Backup Access to the European Side of SATNET

Robert Braden

DISCUSSION

The purpose of this RFC is to  focus  discussion  on  a
particular Internet problem: a backup path for software
maintenance of the European sector of the Internet, for
use  when  SATNET  is partitioned.  We propose a
mechanism, based upon the Source Routing option of  IP,
to  reach  European  Internet sites via the VAN Gateway
and UCL.

This proposal is not intended as  a  standard  at  this
time.

## 1. Introduction

   During  several  previous  SATNET  meetings,  it  has   been
   observed  that  it  would  be  useful  for BBN to be able to
   access the European side of SATNET indirectly  via  the  VAN
   Gateway,  when  direct  SATNET  connectivity  has been lost.
   This  short  paper  proposes  a  possible  approach  to such
   "backup" access, using the source routing option of IP.

   Figure 1 illustrates the problem we wish to solve.   The  US
   host  H  is  used  for  diagnosis  and control of the SATNET
   SIMP's S1 and S2 as well as the gateways B and G and the UCL
   TAC (not shown, but connected to G).

```
                                 SATNET
                               (partitioned)
   ARPANET/SATNET                __    __               UCL
   Gateway              Simp (    \    \   )  Simp     Gateway
    ____               ___(      /    /    )___         ____
   | B  |__| S1 |       \    \       | S2 |_____| G  |_____ rsre
   |____|  |____|       /    /       |____|        |____|
     |      |____|     (     \    \      )            |
     |                  (__  /    /__)         _____|____
    _____|____                              (            )
   (            )                            (              )
   (    ARPANET     )                        (    UCL NET    )
   (            )                            (              )
   (_____)                            (            )
     |       |                                 (_____)
    __|_     |            VAN/                      .
   | H  |    |         Public Data Nets            .
   |____|    |          _____              .
   Diagnostic |        (             )             .
   Host     __|__      (    VANNET    )          _._____
   | VAN |* * (* * * * * * * *)*   * * * |      |      |
   | gw------(--- IP Tunnel -----)--------|  U   |
   |_____|* * (* * * * * * * * *)*   * *  |_____|
   VAN         (             )
   Gateway      (_____)
```
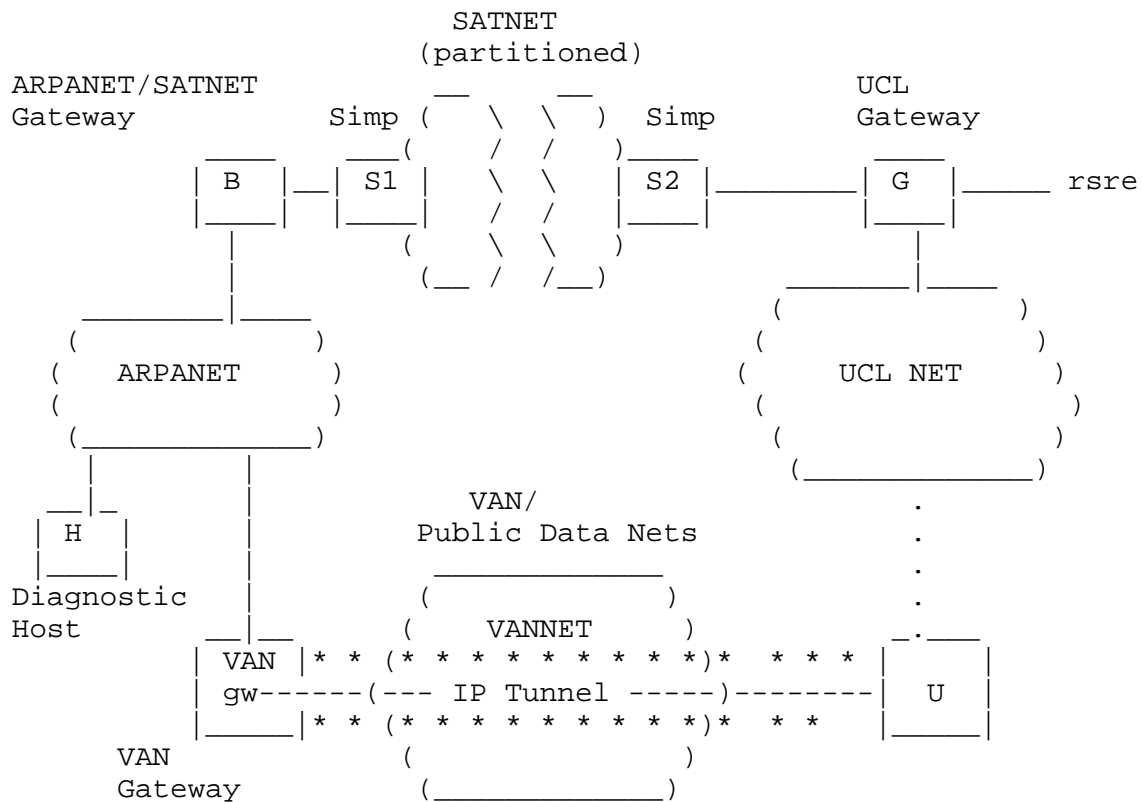
Figure 1. US/UK Connectivity with Partitioned SATNET

VANgw is the VAN Gateway which encapsulates IP datagrams  in
X25  packets for transmission over VAN/PTT virtual circuits.
The collection of these paths, called "IP tunnels"  by  UCL,
is  addressed  from  the  Internet  as  a  distinct network,
VANNET.

U is a UCL host,  the  Terminal  Protocol  Converter,  which
provides a path to UK X25 networks. However, to the Internet
world U looks like a host on VANNET, so the path from  U  to
UCLNET (shown dotted) does not appear to exist.

Now suppose SATNET is partitioned between S1 and  S2.   Then
we  wish  host H to be able to exchange IP datagrams with S2
via the "back door" path:

  H - Internet - VANgw - VANNET - U - UCLNET - G - S2

There are some important rules in this game, however.

  (1)    U may only be a host, not a gateway.

         This is because we do not want the Internet to route
         ALL  its  traffic (e.g. rsre traffic and UCL traffic
         that is required to use SATNET) via the  IP  Tunnel.
         So  the VAN Gateway (VANgw) must not discover it can
         get to UCLNET through U.

  (2)    To implement the  back  door  path  to  S2,  we  are
         willing  to have some special code in H and/or in U,
         but not in G, S2, or VANgw.

         Note: Jack  Haverty  is  allowed  to  violate  this
         assumption,  though  we  doubt that he will want to.
         But we must stick to it.

Given these constraints, we claim  that  the  only  possible
solution  is  to  "mung" the headers of IP datagrams at UCL.
Thus, when SATNET is partitioned:

  (1)    The IP addresses of S2,  G,  and  the  UCL  TAC  are
         unreachable  from  all US gateways. Therefore, if H
         sends  a  packet  addressed  to  one  of  these
         destinations,  it  will  be  discarded  and  an ICMP
         unreachable message returned.

(2)     Similarly, the IP address of H is  unreachable  from
        the  UK  side.   Hence, if the XNET debugger in a UK
        host emits a return  packet  addressed  to  H,  that
        packet will be dropped.

Therefore, the destination address of  each  packet  from  H
must be changed in order to reach the UCL side of SATNET (S2
or G), and the source address of each of these packets  must
be  changed  so  that  return  packets can reach H.  For this
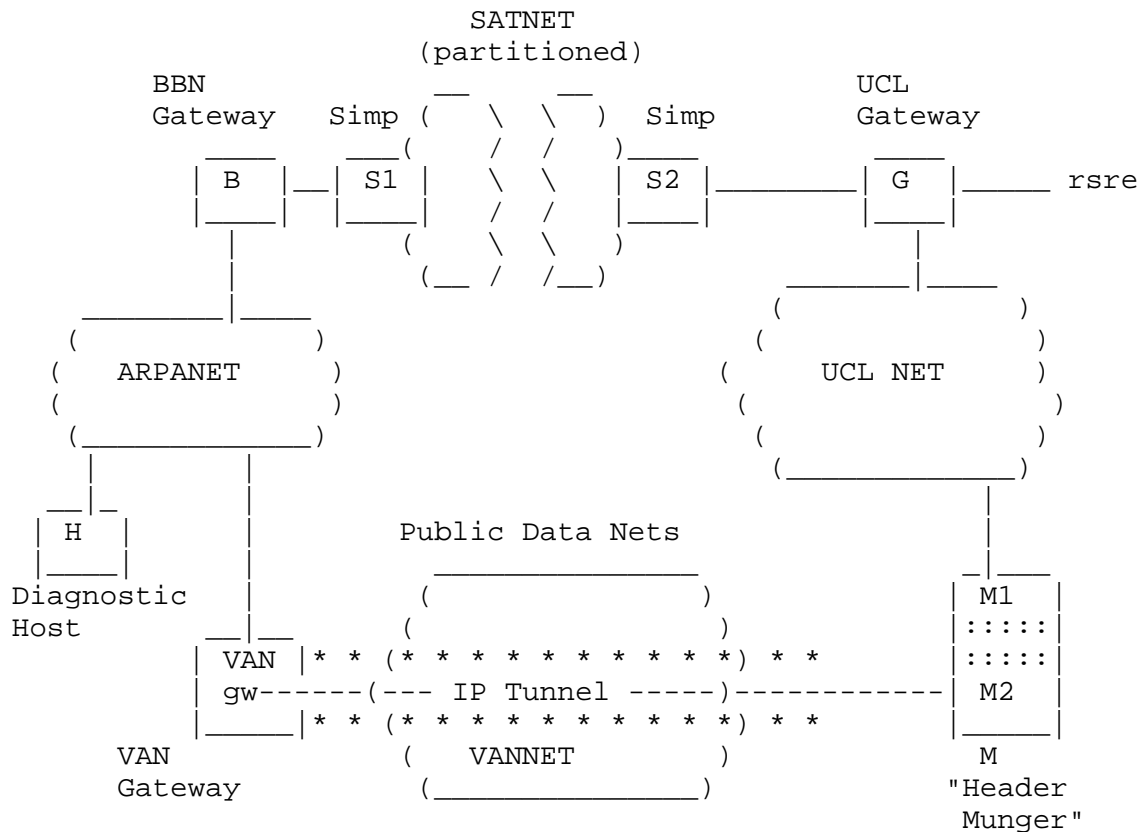purpose, we introduce the Munger host M  (see Figure 2).

```
                          SATNET
                        (partitioned)
            BBN            __    __                UCL
            Gateway  Simp (   \  \  )  Simp        Gateway
             ____    ____(    /  /   )____          ____
            | B  |__| S1 |   \  \   | S2 |_____| G  |_____ rsre
            |____| |____|   /  /   |____|         |____|
              |             (   \  \   )             |
              |            (__  /  /__)       _____|____
         _____|____                      (            )
        (            )                      (            )
        (   ARPANET    )                    (   UCL NET    )
        (            )                      (            )
         (_____)                      (            )
           |      |                           (_____)
         __|_     |                                |
        | H  |    |        Public Data Nets        |
        |____|    |        _____        _|___
       Diagnostic |       (               )      | M1  |
       Host       |      (                 )     |:::::|
              __|__ |* * (* * * * * * * * *) * * |:::::|
             | VAN |*  *(                   )* * |:::::|
             | gw------(--- IP Tunnel -----)-----------| M2  |
             |_____|* * (* * * * * * * * *) * *  |_____|
              VAN       (    VANNET        )        M
              Gateway   (_____)      "Header
                                                 Munger"
```

         Figure 2. Introduction of Header Munger at UCL


Host "M" (M1/M2) is mulit-homed, appearing  as  host  M2  on
VANNET  and  as  host  M1  on  UCLNET. Like host U (shown in
Figure 1), host  M2  is  the  end  of  an  IP  Tunnel  which
communicates with VANgw over an X25 virtual call.

Suppose for example that host H desires to  reach  the  XNET
debugger  in  the  SIMP  S2.   H  must send its packets with
destination address M1; these will be routed to M1 via VANgw
and  the IP Tunnel.  Host M will change the headers of these
datagrams to contain source address M1 and  destination  S2.
S2  will  return packets to M1, and M1 will change them back
to M2->H packets and launch them back through the VANNET  to
H.

How does M know how to change the headers?

  (1)    M could respond to a range of M1 and  M2  addresses,
         and have a fixed table of correspondence.

  (2)    We propose instead to use the SOURCE ROUTING  option
         in  the  datagrams.   This assumes that H is able to
         build source-routed datagrams, and is not upset that
         the intermediate host in the route is not a gateway.

         If we further assume that the IP layers in G and  S2
         can  handle  source and return routes, then the task
         is  simple.  M  must  contain  the  source   routing
         algorithm  of  a  gateway,  but otherwise act as two
         hosts (no routing updates, etc).

  (3)    Although G supports source routing, S2 and  the  TAC
         may  not.   In that case, S2 and the TAC will not be
         able to recognise the return  route  in  a  received
         packet  and use it as a source route in packets sent
         in reply.

         This possibility calls for additional complexity  in
         M, a combination of (1) and (2):

           *       In  the  US  ->  UK  direction,  the  Source
                   Routing option would be used.

           *       In  the  reverse  direction  (UK  ->   US),
                   mapping  of  datagram  addresses  would  be
                   controlled by a table in M.

            We suggest that M use source routing to get  packets
            from  H  to  S2,  and meanwhile build a "soft state"
            table showing this mapping.   When  a  packet  comes
            from S2 without source routing, M would consult this
            soft  state  table  to  discover  how  to  alter  the
            addresses to reach H again.  This would  allow  only
            one US host at a time to access a given SATNET host,
            but surely this is no restriction.


     In practice, M2 and U should have different IP  tunnels  and
     hence  different  DTE  addresses.  Since the caller pays the
     X25 charges, the IP Tunnel for U  will  normally  be  opened
     only  by UCL. On the other hand, the IP Tunnel to M2 will be
     opened from the US end.  Since UCL has only  one  PSS  line,
     this requires the use of separate X25 subaddresses.  The VAN
     gateway must handle 14 digit X121 addresses, as well  as  12
     digit addresses.


2. Acknowledgment

     Robert Cole of UCL  has  made  major  contributions  to  the
     contents  of this paper. In particular, he suggested the use
     of the Source Routing option.