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Subject: XROUTER Background

During the last six months of 2003, Bryan G0SYR has been leading and following the debate with regards the Network Management of XRouter Nodes attached to the Internet with those that operate the Linux_node, BPQ, TheNet, JNOS node, routers over Radio (wireless) and Internet networks. Node Names described in this paper are to just to illustrate difficulties encountered. And would apply to any other similar systems in the UK and worldwide. (Paul g4apl)

As you have read this far. I thought you might be interested in a bit of background as to what's happened with the development of XROUTER.

I'm not sure how much you (The Reader) know about INP3 etc. as it was completely new to me when it was introduced into XROUTER, and not a lot of info has been released by the author.

I'm afraid I'm branded as a luddite, as I didn't fully embrace the concept as I only interfaced with old fogies running antiquated systems on the radio (Like Various Radio SysOPs and G4APL Paul ☺ and I didn't feel the extra loading of a new network protocol, in addition to NetRom, necessarily as good thing :-)

NetRom was only a secondary issue to amprnet (AMateurPacketRadioNETwork using TCP and IP protocols) connectivity but it's important to encourage ax25 users.

When internet connectivity was added to XRouter, the author wanted to build an interconnected group of nodes which incorporated an XNET node in the US. This proved difficult as XNET is notoriously bad at routing. It has implemented a completely different routing mechanism measuring trip times to neighbours and distributing these with a protocol called INP3. It also maintains the traditional nodes broadcasts with QUALITY values which it calculates from its trip time calculations with little or no intervention from sysops.

This may seem ok but with a mixed radio and internet network the outcome is traffic is routed away from the radio as few radio links can give a trip time to compete.

XROUTER was developed to include Time Domain Routing with INP3 protocol which is active by default. But Paula G8PZT the author saw the flaw with trying to convert time into quality and in XRouter each has a separate domain so XROUTER is effectively two AX25 routers in one which share a single nodes table for the user.

INP3 capable routers such as XNET and XROUTER can exist in both domains whereas non INP3 compatible nodes exist only in the quality domain.

XRouter always routes in the time domain when it can. So for a sysop to retain full control of routing, time domain must be turned off between XROUTERS

Traditionally ax25 internet wormholes had been managed as if they were long radio links no attempt was made to reflect how much faster they were.

When XROUTER sysops formed a large group of interconnected nodes. They initially tried to incorporate an XNET node in the USA and found it acted as black hole with all routing being sucked into it. To compete they spiralled up their QUALITY values to 255 at one point. They eventually agreed using 250 and justified it as being a true representation of the internet's speed.

Unfortunately this was a world wide group in ZL/VK/USA/UK with around 10 UK stations they all set QUALITY values of 250 to each other and some resisted any suggestions to use any other values.

Huge nodes lists resulted and MINQUALITY was raised to 245 to reduce the numbers.

This wouldn't matter much with the international links, but the links within the UK, which were replacing lost radio links, were impossible to manage as all internet stations had values around 250. If one raised MINQUALITY to reduce nodes list the radio links with lower qualities were the first to disappear.

The main problem was they lost a sense of geography which is important if you are going to mix internet/radio, as the radio network has inherent geography built into it.

Fortunately the existence of many Linux_node / BPQ stations which do not have time domain routing has broken up the XROUTER network, not allowing the time domain routing a free run.

If it had, it would make running any radio link a waste of time. As for example say we set up a 19K2 bd radio link between Paul (G4APL) and yourself (The Reader), Paul has an internet link to GB7FLY in Reading and you (The Reader) has an internet link to COAST. COAST and FLY see each other via the internet routed purely by the quickest link. If Paul and yourself (The Reader) were running XROUTER.

The trip time down your direct radio link is unlikely to beat the trip time via the internet even it's 3/4/5 hops or more resulting in no NETROM at all down your radios ☹ (good job we have amprnet!)

The XRouter Network Strategy Document that I wrote, only affects the traditional QUALITY domain of the network. No control of the TIME domain is possible other than to limit its horizon in terms of hops.

It will always choose what it thinks is the fastest path, so setting QUALITY values between COAST and ESX (another Internet link XRouter node) has no effect on connections between COAST and ESX. But they do affect packets from non XROUTER nodes.

Many XROUTER sysops do not fully understand these problems. I'm not sure I do! But the nodes that COAST broadcasts to you (The Reader) all have a very high value sent to COAST from ESX, so all routing suddenly is sucked via the black hole in Essex ☺

As default XROUTER comes with its time domain set to allow a 30 hop horizon and although it can be tamed it does require a good understanding.

It was very hard to persuade anyone to change from the settings that Paula G8PZT advocated, as being a luddite I was not party to the internet revolution ☺

I have concentrated on the UK members as most overseas nodes do not have an existing network to integrate with. So do not know what I'm "banging on about".

ESX is now the only major UK router following this policy of 250 with a several isolated sites like COAST that have only a single connection via the internet so it doesn't matter what value they agree, until they become interested in a second link when the difficulties of balance adjacent path values become apparent.

Let's review the Routes table from ESX node to see what's going wrong.

```
> 1 G0TJW-1 190 2!  
> 2 GB7CF 250 8!  
> 3 GB7DXE-1 250 2!  
> 5 SM0RUX-3 250 10!  
> 6 G1NNA 250 6!  
> 7 G8PZT 250 48!  
> 8 VK3TE-9 250 29!  
> 9 G4VLS-6 250 14!  
> 10 ZL2BAU-3 250 30!  
> 11 G0CNG-8 250 47!  
> 12 G6HJP-3 250 25!  
> 13 VE2PKT-4 250 20!  
> 14 G0CGL-1 250 45!  
> 15 M1CMN-8 250 42!  
> 16 G1SSL-1 250 8!  
> 17 ZL2TZE-3 250 42!  
> 18 GB7YB 250 41!  
> 19 GB7LGS-9 250 25!  
> 21 N0LBA-1 250 38!  
> 22 EI7WDX-9 250 3!  
> 23 GB7TUT-1 250 10!
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It's an interesting problem to try and manage.

The main point of the **XRouter Network Strategy document** is not to say you 'must' not link to this or that station.

- a) Simply to minimise their effect on the network as a whole and enhance the links between well managed nodes.
- b) creating a simple two tier system for the internet links, which don't kill off peoples radio links and allow them to co-exist

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