Warning, 5=Error, 6=Fatal
DisplayLevel=1
FileLevel=2
```

1) stop a service: systemctl stop (name).service,
2) delete it's log,
3) cd /opt/MMDVM_Bridge,
4) ./MMDVM_Bridge MMDVM_Bridge.ini

Netstat can show open UDP ports and associated processes: netstat -unap

Netstat shows ports in use

```
root@P25reflector:~ # netstat -unap
Active Internet connections (servers and established)
Proto Recv-Q Send-Q Local Address           Foreign Address         State       PID/Program name
udp        0      0 0.0.0.0:42178           0.0.0.0:*                           304/avahi-daemon: r
udp        0      0 0.0.0.0:34001           0.0.0.0:*                           957/Analog_Bridge
udp        0      0 0.0.0.0:5353            0.0.0.0:*                           304/avahi-daemon: r
udp        0      0 127.0.0.1:32001         0.0.0.0:*                           536/asterisk
udp        0      0 0.0.0.0:32010           0.0.0.0:*                           953/MMDVM_Bridge
udp        0      0 0.0.0.0:34100           0.0.0.0:*                           957/Analog_Bridge
udp        0      0 0.0.0.0:34103           0.0.0.0:*                           953/MMDVM_Bridge
udp        0      0 0.0.0.0:2470            0.0.0.0:*                           940/md380-emu
udp        0      0 0.0.0.0:42010           0.0.0.0:*                           15667/P25Gateway
udp        0      0 0.0.0.0:42011           0.0.0.0:*                           942/P25Parrot
udp        0      0 0.0.0.0:42020           0.0.0.0:*                           15667/P25Gateway
udp        0      0 0.0.0.0:41000           0.0.0.0:*                           944/P25Reflector
udp        0      0 0.0.0.0:68              0.0.0.0:*                           533/dhcpcd
udp        0      0 0.0.0.0:4180            0.0.0.0:*                           536/asterisk
udp        0      0 192.168.0.188:123       0.0.0.0:*                           576/ntpd
udp        0      0 127.0.0.1:123           0.0.0.0:*                           576/ntpd
udp        0      0 0.0.0.0:123             0.0.0.0:*                           576/ntpd
udp6       0      0 :::5353                 :::*                                304/avahi-daemon: r
udp6       0      0 :::46998                :::*                                304/avahi-daemon: r
udp6       0      0 :::546                  :::*                                533/dhcpcd
udp6       0      0 fe80::7308:a591:287:123 :::*                                576/ntpd
udp6       0      0 2605:a601:ab19:5300:123 :::*                                576/ntpd
udp6       0      0 ::1:123                 :::*                                576/ntpd
udp6       0      0 :::123                  :::*                                576/ntpd
```