A Few Observations on NCP Statistics

The NCP in use at HARV-10, CMU-10A, and CMU-10B collects a number of
operating and error statistics, which may be typed out on demand by
any user by means of the 'IMP ERROR' command, as shown on the sample
typescript.

   The figures shown cover the period since the system was last
   restarted. They are not logged or recorded in any more permanent
   form due to extremely limited on-line storage at HARV-10. where
   the software was implemented. However, due to the small size of
   the system and infrequent monitor development work, HARV-10 tends
   to stay up for periods approaching the interval between hardware
   maintenance, which is one week. The attached output was obtained
   after 168 hours system uptime.

There are a few things I would like to point out that may be of
interest to NCP implementers.

First, note that the number of discarded (unexpected) RFNMs is equal
to the number of simulated (timed out) RFNMs. This has been the case
almost every time I have looked at these statistics. It suggests
that the RFNMs are not being lost but are rather delayed beyond the
NCP timeout interval, which I believe is 30 seconds.

   I have heard talk among a few people in the Network community
   about "lost RFNMs", and would like to suggest this as a possible
   alternative explanation. Perhaps longer timeouts are in order.

Second, the observed ratio of received allocates to transmitted
allocates (on the order of two to one) is also fairly typical. I
believe this reflects differences in allocation strategies among
various hosts.

   Many hosts appear to send out an allocate for every data message
   received. While this is reasonable for connections such as FTP
   data transfer connections, it imposes considerable extra traffic
   in the case of the single character messages that seem to be the
   most common on the network.

The strategy used by the Harvard NCP is to assign a "desired level
of allocation" figure to each socket (typically quite small for
Telnet connections and large for FTP data connections; it is a
user program settable parameter). When the actual allocation for
the socket falls below 50% of this level, enough additional
allocation is sent to bring it up to the full "desired level".

The effect of this strategy is to significantly reduce the number
of allocates returned for a given number of small messages
received. This reduces both network traffic and control message
overhead at the other end. The strategy has no effect on FTP data
messages, since each message is usually large enough to reduce
outstanding allocation by at least half at a single blow.

Finally, I should remark on the appallingly large number of NOPs
received (typically 25% of all control messages). Most of these seem
to be piggy-backed onto other control messages, so the situation is
not as awful as the figures would indicate. Nevertheless, I am
forced to wonder why anyone would want to send so many.

TELNET typescript file started at THU 31 JAN 74 428:05

#harv-10 (settings loaded) is complete.#

Harvard 5.06A-18 7:28:38
Type "HELP" if you need it.

.login 62,#
JOB 2 Harvard 5.06A-18 TTY25
Your name please (last name first): Taft
You are logged in as 62,404000
0728 31-Jan-74 Thur
SCHEDULED PM ON THURSDAYS, 0830-1200 EOT

.imp error

NCP version 1573.1604 operating statistics

07:29:02 31-JAN-74

NCP (link 0) message errors:
Socket not found: 2184

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Improper state: 323
Illegal message type: 2
Last discarded allocation from PARC-MAXC (XEROX) link 12
Timed-out exec ICPs: 3

NCP messages:
Type Received Sent
NOP 81850 0
RTS 3688 2507
STR 2388 3562
CLS 6055 6059
ALL 183050 101442
GVB 772 0
RET 0 772
INS 109 0
ECO 7472 15426
ERP 15065 7472
ERR 2 0
RST 2782 226
RRP 162 2782

Received NCP error messages:
Type Count
4 2

Most recent error: type 4 from UCLA-CCN
Data (octal) 4 74 0 10 0 0 74 254 0 200
(decimal)    4 60 0  8 0 0 60 172 0 128

IMP data message faults:
Hardware fault: 2
Link not found: 8
Discarded RFNMs: 10
Simulated (timed out) RFNMs: 10

Received IMP messages:
Regular 590812
Err w/o id 3
NOP 4
RFNM 490095
Dest dead 366
Inc trans 52
IMP reset 2

Histogram of received data message sizes
Bits Count
<1 3
<16 146834
<32 39751
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```
<64 7044
<128 196983
<256 46099
<512 147609
<1024 534
<2048 1820
<4096 1152
<8192 2979

72 free buffers
7% average buffer utilization

.kjob/k
Job 2, User [62,404000] Logged off TTY25 0729 31-Jan-74
Runtime 0 Min, 03.29 Sec
```