A guide to digipeating and unproto paths for APRS

The basics: digipeaters

•When you set DIGI ON in your tnc, it will digipeat all packets addressed to your callsign and any aliases you may have set; but only where the next unused digi address matches one of your aliases or callsign

Digipeater Setup

Enable digi ☒   UI Only ☒   Alias substitution ☒

WIDEn-n ☐   TRACEn-n ☐

Alias(es) `G0TRT,RELAY`

Sub Alias `G0TRT`

Dupe secs `15`

1=1
2=
3=
4=
5=

Ok   Cancel
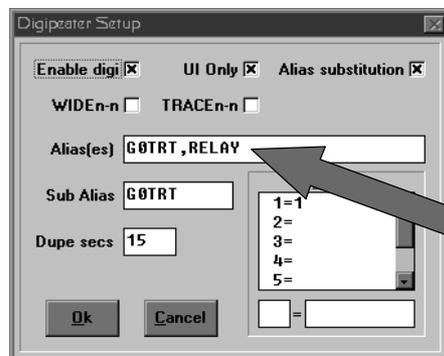
•Using UI-View, with a KISS tnc, this station will digipeat ALL packets with G0TRT or RELAY if it's the next unused digi address.

The basics: unproto

•The unproto path is the path you want your beacon to take.

•This example would send my position via a WIDE digi, then another, and another, and a fourth.

•This is similar to via G6HPY,M1EMF,G60DT,G1EUC

•If all of these stations had an alias set to WIDE, that is the path the beacon would take.

Station Setup

Callsign	Latitude	Longitude
G0TRT	52.07.36N	000.58.01E

Unproto port: 1
Unproto address: APRS,WIDE,WIDE,WIDE,WIDE

Beacon comment: Op Ciemon - email g0trt@amsat.org

UI-View Tag

Beacon interval (mins)
Fixed 30   Mobile 0   0
○ miles ○ km

APRS address: APRS

Symbol: No. Digi   O'ly T
GPS symbol: Car   O'ly

Ok   Cancel

The basics: unproto limits

•AX25 only allows a packet to be digipeated a **maximum** of 7 times e.g.

G0IZU>BEACON,G8HUE,G8KPY,G6ISY,G1EUC,G7BKU,G0TRT,G3XVL
   1   2   3   4   5   6   7

OR

G0IZU>BEACON,WIDE,WIDE,WIDE,WIDE,WIDE,WIDE,WIDE

•So:

  G0IZU>BEACON,WIDE7-7,TRACE7-7

won't work because that's a total of 14 digi's

•But:

  G0IZU>BEACON,G8HUE,G6ISY,TRACE5-5

Will, because the digi's total 7. Any over 7 are ignored.

The basics: Alias substitution

•To help UI-View acknowledge messages it's important to enable Alias substitution.

•You must ensure that what you put in the Sub Alias box is the same as what's in the Station box i.e. your callsign.
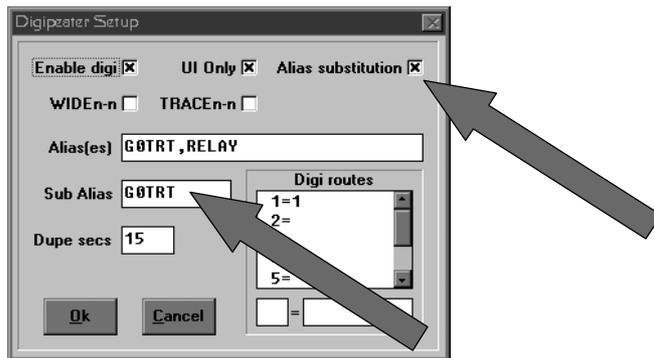
The basics: Frame headers.

•Looking at packet frame headers will show you the route a received packet has taken to get to you.

  G0IZU>BEACON,SURB*,G8KPY*,ORP22*,G1EUC*,G7BKU*,G0TRT*

•This packet clearly shows the route taken. Each digi adds an asterix (the address H bit is set) to indicate that a digi has taken place.

•But different firmware/software uses the asterix differently and this can cause confusion.

•The example above shows what BPQ and UI-View will show, indicating that every address has digipeated the packet.

•Tiny 2 clones only put a * against the last digi with the H bit set, this should be the digi you heard.

The basics: Frame headers.

- BPQ:

 G0IZU>BEACON,SURB*,G8KPY*,ORP22*,G1EUC*,G7BKU*,G0TRT*

- Tiny-2:

 G0IZU>BEACON,SURB,G8KPY,ORP22,G1EUC,G7BKU,G0TRT*

- But if the frame is digipeated incorrectly, the Tiny-2 can produce a header like this:

 G0IZU>BEACON,SURB,G8KPY,ORP22,G1EUC*,G7BKU,G0TRT*

- G1EUC hears the packet for a second time from G0TRT

Notes:

- One of the main aims of APRS is to keep channel use low.
- Stations should strive to use as few digipeaters as possible to achieve this aim.
- All fixed stations must have an alias of RELAY.
- Each area must have one WIDE digipeater for linking to other areas.
- WIDE coverage should be as much as possible, in the UK, this will be in the region of 50 miles depending on terrain.
- WIDEn-n and TRACEn-n should only be enabled in "smart WIDEs" and no other stations.
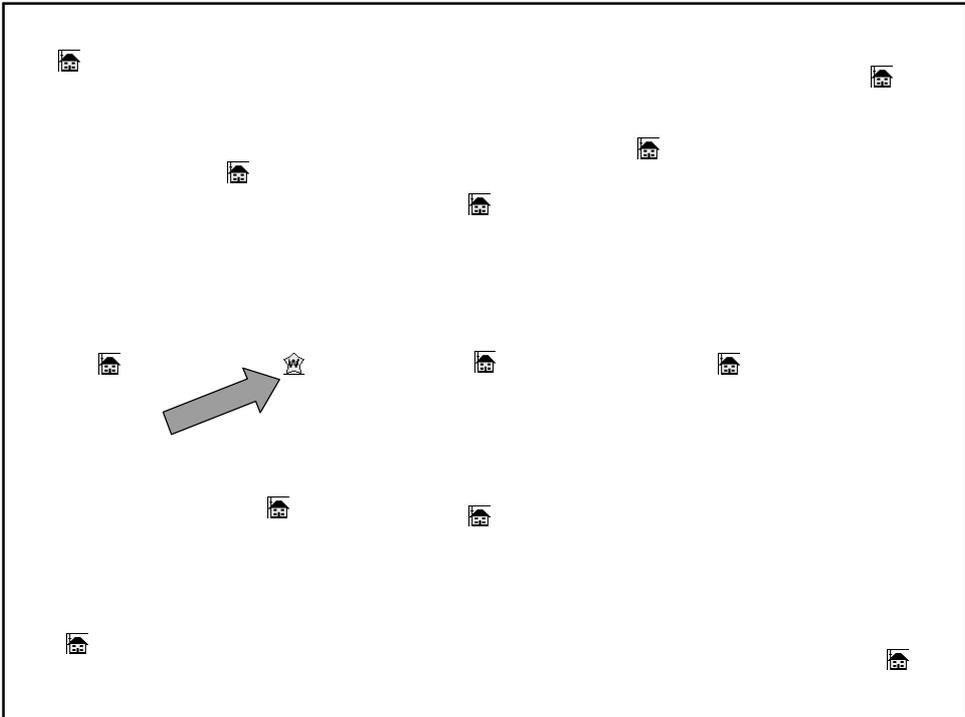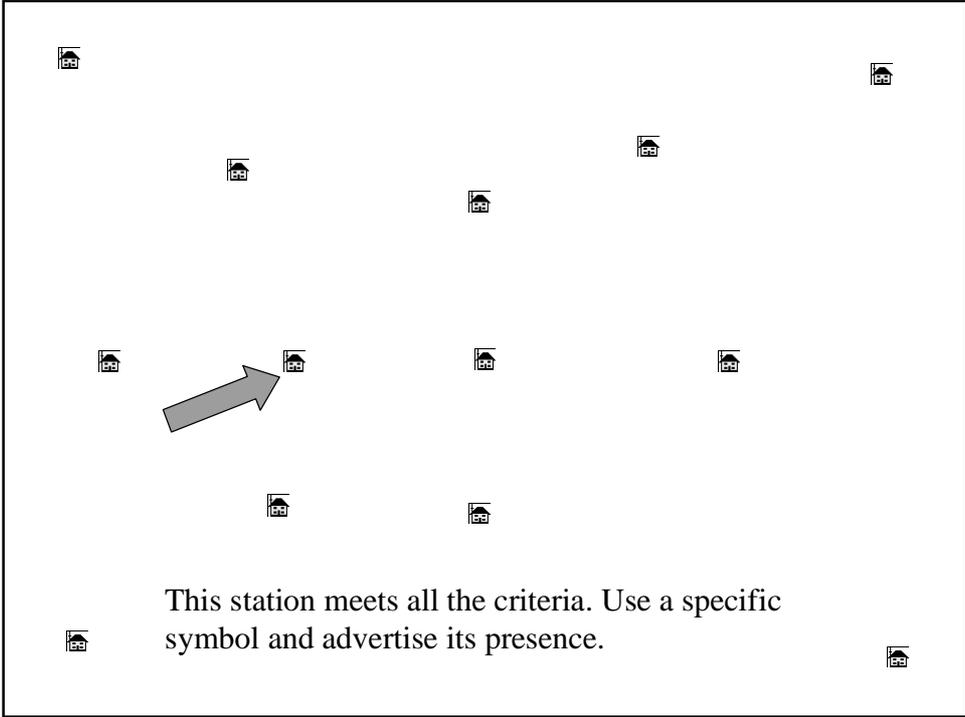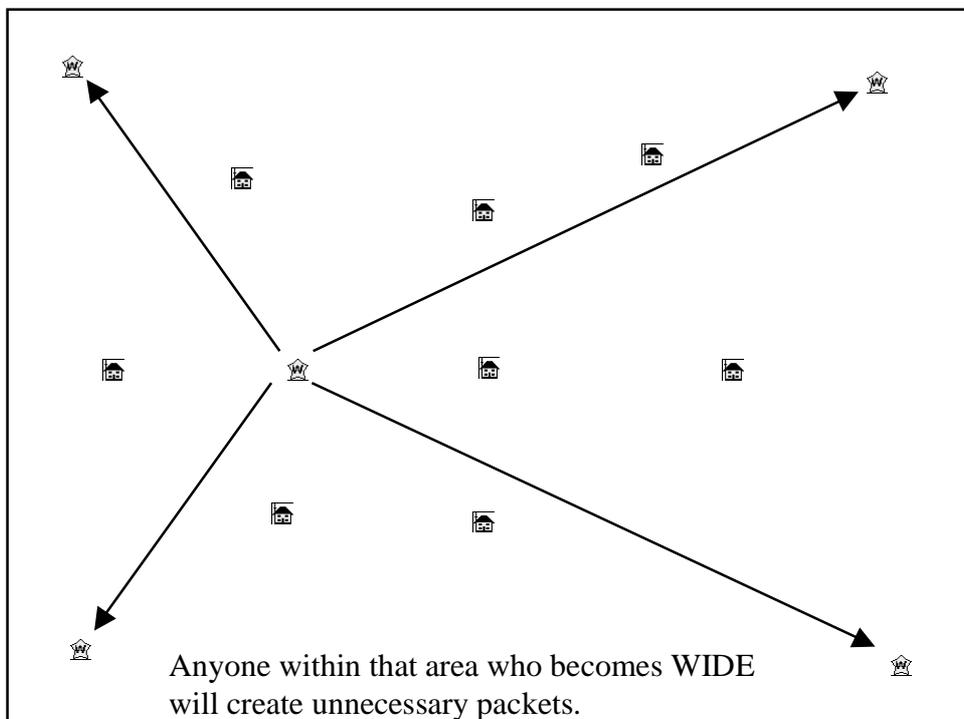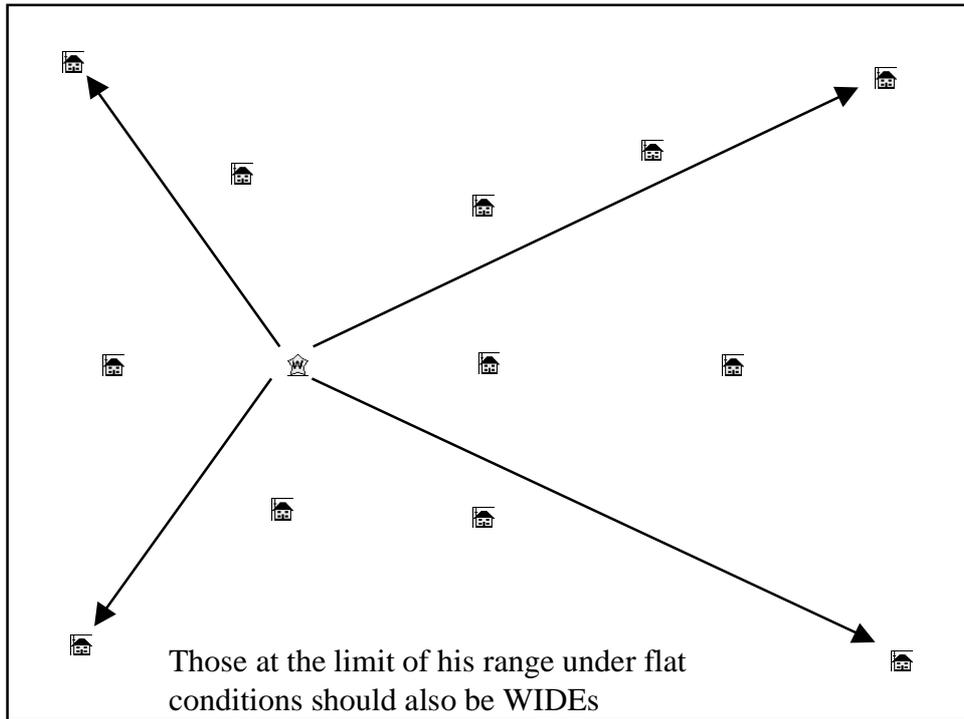- Fixed stations should never use RELAY in their unproto path.

Notes:

•Decide how far you want to be seen. Using CQ,WIDE,WIDE,WIDE,WIDE,WIDE,WIDE,WIDE is ok, but your beacon could travel around 300 miles if not further!

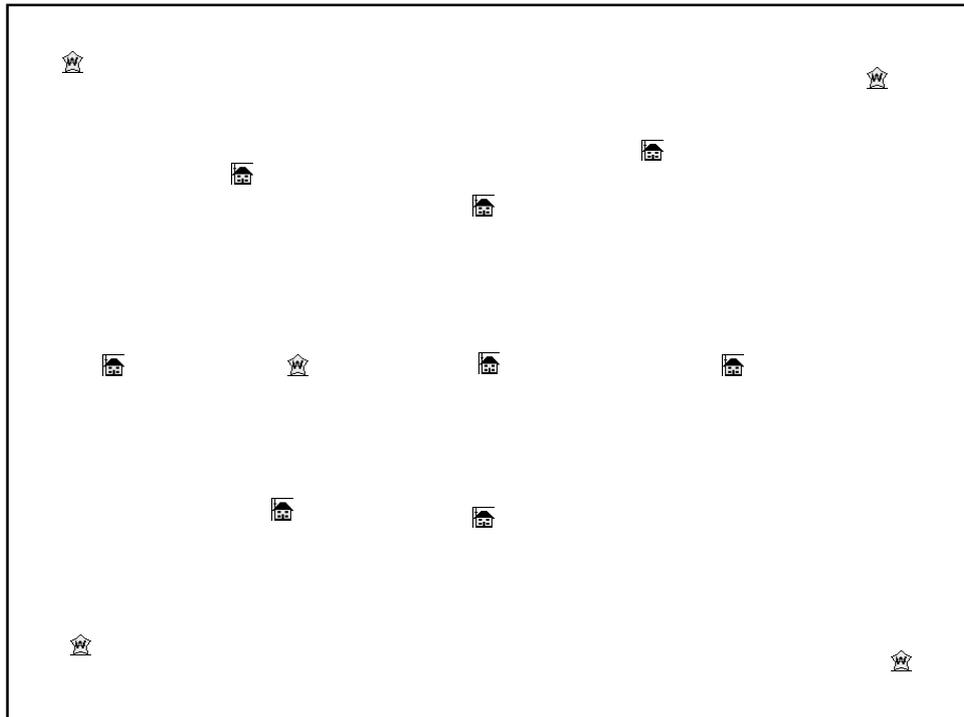•Where possible, enable alias substitution to help with path profile analysis.

Example 1 - Co-ordinating WIDEs

•The station with best wide area coverage that will be on 24 hours a day must be the area WIDE.

•Each WIDE must cover an area of 30-50 miles minimum under flat conditions.

•It must have RELAY and WIDE set as aliases, preferably with WIDEn-n and TRACEn-n set too.

Note: only the latest KPC tnc's have this ability for stand alone digis

This station meets all the criteria. Use a specific symbol and advertise its presence.

Those at the limit of his range under flat conditions should also be WIDEs

Anyone within that area who becomes WIDE will create unnecessary packets.

Example 2 - Setting your unproto path

•The idea is to use the shortest path to get into the WIDE network.

•If you can work a WIDE direct your path should be:

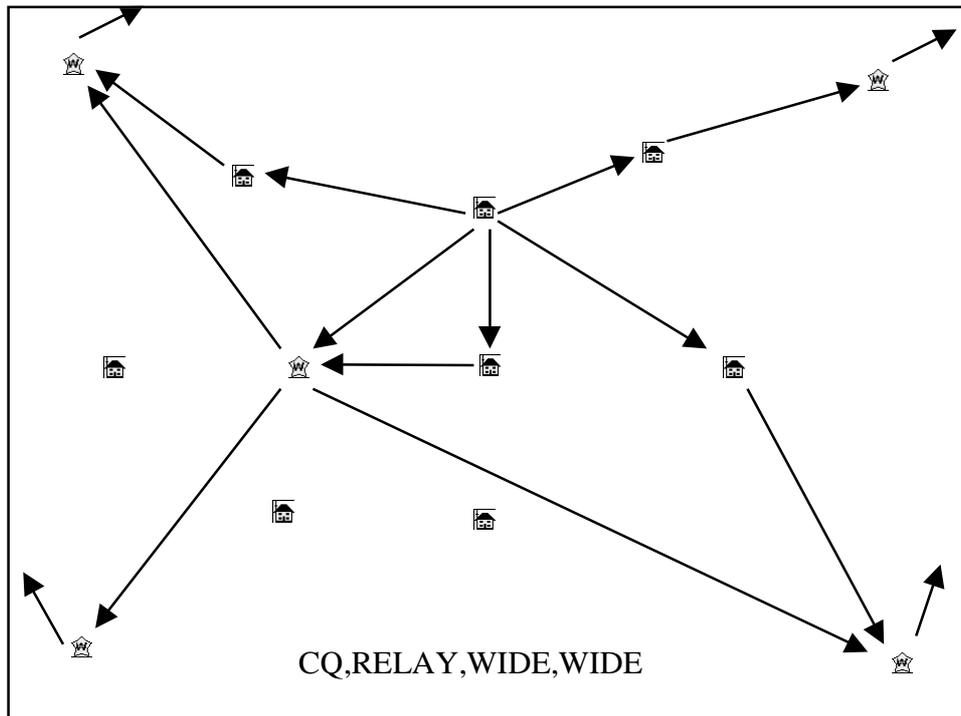APRS,WIDE,WIDE etc
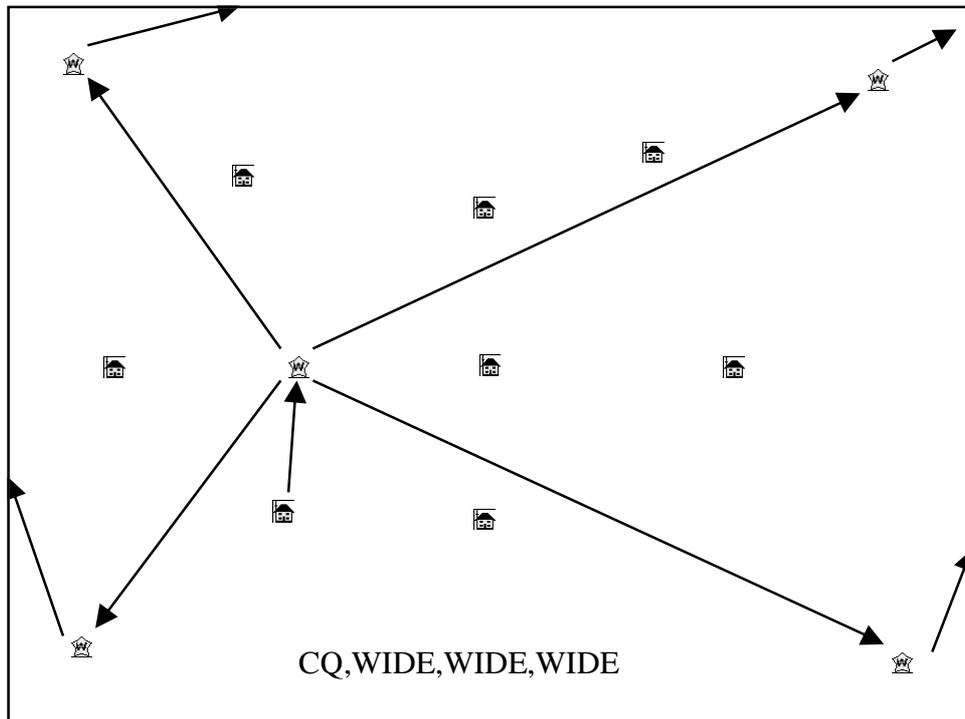
CQ,WIDE,WIDE,WIDE

Example 2 - Setting your unproto path

•The idea is to use the shortest path to get into the WIDE network.

•If you can work a WIDE direct your path should be:

APRS,WIDE,WIDE etc

•If you can't, use a specific station to get to the WIDE, eg APRS,G6ISY,WIDE,WIDE etc
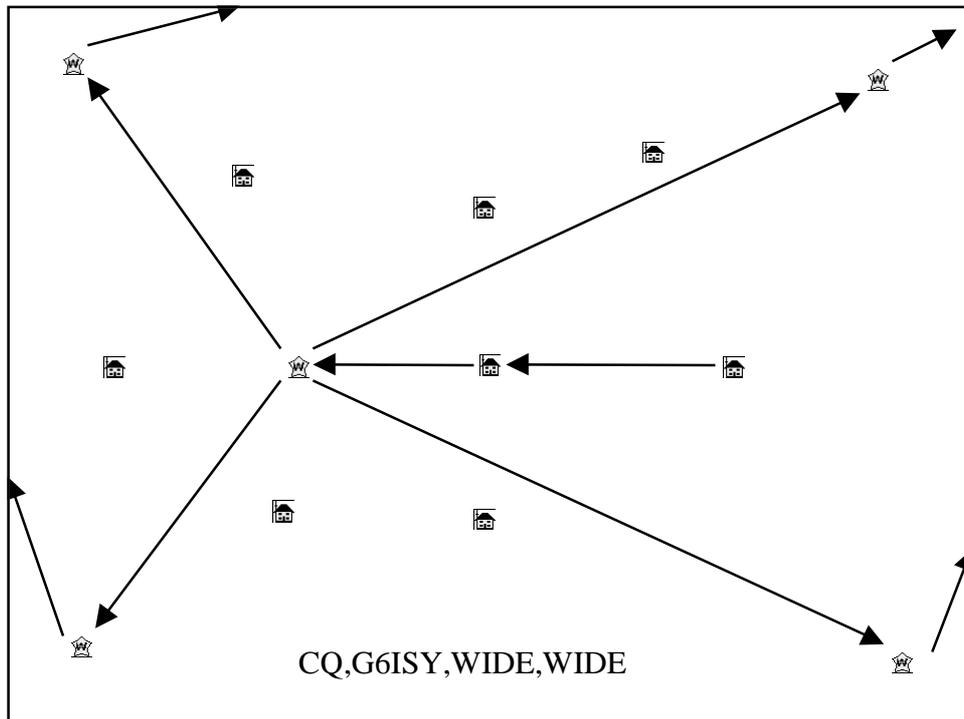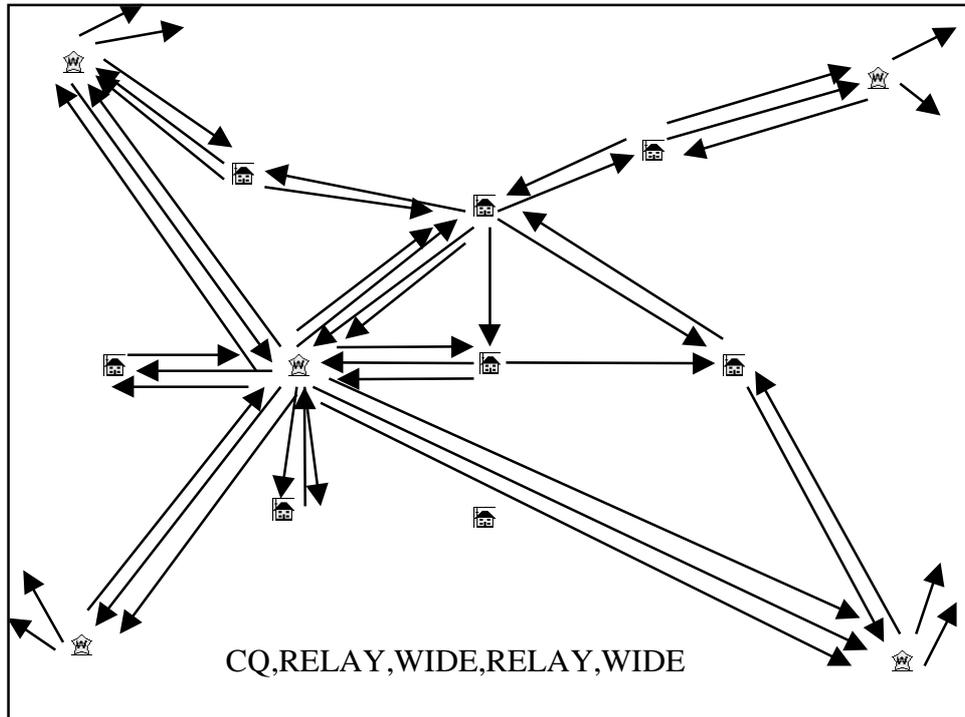
CQ,G6ISY,WIDE,WIDE

Example 2 - Setting your unproto path

- The idea is to use the shortest path to get into the WIDE network.
- If you can work a WIDE direct your path should be:

APRS,WIDE,WIDE etc

- If you can't, use a specific station to get to it to the WIDE, eg APRS,G6ISY,WIDE,WIDE etc
- DO NOT use RELAY, this is for mobiles only. Use by fixed stations causes too much QRM.

CQ,RELAY,WIDE,WIDE

Example 2 - Setting your unproto path (fixed stations)

•The idea is to use the shortest path to get into the WIDE network.

•If you can work a WIDE direct your path should be:

APRS,WIDE,WIDE etc

•If you can't, use a specific station to get to it to the WIDE, eg APRS,G6ISY,WIDE,WIDE etc

•DO NOT use RELAY, this is for mobiles only. Use by fixed stations causes too much QRM.

•Multiple RELAYs anywhere in an unproto path are SERIOUS QRM monsters…try and follow this….

CQ,RELAY,WIDE,RELAY,WIDE

Example 2 - Setting your unproto path (mobiles)

•The idea is to use the shortest path to get into the WIDE network.

•Assuming most fixed stations can work a WIDE, the easiest way is digi thru one.

•This is the reason for all stations setting their alias as RELAY.

•Even the low power tracker should now be able to get into the WIDE network using a path of :
APRS,RELAY,WIDE,WIDE etc
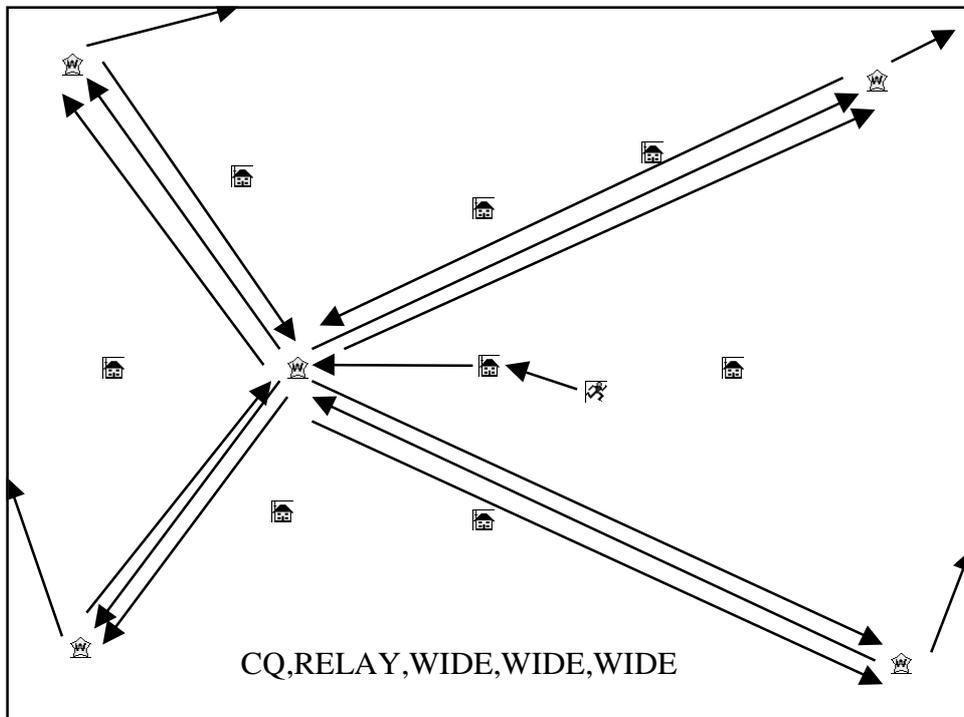
CQ,RELAY,WIDE,WIDE,WIDE

OR

CQ,RELAY,WIDE,WIDE,WIDE
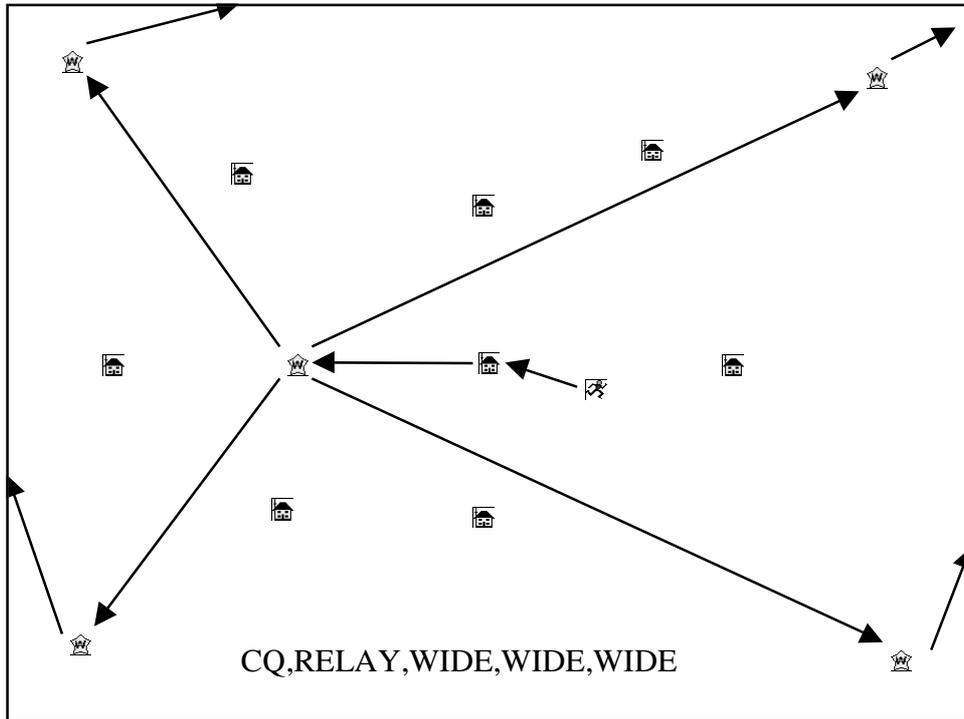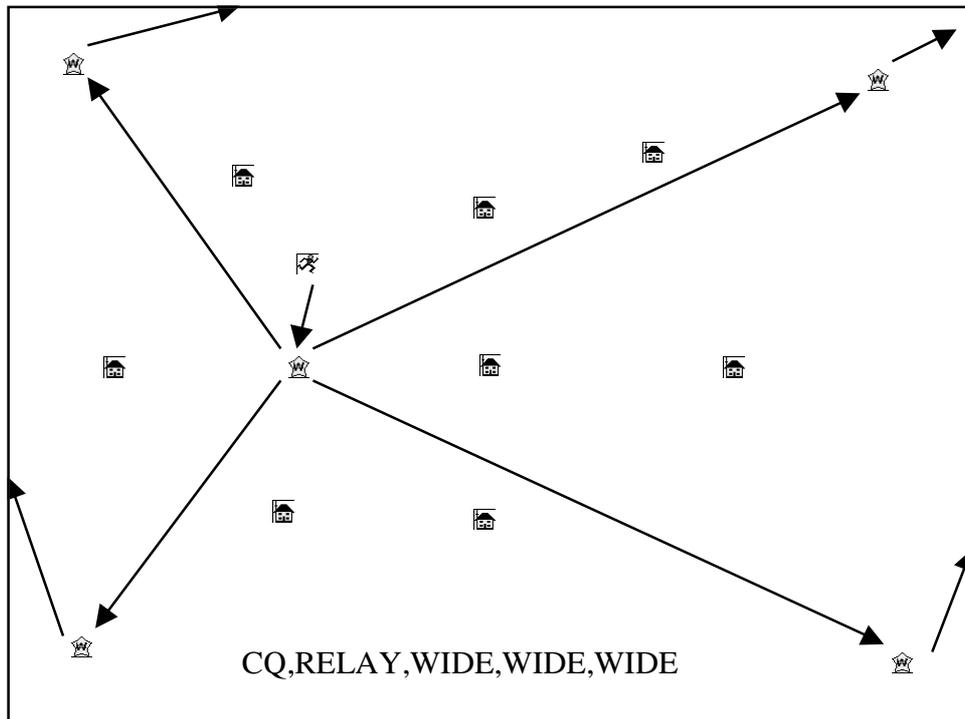
Notes:

•You should now hopefully see why aliases such as FIELD, HAT and NORTON are pointless. The only ones required are RELAY and WIDE, anything else makes manual tracing incredibly difficult.
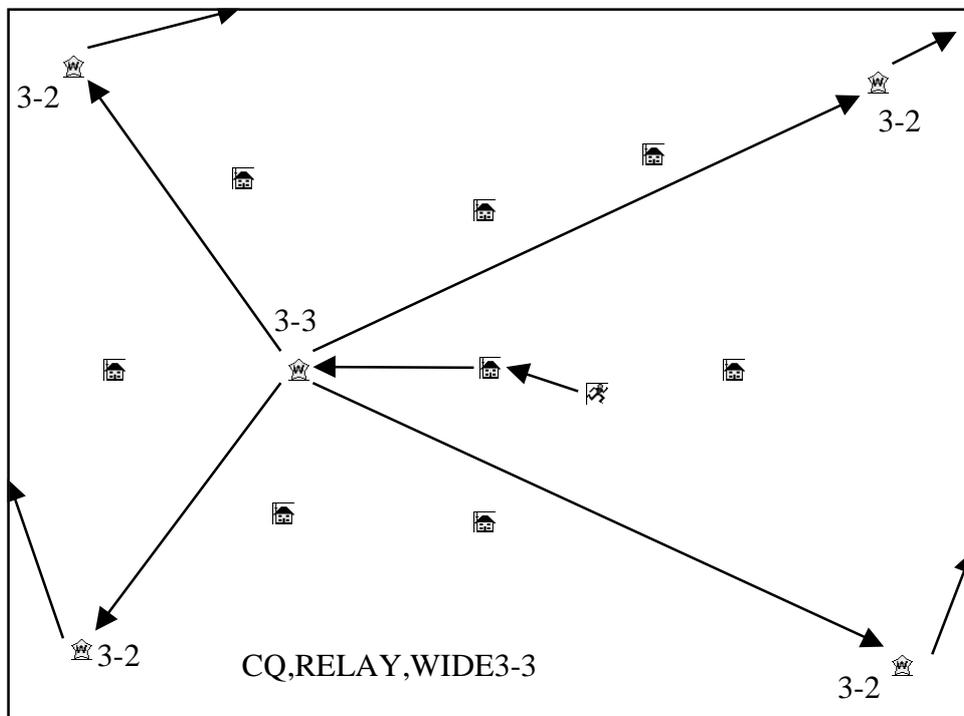
•So what about WIDEn-n and TRACEn-n?

WIDEn-n and TRACEn-n

•You may have noticed that paths like :
APRS,WIDE,WIDE,WIDE can also cause ping pong
problems:

CQ,RELAY,WIDE,WIDE,WIDE

WIDEn-n and TRACEn-n

•You may have noticed that paths like :
APRS,WIDE,WIDE,WIDE can also cause ping pong
problems:

•If the facility exists, WIDEn-n is better than WIDE because
it prevents ping pong; a WIDEn digi will only digi a
WIDEn-n beacon once:

3-2
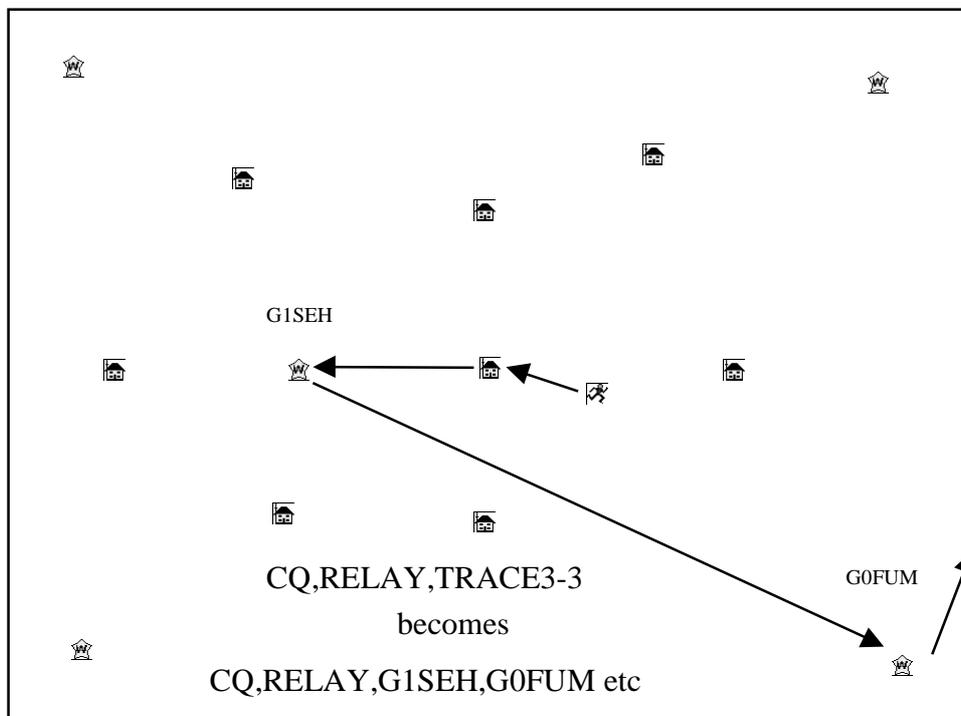
3-2
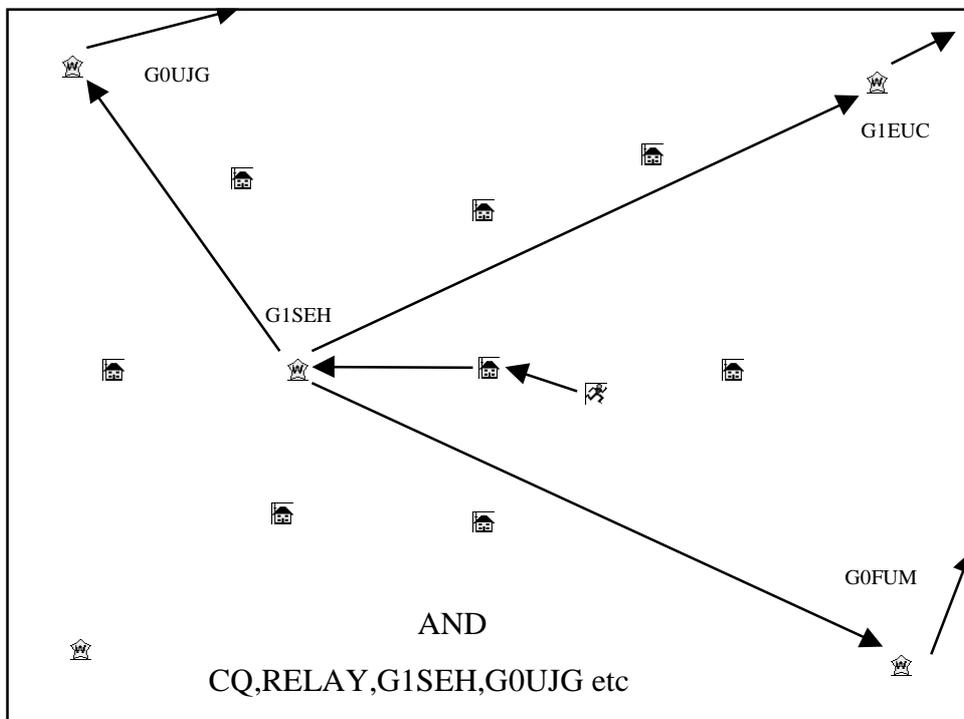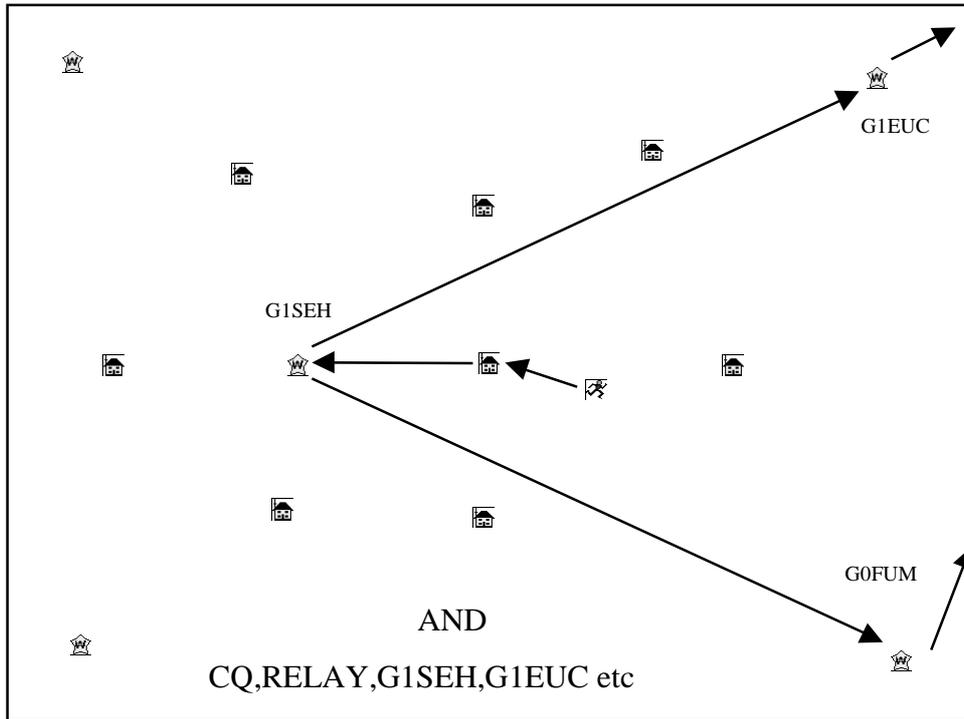
3-3

3-2

3-2

CQ,RELAY,WIDE3-3

WIDEn-n and TRACEn-n

•You may have noticed that paths like :
APRS,WIDE,WIDE,WIDE can also cause ping pong
problems:

•If the facility exists, WIDEn-n is better than WIDE because
it prevents ping pong; a WIDEn digi will only digi a
WIDEn-n beacon once:

•The only problem so far has been the inability to "see" the
path that a beacon has taken. TRACEn-n changes this by
substituting the station callsign in the digipeated frame:

G1SEH

CQ,RELAY,TRACE3-3

becomes

CQ,RELAY,G1SEH,G0FUM etc

G0FUM

G1EUC

G1SEH

AND

CQ,RELAY,G1SEH,G1EUC etc

G0FUM

G0UJG

G1EUC

G1SEH

AND

CQ,RELAY,G1SEH,G0UJG etc

G0FUM

AND

CQ,RELAY,G1SEH,G4NWJ etc

WIDEn-n and TRACEn-n

•You may have noticed that paths like :
APRS,WIDE,WIDE,WIDE can also cause ping pong
problems:

•If the facility exists, WIDEn-n is better than WIDE because
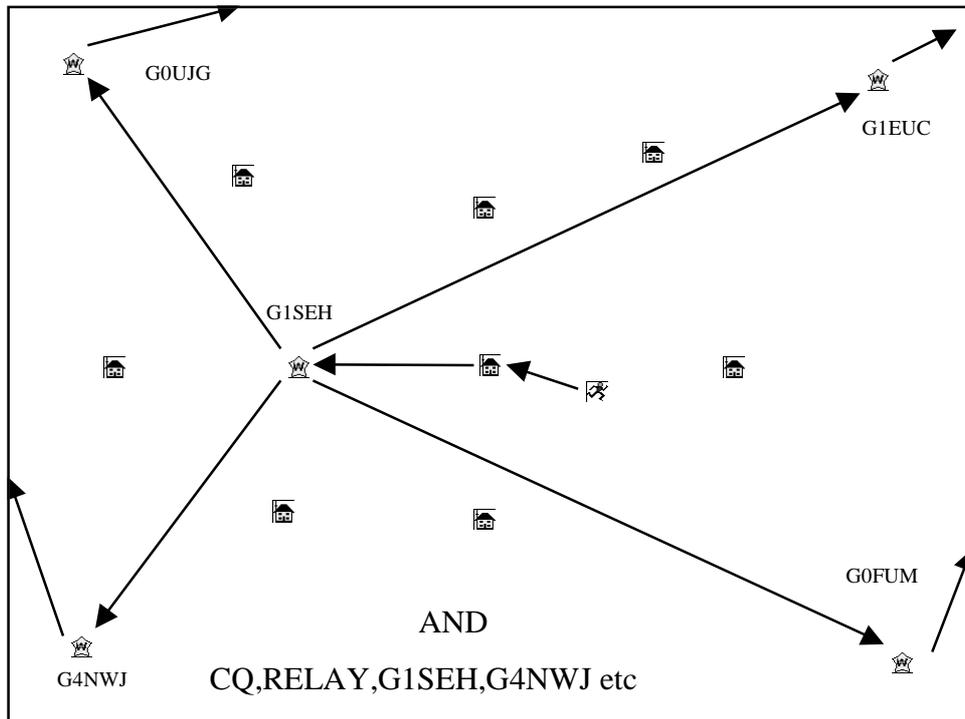it prevents ping pong; a WIDEn digi will only digi a
WIDEn-n beacon once:

•The only problem so far has been the inability to "see" the
path that a beacon has taken. TRACEn-n changes this by
substituting the station callsign in the digipeated frame:

•Each of these paths is uniquely traceable which has real
benefits for path analysis and messaging.

WIDEn-n and TRACEn-n

•So why don't all WIDE's enable TRACEn-n?

•All "smart WIDEs" should, but stand alone tnc's without these facilities can't provide it, unless a pc is used at the site.

•Because of this, all area's should make available, preferred settings for operating in their area.

Suggested symbology.

•To help everyone keep track of exactly what facilities digpeaters have available I suggest the following symbology:

•Use the number digi in UI-View, overlaying:

      W for WIDE

      N for WIDEn-n

      T for TRACEn-n

•Stand alone digis can achieve this by using the following position string:

!5207.36N*00058.01E#

•The * should be replaced with T N or W as required.

Summary

•Only mobiles use RELAY, and only once.

•Don't use unnecessary aliases, they just confuse manual path analysis.

•In a developed network, or an area that is being co-ordinated, don't enable WIDE, WIDEn-n or TRACEn-n without consulting the co-ordinators. As has been shown, you'll create too much QRM

•That said, many stations are experimenting with APRS as it's all very new and turning these features on. Whilst this is increasing channel loading, many stations are being seen at extreme ranges, often using all 7 digi's of a TRACE7-7 path! So why not carry on until co-ordination happens!

•DO enable RELAY!

Summary

Enjoy experimenting!

Enjoy your hobby!

Have fun!