

Building Digital Message Hubs with BPQ

The European Target Station

by
Peter M. Dintelmann

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0. Abstract

This paper details the section "Rewrites done right" of the author's recent paper "Some Remarks on the Design of the Digital Parts of an International Traffic System for Radio Amateurs".

We show how complex target gateway stations may be designed and implemented with the BPQ32 software by the example of the European target station DB0NTS.

We do not only consider the DTN related messaging parts of this station but demonstrate also how other services like a Winlink RMS, a packet radio gateway etc. seamlessly integrate with the proposed concept.

1. Introduction

One of the main tasks of target gateway stations in an international context is to translate message addresses between the international format and local versions by means of the INTRCPT file mechanism for type T messages.

The case of DB0NTS is particularly complex because this station also performs address translations logically belonging to its counterpart KW1U in order to relieve the latter station from this task. A concept that works for the rather elaborated setup of DB0NTS will most probably fit for other cases as well.

Regarding the translation of message addresses only the AT part of a message address can be changed based on (wildcarded) matches on either the TO or AT address parts. However, the TO parts are not necessarily unique in an international setting in particular not when zip codes are involved and examples for this have been given in the above mentioned paper.

Regarding the usage of zip codes and callsigns for addressing purposes we have to keep in mind that:

zip codes are unique per country

Each country has its own zip code system and zip codes are unique per country only. A zip code may be issued in several countries.

callsign and zip code matches conflict

Some countries use letters and numbers within their zip code system so that zip codes and callsigns cannot be (easily) distinguished in INTRCPT file matches.

callsigns are unique

Although callsigns are issued by national authorities the ITU callsign system ensures that each callsign is only assigned once.

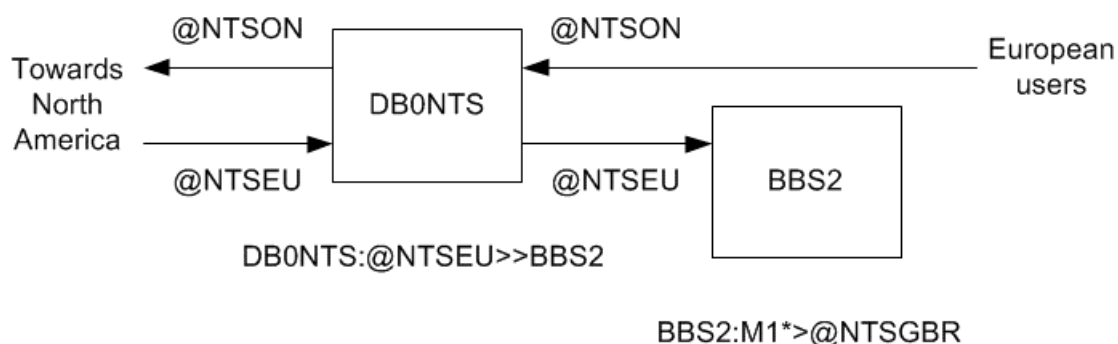
Today callsigns are used in the TO parts of message addresses for Europe and the AT part is rewritten according to the country the message is destined for. As an example, the address M1XYZ@NTSEU is rewritten to M1XYZ@NTSGBR (for Great Britain). Wildcarded matches on callsigns are used to this end and the relevant INTRCPT file entry for M1XYZ is

```
M1*      NTSGBR
```

However, this also matches on M1N1T1@NTSON (Scarborough in Ontario, Canada) and inadvertently rewrites it to M1N1T1@NTSGBR. As a consequence those messages destined to Ontario will be routed to Great Britain instead. We use this case to illustrate the basic concept we are going to refine later on.

In order to perform the rewrites only on the messages wanted we need to separate messages with conflicting TO parts i.e. messages for Great Britain have to be on a BBS separate from where the messages for Ontario are when being rewritten. The AT part needs to be used for this as the TO parts have the same match M1*. Thus all messages for @NTSEU are forwarded to a separate BBS where they can be safely rewritten.

The following diagram sketches this message flow:



Here

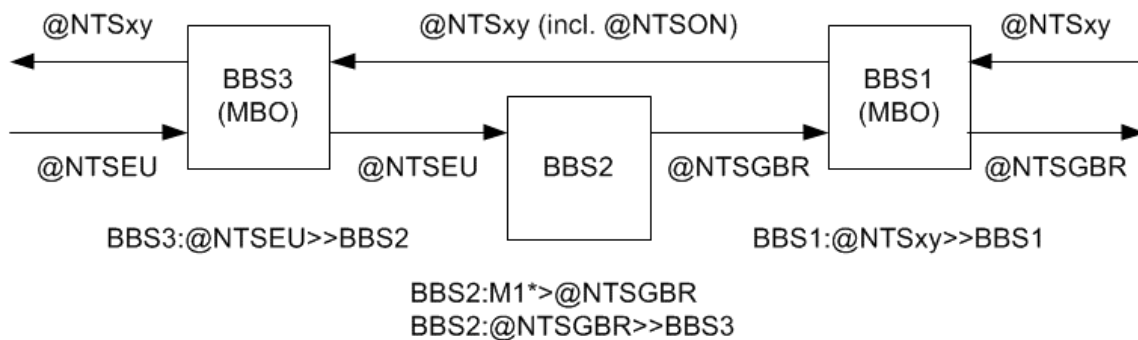
```
DB0NTS:@NTSEU>>BBS2
```

denotes that at DB0NTS all messages @NTSEU are forwarded to BBS2 and

```
BBS2:M1*>@NTSGBR
```

means that at BBS2 the AT part of message addresses matching M1* is rewritten to @NTSGBR using the INTRCPT file mechanism.

Now the question arises where British DTS exchange traffic with DB0NTS. The first idea is to send the rewritten messages back to where they came from. However, this will result in duplicate BIDs at DB0NTS. In case they use BBS2 to exchange their traffic we will encounter the conflict with Canadian zip codes again. Thus we need to introduce a third BBS at DB0NTS:



We simply called the three BBS now BBS1, BBS2, and BBS3 and we will later see how to best choose BBS names in a setup involving multiple BBS at a single station. For the time being the term BBS was used because this is the name of the BPQ application. However, those BBS having direct interaction with other stations will be called MBO in the following.

The above diagram is the basic blueprint to be applied when message addresses need to be rewritten in an international traffic system and it shows in particular the three different roles BBS assume:

DTS MBO

The DTS MBO is the BBS that serves DTS/ DRS users. There is always a single DTS MBO in every multi-BBS setup. Note that the DTS MBO has only inbound radio connections. In the hierarchical network model the DTS MBO is part of the distribution layer.

gateway MBO

Those BBS in the core layer of the hierarchical network model exchanging traffic with other target gateway stations are called gateway MBOs. There may be multiple of them depending on the layout of the autonomous systems involved. Gateway MBOs have both inbound and outbound radio links.

rewrite BBS

The sole purpose of rewrite BBS is to rewrite the addresses of type T messages and they do not have any direct interaction with other radio stations which is why we stick to the term BBS as opposed to MBO.

Running multiple BPQ nodes at a station is not problematic in any way. However, only a single node can be installed on an operating system instance. Basically, there are two ways to deal with this:

- set up a dedicated computer for each node. Raspberry Pis will be sufficient.
- set up multiple virtual machines (VM) on either Windows or Linux and run a node on each of them.

At DB0NTS virtual machines are going to be used. The only hardware change necessary is to add another 4 GB of RAM to the PC already running BPQ.

2. The basic design

In the previous section we already got to know the building blocks needed to rewrite message addresses at a target station. Now we broaden our view on the requirements to be met by the particular station DB0NTS. As we will implement the station with the BPQ32 software package we group the requirements according to the BPQ components:

DTN messaging functions

- DTN/ DRS access
- gateway to the US DTN/ NTSD
- gateway to the OC autonomous system
- address rewrites for @NTSEU (inbound)
- address rewrites for the US DTN @NTSxy domains (outbound)

Further messaging functions

- local messaging client (Airmail)
- Winlink message integration incl. AutoImport of DTN messages
- packet radio bulletin BBS (to be prepared only)

BPQ node functions

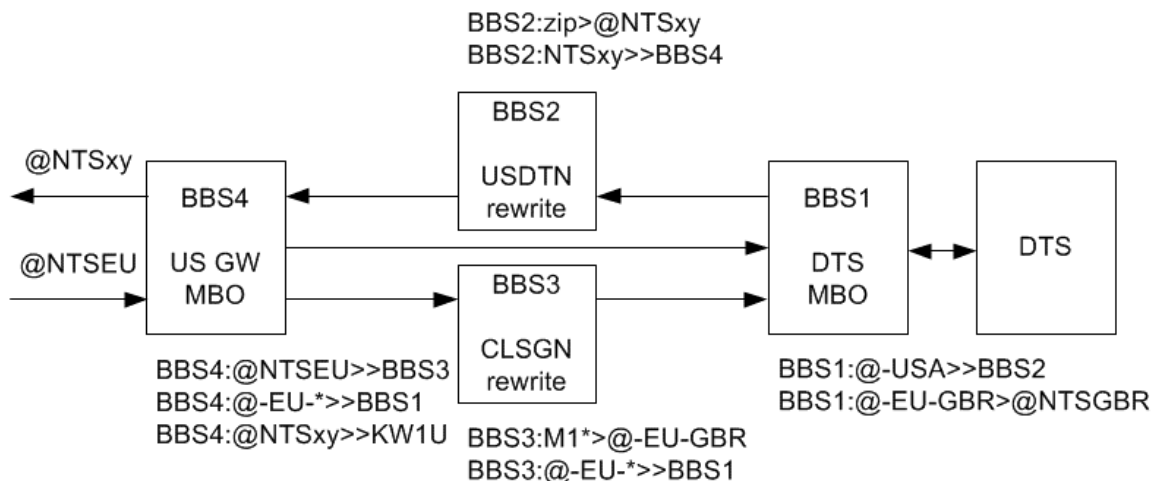
- packet radio node
- sysop chat application
- Winlink RMS gateway
- HF Pactor to UHF packet radio gateway
- APRS digipeater (to be prepared only)
- BPQ node map entry (to be prepared only)

Devices and interfaces (ports)

- SCS Dragon Factor controller
- SCS PTC II with packet radio boards as packet TNC
- HF radio Icom IC-7410
- HamNet connectivity
- internet connectivity (e.g. WL2K RMS gateway)

Both the packet radio BBS and the APRS digipeater will be part of the planning but will not be set up in one of the first steps. They should however have a place to add them later on.

We start with the DTN messaging functions and then add the other functions as needed. From the introduction we already know how to deal with inbound @NTSEU messages. Additionally we need a rewrite BBS to translate from the international address format @-USA (e.g. 07405@-USA) used in Europe to the US DTN address format @NTSxy (e.g. 07405@NTSNJ). This task cannot be performed on the same BBS as the @NTSEU rewrites because of the conflict between British callsigns and Canadian zip codes. Thus we simply add another rewrite BBS for the @NTSxy domains.



This is straightforward and the routes for @-EU-* are for the new international address scheme. Here are two examples:

Example 1: a message from a European DTS to 07405@-USA

A DTS connects to BBS1 to submit a message for 07405@-USA which is forwarded to BBS2 where the address is rewritten to 07405@NTSNJ. The message is subsequently moved on to BBS4 from where it will be transferred to the US DTN target station KW1U.

Example 2: a message from the US to M1XYZ@NTSEU

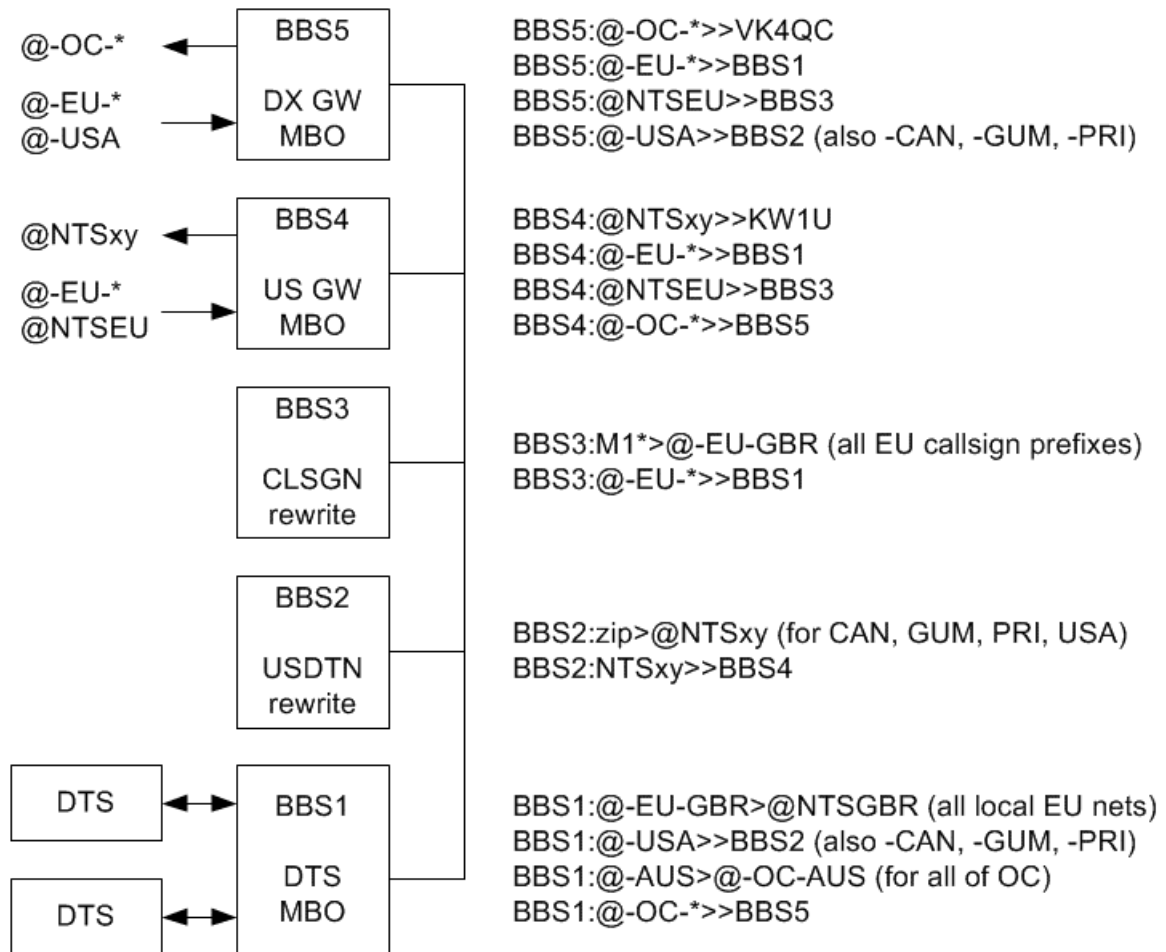
A message from the US to M1XYZ@NTSEU comes in at BBS4 and is forwarded to BBS3 where it's address is rewritten to M1XYZ@-EU-GBR. It is then forwarded to BBS1 where it's address is rewritten to M1XYZ@NTSGBR and will later be picked up by a UK DTS. The double rewrite is to support both (old) @NTSEU and (new) @-EU-* addresses.

Things get a little more exciting when we start thinking about the Oceania gateway MBO. The obvious idea is to use the existing US gateway for Oceania, too.

```
BBS1:-AUS>@-OC-AUS (for all OC countries)
BBS1:@-OC-*>>BBS4
BBS4:@-OC-*>>VK4QC
```

This works well for outbound traffic and inbound traffic for Europe is handled exactly the same way as when coming from the US. But what about transit traffic to the US i.e. messages addressed as @-USA coming in from Oceania and to be forwarded to the US? These need to be rewritten to the appropriate @NTS_{xy} domains on BBS2 but can subsequently not be forwarded back to BBS4 because this will result in duplicate BIDs there. This argument is however not specific for Oceania and applies to all other (future) autonomous systems. You already know the solution to solve this by now: just add another BBS. We call this the "DX gateway MBO" since it handles (transit) traffic from all other autonomous systems.

For ease of drawing the five BBS are now aligned in a row and the connection on the right side means that they are all inter-linked with each other.



The relatively high number of BBS needed is due to several reasons:

1. the support of the already existing @NTSEU addresses (BBS3)
2. the support for transit traffic with other autonomous systems like Oceania (BBS5)
3. the address rewrites for the US DTN system (NTSxy) (BBS2) which from a logical perspective belongs to the US side.

Addresses of the form CALLSIGN@NTSOC can be easily supported by performing the necessary rewrites on BBS3. There will not be a conflict with the NTSEU rewrites because callsign prefixes are uniquely assigned to countries.

Note that the rewrite BBS have a static configuration mapping zip codes or callsign prefixes to country codes or state abbreviations. Once set up the configuration of the rewrite BBS will not be touched again later.

3. Adding more functions

So far our design supports all needed DTN messaging function and we will next look at how to support further messaging and BPQ node functions.

All these additional functions are for users to interact with the system and as the rewrite BBS do not have any direct user interaction (their sole purpose is to rewrite

message addresses) we keep them as-is and make the additional functions available on the MBOs.

Airmail is to be used as a local messaging client for the following tasks:

- sending and receiving DTN messages
- sending and receiving personal Winlink messages
- receiving SYSTEM messages of the 5 BBS (housekeeping, info on unroutable messages, new users etc.)

Since our local message client behaves mainly like a DTS we will attach it to the DTS MBO with a local (network) connection instead of a radio link.

SYSTEM messages originate from "SYSTEM" and may either be addressed to a given sysop call or to "SYSOP". We prefer the latter and set up appropriate forwarding rules on each BBS (except for BBS1):

```
BBSn: (BBSCALLn) SYSOP>>BBS1, n=2...5
```

Here the name in brackets specifies the BBS user the forwarding rule is configured for. All SYSTEM messages are retrieved with our local messaging client from BBS1. Two more points are to be observed here which we will come back to later:

- we need to be able to distinguish the SYSTEM users of the various BBS
- all BBS need different BBSCALLs since these are used for the composition of BIDs and we do not want SYSTEM messages to be rejected by BBS1 because of duplicate BIDs.

Concerning Winlink message transfer we have the following needs:

- the messaging client needs to exchange personal Winlink messages with the DTS MBO (see above)
- on the two gateway MBOs we need the ability to forward pending messages using Winlink
- we need to be able to receive messages from US and OC MBOs to auto-import.

The last point is the most crucial one. When receiving a Winlink auto-import message all encapsulated messages will be imported into the local BBS. In our case this may include traffic for @-USA (-CAN, -GUM, -PRI), @-EU-*, @NTSEU, and @-OC-*.

Routes for these are available on the gateway MBOs only where Winlink BBS integration needs thus to be configured. For robustness Winlink CMS access has to be one the same node. Furthermore we need appropriate routes for outbound Winlink traffic on the other two MBOs.

As we do not have sufficient information yet to decide on which MBO the Winlink BBS integration together with CMS access best resides, we have a closer look at the hardware part.

We are interfacing with the outside world at the various MBOs which is why we attach the devices (radios, teletype controllers) there. However, some devices need to be shared between several MBOs which is achieved with BPQ applications.

The packet radio TNC is for user access to the following services: DTS MBO, packet BBS, RMS, packet node, and sysop chat. It will therefore be attached to the DTS MBO node. Note that the DTS MBO BBS is used for both radiogram and packet radio messages.

HF radios can be controlled from remote BPQ BBS with the RADIO AUTH command and may thus be attached to any of our MBOs. However, the configuration is least complex when we choose the MBO with the most outbound connections which is one of the gateway MBOs (the DTS MBO has inbound connections only). As the Pactor controller is part of the same BPQ port configuration we will attach both the controller and the HF radio to the US MBO gateway (the node of BBS4).

DTS MBO access will be provided by means of a forwarding application. The same mechanism will also be used for inbound connections on the DX gateway MBO.

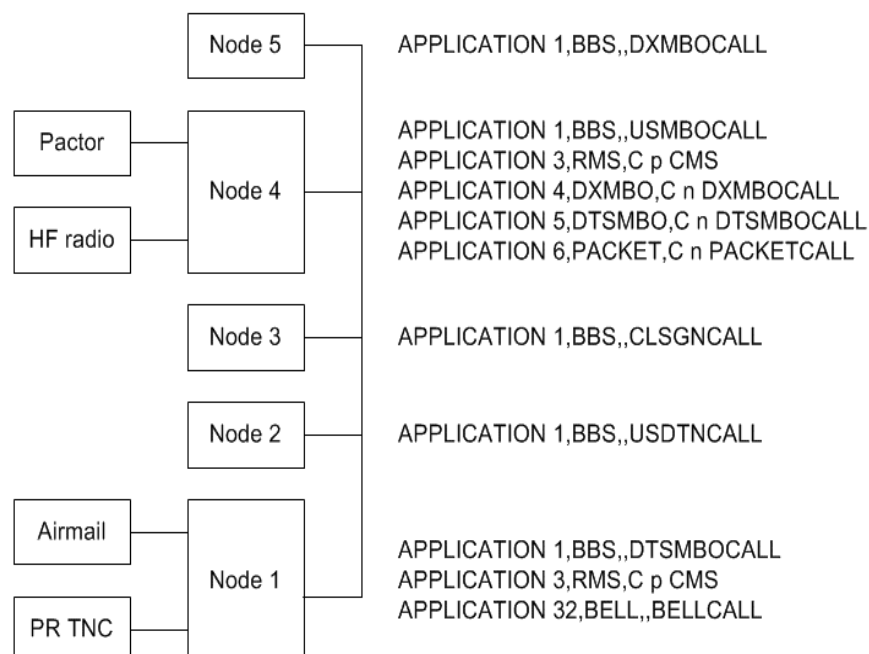
HF Winlink access is best provided on the node the Pactor controller is attached to, i.e. the node of the US gateway MBO. Winlink RMS gateways consists of several parts:

- BPQ telnet port with CMS access
- WL2K reporting lines
- RMS application

Reporting lines are always placed on the node the respective radios are attached to because they are related to the radio scanning frequencies and an RMS application has to be on the same node for the reporting to work.

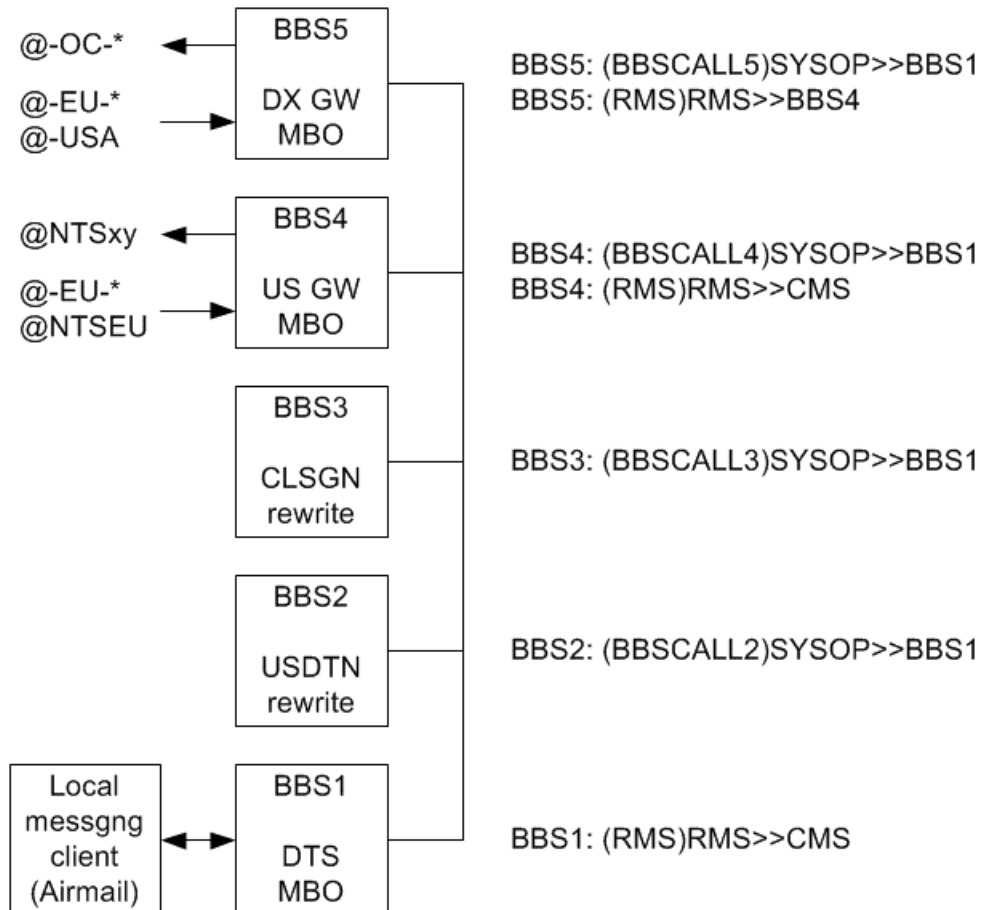
Both a HF Pactor to UHF packet radio gateway and an APRS digipeater are simple BPQ applications which should each be located on the node where the hardware for the inbound connections is attached to.

Translating the above considerations on the various services in BPQ terms gives us a view on the applications needed.



We chose to have Winlink CMS access in two places: on node 1 for packet radio and on node 5 for Pactor. The alternative is to have an additional application routing inbound RMS connections for one of the nodes. Winlink access on node 5 may either be routed to node 4 or node 1.

Here is a summary of the forwarding rules we added in this section:



Placeholders have been used for the application callsigns above and it is now time to think about the real callsigns to be employed.

4. Callsigns

Values have to be determined for the 5 nodecalls (and nodealiases), the 5 BBS callsigns, and a total of 6 application callsigns. This is quite a lot and before things become unmanagable we first think of a few guidelines to follow:

- Real callsigns are employed for user interaction only and virtual callsigns are used for internal connections.
- We try to minimize the overall number of callsigns e.g. with the help of SSIDs.

The challenge is not the sheer amount of callsigns alone but that they are partly dependent on each other. We therefore follow these steps to determine the callsigns:

BBSCALLs

Determine the BBSCALLs first because they have external (i.e. outside of our own system) impact.

rewrite BBS

Determine the missing callsigns for the rewrite BBS so that they have a simple configuration.

MBOs

Determine the remaining calligns needed for the MBOs. Follow the pathes of inbound and outbound connections to this end.

The BBSCALL is the callsign entered in the BBS main configuration screen and it is used for two purposes: for the creation of routing header lines in messages and for the creation of local BIDs. Above we have already seen that we need different BBSCALLs to route the SYSTEM messages. Regarding the choice of BBSCALLs we have these constraints and requirements:

- BBSCALLs have a maximum of six characters from [A-Z] and [0-9]
- the five BBSCALLs in our system must be different for routing of SYSTEM messages
- on a message path each BBSCALL may appear at most twice in the message routing headers (R: lines)
- non-delivery notifications are sent to the HA address in the first R: line.

From the last point we infer to use the base callsign DB0NTS together with the packet radio HA #HES.DEU.EU for the BBSCALL on the DTS MBO which also fits nicely with the packet radio related features located on this node. For the remaining four nodes we need kind of virtual callsigns for the BBSCALLs and there are several ways to create those in particular by geography and by BBS function. We opt for the latter variant because we consider it to be simpler.

rewrite BBSCALL

For the BBSCALLs of rewrite BBS we use the first letter "R" (for rewrite) and append a string of up to 5 letters describing the routing domains or functions involved. If our own autonomous system name is involved we put it's code (EU in our case) first. As an example the rewrite BBS for the US DTN has the callsign RUSDTN.

MBO BBSCALL

For the BBSCALLS of the MBOs we use the first letter "M" (for MBO) and append a string of up to 5 letters describing what this MBO is for. If our own autonomous system name is involved we put it's code (EU in our case) first. As an example the gateway MBO for the US DTN has the callsign MEUUS.

Except for the DTS MBO (see above) we set the HA to DB0NTS.LOCAL to state which station is responsible for the corresponding R: line.

Summing up we have the following BBSCALLs:

BBS	BBSCALL	HA	Remarks
DTS MBO	DB0NTS	#HES.DEU.EU	real callsign
callsign rewrite	RCLSGN	DB0NTS.LOCAL	rewrite on callsigns
US DTN rewrite	RUSDTN	DB0NTS.LOCAL	rewrite to @NTSxy
US gateway	MEUUS	DB0NTS.LOCAL	US gateway MBO
DX gateway	MEUDX	DB0NTS.LOCAL	gateway MBO for DX

Note that the BBSCALL has nothing to do with the callsign used for inbound or outbound connections.

Now we need to determine the missing callsigns for the rewrite BBS which are the nodecall and the application callsign of the BBS. For the latter we simply choose the BBSCALL. We have two main options for the nodecall:

- Option 1: use the BBSCALL together with an SSID, e.g. RCLSGN-1 for the RCLSGN rewrite BBS.
- Option 2: replace the first letter of the BBSCALL with an "N" to indicate that this is the node callsign, i.e. NCLSGN for the node of the RCLSGN BBS.

We choose the first option because it minimizes the overall number of callsigns, it simplifies the configuration of the internal links between our five nodes, and it saves one BBS user.

Here is part of the BPQ config for the RCLSGN rewrite BBS:

```
[bpq32.cfg of RCLSGN]
NODECALL=RCLSGN-1
NODEALIAS=;
NODE=1
LOCATOR=NONE

; applications
BBS=1
APPLICATION 1,BBS,,RCLSGN,,0
```

We have a brief look at SSID usage before we determine the remaining calligns for the MBOs. Standards differ a bit from region to region and here is what is mainly used in Germany:

SSID	Purpose
-0	main function of the station (BBS, packet etc.)
-1	packet node
-2	packet node

-8	BBS
-9	sysop chat, system statistics
-10	Winlink RMS gateway
-15	not assigned, used by gateways

Only the DTS MBO node is accessible for users which is why we assign DB0NTS-2 to it. The remaining MBO nodes (US gateway, DX gateway) are not publicly accessible and we use the BBSCALL with SSID -1 for their node callsigns as we have done for the rewrite BBS. Thus we are finished with all the node calls:

Node	NODECALL
node 1	DB0NTS-2
node 2	RCLSGN-1
node 3	RUSDTN-1
node 4	MEUUS-1
node 5	MEUDX-1

Concerning user access on HF there are basically two approaches: The first one employs a dedicated callsign per application independent of scanning frequencies and the second approach is based on a single base callsign and dedicated scanning frequencies per application. As we have only a single callsign (DB0NTS) assigned we choose the latter option with application-dependent HF scanning frequencies. Additionally, SSIDs are used.

All inbound HF connections start on node 4 because this is where the HF transceiver and the Pactor controller are attached to. Inbound connections should always be for DB0NTS which we use as the PORTCALL on the SCSPactor port. Applications are invoked depending on the active scanning frequency which set their application callsign on the BPQ stream. Those application callsigns are derived from the base callsign DB0NTS by appending SSIDs geared to the table above resulting in:

Node	Appl.	Callsign	Remarks
Node 1	(node)	DB0NTS-2	packet node, not an application
	BBS	DB0NTS	DTS MBO
	RMS	DB0NTS-10	(UHF) Winlink RMS gateway
	BELL	DB0NTS-9	sysop chat
Node 2	BBS	RUSDTN	rewrite BBS for NTSxy
Node 3	BBS	RCLSGN	rewrite BBS for callsigns
Node 4	BBS	DB0NTS-8	US gateway MBO
	RMS	--	(HF) Winlink RMS gateway (PORTCALL)
Node 5	BBS	DB0NTS-7	DX gateway MBO

A side effect of this is that although other MBOs connect with our US and DX gateway to DB0NTS they will hear the CWIDs DB0NTS-8 and DB0NTS-7, respectively. There is also a way that all MBOs use DB0NTS as application callsign

but this results in a quite elaborated network configuration of the internal links which we want to avoid.

Here is part of the BPQ config for node 4:

```
[bpq32.cfg of node 4]
NODECALL=MEUUS-1
NODEALIAS=;
NODE=1
LOCATOR=NONE

; Pactor port
PORT

    ID=PTC
    PORTNUM=3
    DRIVER=SCSPactor
    QUALITY=0

    PORTCALL=DB0NTS

; Winlink reporting - centre frequencies
WL2KREPORT PUBLIC, ...

CONFIG

    ... ..

ENDPORT

BBS=1
APPLICATION 1,BBS,,DB0NTS-8           ; US gateway MBO
APPLICATION 3,RMS,C 1 CMS             ; RMS Winlink gateway
APPLICATION 4,MEUDTS,C 2 DB0NTS       ; EU DTS MBO
APPLICATION 5,PACKET,C 2 DB0NTS-2     ; packet radio gateway
APPLICATION 6,MEUDX,C 2 DB0NTS-7      ; DX gateway MBO
```

A HF APRS digipeater can later be added to this node as a further application.

5. Who is the real DB0NTS?

This section describes a situation that might occur in certain target station setups. Since it is not relevant for our specific case you may skip this section and proceed with the next one.

All three MBOs in our system use the base callsign (DB0NTS) for outbound connections. Now consider the case that the base callsign is used with the local message client, too. Think of a pending message at the DTS MBO which is destined for your local message client. When one of the other MBOs connects to the DTS MBO it logs in with the base callsign and the DTS MBO cannot distinguish the MBO from the message client because both have the same callsign. Therefore the DTS

MBO will erroneously forward the pending message to the MBO instead of the message client.

Obviously, we have to change callsigns either for the message client connections or the internal MBO connections to avoid this.

Since Airmail cannot change its callsign when performing outbound connections we need to make the change on the DTS MBO side. First of all, create a BBS user named LOCAL together with a telnet login mapped to this callsign. This BBS user will be used to exchange messages with Airmail. Furthermore, a relay application is used to establish a telnet connection with this user. Here is the relevant part of the telnet server port configuration:

```
; on DTS MBO
PORT

    ID=Telnet
    PORTNUM=2
    DRIVER=TELNET
    QUALITY=0

    CONFIG

        . . . . .
        FBBPORT=8012
        DisconnectOnClose=1

        USER=user,secret,LOCAL,BBS
        RELAYAPPL=*LOCAL

    ENDPORT

APPLICATION 4,*LOCAL,ATT 2 localhost 8012 user secret
```

Anybody connecting to TCP port 8772 (the relay host port) will assume the identity of the user LOCAL. This should not be a problem as long as the FBBPORT is not exposed on the internet. If you have a bad feeling with this configuration being on a node accessible to users move the relay host part to one of the rewrite BBS. Simply configure the relay host as above on a rewrite BBS and use an AXUDP port (which is needed anyway for all internal connections, see below) to connect to the DTS MBO.

```
; on rewrite BBS
PORT

    ID=AXUDP
    PORTNUM=1
    DRIVER=BPQAXIP
    QUALITY=0

    MAXFRAME=4
    . . . . .
```

```

CONFIG
    . . . . .
    MAP DB0NTS      node1

ENDPORT

PORT
    ID=Telnet
    PORTNUM=2
    DRIVER=TELNET
    QUALITY=0

CONFIG
    LOGGING=0
    CMS=0

    FBBPORT=8012
    MAXSESSIONS=3
    DisconnectOnClose=1

    USER=user,secret,LOCAL,*MEUDTS
    RELAYAPPL=*LOCAL

ENDPORT

APPLICATION 4,*LOCAL,ATT 2 localhost 8012 user secret
APPLICATION 5,*MEUDTS,C 1 DB0NTS

```

Now, anybody connecting to TCP port 8772 of the rewrite BBS will initiate an AXUDP connection to the DTS MBO with the callsign "LOCAL" and there is no special configuration on the publicly accessible DTS MBO. On the rewrite BBS the application *LOCAL performs the identity change and the application *MEUDTS performs the outbound (AXUDP) connection to the DTS MBO.

Another option to change the callsign at the DTS MBO side is to employ an additional BBS with the BBSCALL LOCAL and a second user for the base callsign DB0NTS. This BBS logs into the DTS MBO to exchange messages for the message client. However, this approach comes at the cost of additional hardware or an additional virtual machine which is quite a lot of overhead.

In order to change the callsign for internal outbound connections at the gateway MBOs first configure

```
ENABLE_LINKED=A
```

in their main BPQ configuration (bpq32.cfg) and use the LinkedTo command in the forwarding scripts for internal MBO connections. On a gateway MBO use e.g.

```
*** Linked To MEUUS
C 1 DB0NTS
```


In this example the MBO will perform outbound calls from this forwarding script with the callsign MEUUS instead of DB0NTS. Additionally a BBS user with this name is required on the DTS MBO DB0NTS, of course.

Whichever option you choose be aware of potentially conflicting BIDs. Both the Airmail message client and the DTS MBO generate BIDs of the form #####_DB0NTS (or whatever your base callsign is). The starting BID number can be configured in Airmail and it is recommended to set it to high value e.g. 90000. With BPQ starting at number 1 this will (most probably) avoid duplicate BIDs being issued.

6. BBS users

On each BBS in our system we have a dedicated user for each of the other BBS to forward messages from the first to the latter. The user with the BBSCALL is automatically created and the missing four users on each BBS are added manually. This makes all BBS look uniformly. For simplicity we choose the BBSCALLs as user names. Thus every BBS has the 5 users

```
DB0NTS
MEUDX
MEUUS
RCLSGN
RUSDTN
```

Furthermore we add the two users

```
RMS
SYSTEM
```

the first of which is for Winlink and the latter for SYSTEM messages (see above).

The forwarding scripts are also kept uniformly for all internal connections. Messages are buffered for a while and sent in batches. The forwarding script for the MEUDX user is

```
PAUSE 100
C 1 DB0NTS-8
```

and we choose the "don't wait for poll timer to expire" option. This will speedily forward pending traffic between the BBS without making too many connections between them. There is no forwarding to a BBS's own BBSCALL and the forwarding script is simply the node command "BYE".

Additional users are created on the gateway MBOs for the remote gateway partners and on the DTS MBO for the DTS user stations.

7. Networking and BPQ ports

Our plan is to compose the BPQ node configurations from a set of fixed building blocks. This also applies to the BPQ ports configuration which we try to have in a uniform way on all nodes.

One BPQ port on each node is needed for linking with the other four nodes. It is obvious to use a network based port to this end and we choose AXIP based on UDP.

The IP addresses for the nodes are defined in a common host file used on all five computers (hardware or virtual machines):

```
127.0.0.1.      localhost
192.168.6.101  node1
192.168.6.102  node2
192.168.6.103  node3
192.168.6.104  node4
192.168.6.105  node5
```

Of course, you may choose any IP network suitable (and any hostnames you like). The corresponding AXIP port config reads:

PORT

```
ID=AXUDP internal
PORTNUM=1
DRIVER=BPQAXIP
QUALITY=0
```

```
MAXFRAME=4
FRACK=7000
RESPTIME=1000
RETRIES=10
PACLEN=255
```

CONFIG

```
; activate AUTOADDMAP on the MBO nodes
; AUTOADDMAP
```

```
UDP 10093
```

```
; internal node and BBS access
```

```
MAP RUSDTN      node2  UDP  10093
MAP RCLSGN      node3  UDP  10093
MAP MEUUS       node4  UDP  10093
MAP MEUDX       node5  UDP  10093
```

```
; services for users
```

```
MAP DB0NTS-0   node1  UDP  10093 ; EU DTS MBO
MAP DB0NTS-2   node1  UDP  10093 ; packet node
MAP DB0NTS-7   node5  UDP  10093 ; DX gateway MBO
MAP DB0NTS-8   node4  UDP  10093 ; US gateway MBO
MAP DB0NTS-9   node1  UDP  10093 ; sysop chat
MAP DB0NTS-10  node1  UDP  10093 ; Winlink RMS
```

ENDPORT

The AUTOADDMAP keyword is activated on the MBO nodes only to allow users to access the corresponding BBS through inbound connections. Note that this also prevents users to log into the rewrite BBS.

On the DTS MBO and the US gateway MBO nodes we need each an additional telnet port to perform outbound connections to the Winlink CMS (both), to accept inbound connections from Airmail (node 1), and to attach the BPQTerm TCP terminal to (both). Remembering our building block approach we use the same configuration on both nodes:

```
PORT

    ID=Telnet
    PORTNUM=2
    DRIVER=TELNET
    QUALITY=0

CONFIG

    LOGGING=0
    DisconnectOnClose=1
    MAXSESSIONS=4

    ; FBB for BPQTerm TCP
    FBBPORT=8011
    USER=db0nts,db0nts,DB0NTS,,SYSOP

    ; Winlink RMS gateway
    CMS=1
    CMSLOGGING=0

    CMSCALL=DB0NTS
    CMSPASS=PASSWORD

    ; BBS on 8772/tcp
    RELAYAPPL=BBS
    FALLBACKTORELAY=0

ENDPORT
```

Regarding the usage of the relay application see the previous section.

Additional ports will be used on the nodes devices are attached to (Pactor controller and radio, TNC, HamNet connectivity etc.).

8. Conclusion

We have shown how to build the probably most complex target station within the international DTN. When approaching this task things first look like a bowl of spaghetti where everything (callsigns, ports, applications, forwarding rules) depends on everything else. We have shown some guidelines to establish order in this

situation and all requirements have been met with standard features of the BPQ software suite. The approach we choose is suitable and recommended as a blueprint for other target stations.

When setting up the described system we will start with the DTS MBO and the US gateway MBO resembling the old setup at DB0NTS. The next step is to add the callsign rewrite BBS and then the rewrite BBS for the US DTN. Eventually, the DX gateway MBO will be added to the system.

END OF DOCUMENT