

Network Working Group  
Request for Comments: 225  
NIC 7624  
Category: D.6  
Updates: RFC #74

E. Harslem Rand  
UCSB  
13 September 1971

## 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.

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

UCSB OLS CONNECTED																Feed-back																																																																										
ENTER USER NUMBER 196																OLS Display Area																																																																										
ID NUMBER=																																																																																										
USER NAME= ARPA																																																																																										
JOB NAME= RAND/RFC																																																																																										
AUTOSAVE CODE = 3																																																																																										
LOAD MOLSF																Input Buttons																																																																										
FILE LOADED																																																																																										
<table border="1"> <tr> <td>0</td><td>I</td><td>II</td><td>III</td><td>IV</td><td>V</td><td>VI</td><td>VII</td><td>REL</td><td>CMX</td><td>SYS</td><td>USR</td><td>TYP</td><td>LST</td><td>CALL</td> </tr> <tr> <td>PLS</td><td>MIN</td><td>TIM</td><td>DIV</td><td>SQ</td><td>SQT</td><td>CNJ</td><td>INV</td><td>DIF</td><td>SUM</td><td>PRD</td><td>SOR</td><td>PRD</td><td>TST</td><td>CLOSE</td> </tr> <tr> <td>LS</td><td>RS</td><td>REF</td><td>UP</td><td>DWN</td><td>EVL</td><td>SUB</td><td>MAX</td><td>MOD</td><td>NEG</td><td>CTX</td><td>ENL</td><td>CON</td><td>RPT</td><td>COPY</td> </tr> <tr> <td>SIN</td><td>COS</td><td>LOG</td><td>EXP</td><td>PWR</td><td>ATN</td><td>ARG</td><td>DEL</td><td>CNV</td><td>ID</td><td>LOD</td><td>STO</td><td>ENT</td><td></td><td></td> </tr> <tr> <td>CAS</td><td></td><td></td><td></td><td></td><td></td><td></td><td>DIS</td><td>&lt;&lt;&lt;</td><td>BEL</td><td></td><td>ERS</td><td>RST</td><td></td><td></td> </tr> </table>																0	I	II	III	IV	V	VI	VII	REL	CMX	SYS	USR	TYP	LST	CALL	PLS	MIN	TIM	DIV	SQ	SQT	CNJ	INV	DIF	SUM	PRD	SOR	PRD	TST	CLOSE	LS	RS	REF	UP	DWN	EVL	SUB	MAX	MOD	NEG	CTX	ENL	CON	RPT	COPY	SIN	COS	LOG	EXP	PWR	ATN	ARG	DEL	CNV	ID	LOD	STO	ENT			CAS							DIS	<<<	BEL		ERS	RST		
0	I	II	III	IV	V	VI	VII	REL	CMX	SYS	USR	TYP	LST	CALL																																																																												
PLS	MIN	TIM	DIV	SQ	SQT	CNJ	INV	DIF	SUM	PRD	SOR	PRD	TST	CLOSE																																																																												
LS	RS	REF	UP	DWN	EVL	SUB	MAX	MOD	NEG	CTX	ENL	CON	RPT	COPY																																																																												
SIN	COS	LOG	EXP	PWR	ATN	ARG	DEL	CNV	ID	LOD	STO	ENT																																																																														
CAS							DIS	<<<	BEL		ERS	RST																																																																														
<table border="1"> <tr> <td>ABCDEFGH</td><td>+ = / #</td><td>12345</td> </tr> <tr> <td>HIJKLMN</td><td>, ; = .</td><td>67890</td> </tr> <tr> <td>OPQRSTU</td><td>&lt;-&lt;-&lt;-&lt;-</td><td>()?</td> </tr> <tr> <td>VWXYZ b</td><td>' \ \</td><td></td> </tr> </table>																ABCDEFGH	+ = / #	12345	HIJKLMN	, ; = .	67890	OPQRSTU	<-<-<-<-	()?	VWXYZ b	' \ \																																																																
ABCDEFGH	+ = / #	12345																																																																																								
HIJKLMN	, ; = .	67890																																																																																								
OPQRSTU	<-<-<-<-	()?																																																																																								
VWXYZ b	' \ \																																																																																									

																OLS Dis- play Area																																																																											
<table border="1"> <tr> <td>0</td><td>I</td><td>II</td><td>III</td><td>IV</td><td>V</td><td>VI</td><td>VII</td><td>REL</td><td>CMX</td><td>SYS</td><td>USR</td><td>TYP</td><td>LST</td><td>CALL</td> </tr> <tr> <td>PLS</td><td>MIN</td><td>TIM</td><td>DIV</td><td>SQ</td><td>SQT</td><td>CNJ</td><td>INV</td><td>DIF</td><td>SUM</td><td>PRD</td><td>SOR</td><td>PRD</td><td>TST</td><td>CLOSE</td> </tr> <tr> <td>LS</td><td>RS</td><td>REF</td><td>UP</td><td>DWN</td><td>EVL</td><td>SUB</td><td>MAX</td><td>MOD</td><td>NEG</td><td>CTX</td><td>ENL</td><td>CON</td><td>RPT</td><td>COPY</td> </tr> <tr> <td>SIN</td><td>COS</td><td>LOG</td><td>EXP</td><td>PWR</td><td>ATN</td><td>ARG</td><td>DEL</td><td>CNV</td><td>ID</td><td>LOD</td><td>STO</td><td>ENT</td><td></td><td></td> </tr> <tr> <td>CAS</td><td></td><td></td><td></td><td></td><td></td><td></td><td>DIS</td><td>&lt;&lt;&lt;</td><td>BEL</td><td></td><td>ERS</td><td>RST</td><td></td><td></td> </tr> </table>																0	I	II	III	IV	V	VI	VII	REL	CMX	SYS	USR	TYP	LST	CALL	PLS	MIN	TIM	DIV	SQ	SQT	CNJ	INV	DIF	SUM	PRD	SOR	PRD	TST	CLOSE	LS	RS	REF	UP	DWN	EVL	SUB	MAX	MOD	NEG	CTX	ENL	CON	RPT	COPY	SIN	COS	LOG	EXP	PWR	ATN	ARG	DEL	CNV	ID	LOD	STO	ENT			CAS							DIS	<<<	BEL		ERS	RST			Input But- tons
0	I	II	III	IV	V	VI	VII	REL	CMX	SYS	USR	TYP	LST	CALL																																																																													
PLS	MIN	TIM	DIV	SQ	SQT	CNJ	INV	DIF	SUM	PRD	SOR	PRD	TST	CLOSE																																																																													
LS	RS	REF	UP	DWN	EVL	SUB	MAX	MOD	NEG	CTX	ENL	CON	RPT	COPY																																																																													
SIN	COS	LOG	EXP	PWR	ATN	ARG	DEL	CNV	ID	LOD	STO	ENT																																																																															
CAS							DIS	<<<	BEL		ERS	RST																																																																															
<table border="1"> <tr> <td>ABCDEFGH</td><td>+ = / #</td><td>12345</td> </tr> <tr> <td>HIJKLMN</td><td>, ; = .</td><td>67890</td> </tr> <tr> <td>OPQRSTU</td><td>&lt;-&lt;-&lt;-&lt;-</td><td>()?</td> </tr> <tr> <td>VWXYZ b</td><td>' \ \</td><td></td> </tr> </table>																ABCDEFGH	+ = / #	12345	HIJKLMN	, ; = .	67890	OPQRSTU	<-<-<-<-	()?	VWXYZ b	' \ \																																																																	
ABCDEFGH	+ = / #	12345																																																																																									
HIJKLMN	, ; = .	67890																																																																																									
OPQRSTU	<-<-<-<-	()?																																																																																									
VWXYZ b	' \ \																																																																																										

[ This RFC was put into machine readable form for entry ]  
 [ into the online RFC archives by Mark Davidson 1/00 ]

