                    RAND/UCSB NETWORK GRAPHICS EXPERIMENT

INTRODUCTION

   During the Network Graphics Meeting in July, several experiments were
   outlined to explore graphics over the Network. One of these was the
   use of the UCSB On-Line System (OLS) from graphic consoles at Rand.

   The connection was completed in the latter half of August and has
   been used on an experimental basis since then. OLS users from UCSB
   and TRW (in Los Angeles) have visited Rand and accessed OLS via Rand
   consoles and the Network. Thus, the first phase of the experiment
   was completed in August.

   We are still in the midst of the second phase of the experiment which
   involves cleaning up the initial implementation and reviewing and
   modifying our initial strategies for the OLS connection.

IMPLEMENTATION OF THE EXPERIMENT

UCSB

   UCSB has had a Network interface on the OLS for some time. For a
   description, see RFC #74. The descriptions in RFC #74 were modified
   to conform to current Network protocols (NCP and ICP) and to conform
   to what we considered a general graphics description.

   Basically, the OLS receives an EBCDIC-like input byte stream and
   generates an unstructured graphical output stream. These protocols
   will be documented at the completion of our experimentation and
   presented at the Network graphics meeting in October.

   The Rand Video-Graphics System (VGS) was used to access the OLS via
   the Network. The Video-Graphics System and its consoles are
   described in R-753-ARPA available from the Rand Reports Department.

   VGS consoles had been connected previously to the Network via the
   Rand Network Services Program (NSP). Originally, NSP was designed to
   afford NCP checkout features, logging in to and use of remote systems
   and access to UCSB RJE and UCLA RJS. An additional module was easily
   added to access the OLS.

Input to the OLS was done via a Rand tablet on a VGS console. Input
to the OLS module in NSP is accomplished by moving the tablet cursor
(not shown in the attached figures) which appears as a small dot on
the screen to the desired function button and pressing the tablet pen
down on the tablet.

Figure 1 shows the initial display from the OLS module. The top of
the screen has a feedback line, the remainder of the upper half is
the output display from the OLS, and the lower half is a large
sensitive area containing various function buttons (pic-table).

The sensitive areas fall into three classes:

>   (1) the right most column (CALL, CLOSE)
>   connects/disconnects to OLS over the Network.
>   The third function (COPY) generates hardcopy
>   via an SC 4060. (The figures are, in fact,
>   SC 4060 hardcopy.)
>
>   (2) The grid area contains the OLS function
>   buttons normally on a special function keyboard.
>   (See RFC #74.)
>
>   (3) The lower area allows entry of number,
>   characters and punctuation.

Figure 2 shows the login sequence to OLS and Figure 3, SIN and COS
curves from -PI to +PI generated by OLS.

Completion of the Experiment

We plan to present the experiment at the October graphics meeting in
two forms. First, a description of the protocols and techniques used
in implementing the remote network connection along with conclusions.
Second, we will make a film showing the use of the OLS from Rand and
present it at the meeting.

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     |               UCSB OLS INIT STATS                       |       | |Feed-
     |                                                         |       -+back
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     |                                                         |       | |Dis-
     |                                                         |       | |play
     |                                                         |       | |Area
     |                                                         |       | |
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     || 0 | I | II|III|IV | V |VI |VII|REL|CMX|SYS|USR|TYP|LST|CALL  | |
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     | +---+---+---+---+---+---+---+---+---+---+---+---+---+---+ |  Input
     | |LS |RS |REF|UP |DWN|EVL|SUB|MAX|MOD|NEG|CTX|ENL|CON|RPT|COPY | |But-
     | +---+---+---+---+---+---+---+---+---+---+---+---+---+---+ |  tons
     | |SIN|COS|LOG|EXP|PWR|ATN|ARG|DEL|CNV|ID |LOD|STO|ENT|   |     | |
     | +---+---+---+---+---+---+---+---+---+---+---+---+---+---+ |     | |
     | |CAS|   |   |   |   |   |   |DIS|<<<|BEL|   |ERS|RST|   |     | |
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     |        ABCDEFG        + = / #    12345                    | |
     |        HIJKLMN        , ; = .    67890                    | |
     |        OPQRSTU        <-<-<-<-   ()?                      | |
     |        VWXYZ b        ' \ \                              |-+
     +---------------------------------------------------------+
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|                                                            |
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|                                                            |-+
|                  UCSB OLS CONNECTED                        | |Feed-
|                                                            |-+back
|   ENTER USER NUMBER 196                                    |-+
|   ID NUMBER=                                               | |
|   USER NAME= ARPA                                          | |
|   JOB NAME= RAND/RFC                                       | |
|   AUTOSAVE CODE = 3                                        | |
|   LOAD MOLSF                                               | |
|   FILE LOADED                                              | |
|                                                            | |
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||PLS|MIN|TIM|DIV|SQ |SQT|CNJ|INV|DIF|SUM|PRD|SOR|PRD|TST|CLOSE| |
|+---+---+---+---+---+---+---+---+---+---+---+---+---+---+     | |Input
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|+---+---+---+---+---+---+---+---+---+---+---+---+---+---+     | |tons
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|        ABCDEFG        + = / #   12345                      | |
|        HIJKLMN        , ; = .   67890                      | |
|        OPQRSTU        <-<-<-<-  ()?                        | |
|        VWXYZ b        ' \ \                                |-+
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|           /            /        \            \     | |
|          _____ | |
|                                                    | |OLS
|          \        |         |          \           | |Dis-
|           \      /         /            \          | |play
|            \    /         /              \         | |Area
|             \  /         /                \        | |
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||PLS|MIN|TIM|DIV|SQ |SQT|CNJ|INV|DIF|SUM|PRD|SOR|PRD|TST|CLOSE| |Input
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||LS |RS |REF|UP |DWN|EVL|SUB|MAX|MOD|NEG|CTX|ENL|CON|RPT|COPY | |tons
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|        ABCDEFG       + = / #   12345                 | |
|        HIJKLMN       , ; = .   67890                 | |
|        OPQRSTU       <-<-<-<-  ()?                   | |
|        VWXYZ b       ' \ \                           |-+
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