SCIENCE AND ENGINEERING RESEARCH COUNCIL
RUTHERFORD APPLETON LABORATORY

COMPUTING DIVISION

D I S T R I B U T E D C O M P U T I N G N O T E 5 7 1

SECTION COMMUNICATIONS

Discussion Paper 2

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1. INTRODUCTION

This note should provide a basis for discussion concerning the DCS communication programme. The aim is to attempt the identification of areas critical to the implemetation of communication software, with due regard being given to the overall system environment.

Criticism and comments are welcomed, and will be used to provide information updates to this introductory note.

(APPENDIX 1 is a list of used acronym expansions.)

2. COMMON BASE POLICY

To quote [1],

" The Common Base Policy briefly is:

(a) common software base - portable tool kit written in PASCAL under UNIX operating system. User programs to be PASCAL or FORTRAN under UNIX.

(b) common hardware base - PERQ's, Cambridge Rings, PSS and SERCnet X.25 connections.

(c) common access to special tools - ie. network access to single site running service for special tool, eg. big machine dependent theorem proving system, GAELIC circuit design package. "

The common base policy is the initial phase for providing a standard of software and hardware distributed computing technology. It provides a benchmark for future technologies, whilst allowing a flexible evaluation of currently available techniques.

3. CAMBRIDGE RING LAN

It is intended to incorporate the Cambridge Ring de facto standard as the LAN basis. The ring will support SUS hosts and office automation systems, as well as backup and development machines, some of which will provide WAN communication using X.25 to PSS/SERCnet. (Figure 1.)

Future concepts in ring architecture will be to provide gateway and/or bridge links to other RALab site rings and WAN networks.

> (e.g. ERCC now have a working ring to X.25 gateway which if undertaken commercially, by SEEL, could be available on PDP 11/23's by 3Q 82.)

The development of LAN technology other than Cambridge Ring is not being actively pursued. But the progress of these alternative LAN implementations are being closely watched.

4. SUS OPERATING SYSTEM

A project being undertaken at CMU is for the definition and development of a Scientific Personal Interactive Computing Environment (SPICE). This has an operating system kernel known as ACCENT.

4.1 ACCENT

ACCENT provides a page swapped, multi processing (timeslice) operating environment, supporting system routines. There is also an ACCENT filing utility interface.

The ACCENT kernel (SPICE '81) will replace the current Qcode microcode of the PERQ, and a RALab implementation of UNIX (version 7) will sit on top of the kernel providing a UNIX user command interface to ACCENT.

5. RING NETWORK HOST HARDWARE

5.1 PERQ HOSTS

The SERC common hardware base policy is to use ICL supplied PERQ's.

The PERQ will provide the SUS's on the ring. They incorporate a GPIB (IEEE 488) to onboard Z80 communications controller. A RAL access logic board has been produced to provide the signal translation to a POLYNET ring node.

(Note: evaluation of similar SUS's will continue in parallel to PERQ development. e.g. APOLLO)

5.1.1 PERQ Ring Access

There are at least two choices available:

(a) Incorporate the GPIB Z80 interface in a mini-packet handler.

(b) Build a ring access logic IO board controller with onboard software for TSBSP, BBP, and mini-packet handling.

The Kent University ring software which contains a simple user interface, BSP, BBP, and mini-packet PASCAL code; has been changed to run PERQ PASCAL with a changed user interface and specific GPIB mini-packet handling code.

5.2 DEC HOSTS

The SYSTIME 11/34 UNIBUS and PDP 11/70 UNIBUS ring connections will utilise UMCZ80 access logic boards with onboard software provision for Basic Block handling and a DMA interrupt for interfacing to the host computer. The UMCZ80 connects to a POLYNET ring node.

The LSI 11/23 uses QBUS, this interfaces to POLYNET access logic providing mini-packet programme interrupt to host; ring connection is to a POLYNET node.

5.3 PRIME HOST

The PRIME 'D' has a Z80 hardware logic board which will provide the interface between the host and a POLYNET ring node, this will probably be produced by Acorn due to their JNT involvement.

5.4 GEC HOST

A GEC ring interface consisting of a Direct Memory board with upto 4 ring ports, will probably be provided by Acorn, since they have been involved in the standards definition by JNT. [1]

6. RING NETWORK HOST SOFTWARE

All host systems (where 'system' implies the complete ring hardware connection) will support TSBSP and BSP software. Session and application software (ISO levels 5,6,&7) for local and remote area networks is to include FTP, MAIL, JTMP and remote login facilities.

Inter-computer communication is to be made transparent to the user. Thus whether the utility is a LAN application, (e.g. Mail, Filing, Remote Login, etc), or a WAN application, (e.g. File Transfer, Mail, etc), the connection appears both permanent and single linked.

6.1 PERQ HOSTS

The PERQ will have a PERQ/UNIX OS as implemented at RALab; that is an ACCENT kernel with a UNIX user environment. This will support the facilities mentioned in Chapter 6 above.

Supported languages will be PASCAL, C and FORTRAN 77, these will be implemented with the PERQ OS changeover from POS to ACCENT. File transfer code implementing the Kent ring software of BSP and BBP with a changed MP handler suitable for RS232 interface has been tested successfully. This will take over from the currently used wetstring file transfer mechanism on the PERQ.

6.2 DEC HOSTS

Both the SYSTIME 11/34 and the PDP 11/70 will support UNIX, incorporating the facilities mentioned in Chapter 6 above. The UNIX OS supports C, FORTRAN 77 and PASCAL language compilers.

An RT11 OS is currently used to build a UCSD-PASCAL operating environment which is used for ring communication. When the clock board problem on this system has been solved by DICOLL, then the DCS Common Base policy of supporting UNIX can be implemented.

To cater for the new file transfer written for the PERQ, an interface must be developed to handle these file transfer requests from the PERQ.

6.3 PRIME HOST

The operating system is PRIMOS.

The access logic onboard control software has still to be written for ring communication, but this will probably implement BBP and TSBSP, and be written by Acorn due to their JNT involvement.

FTP77 and FTP80 implementations exist, written in FORTRAN, and are currently available with X.25 on SRCNET.

6.4 GEC HOSTS

GEC intend to provide TSBSP at some later stage. But, software for several different industrial versions of ring interface is likely to include BBP and TSBSP, and to be written by Acorn for RALabs.

7. X.25/PSS COMMUNICATION

An LSI 11/02 provides a communications front end processor to the SYS-TIME 11/02. This allows a YORK X.25 software & hardware implementation to communicate over SRCNET and inludes PSS access during the call level start up connection phase.

There is an existing problem of restricted UNIX kernel space when X.25 communication software is current, this restricts the operation of the UNIX OS. Two members of the UNIX User Group, Alan Mason and Jim McKie, are planning to issue an overlay kernel version of the UNIX OS, which could help alleviate the restricted kernel space during communications activity. In the near future, the communications FEP will be transferred to the PDP 11/70 and the SYSTIME 11/34 will be used for ring software development.

(Note: A back plane extension to UNIBUS on the PDP 11/70 will provide module space for communication to a FE SYSTIME 11/34.)

7.1 X.25/PSS PROTOCOLS

The latest version of the YORK UNIX PAD (version 2) uses XXX over X.25 only. This version also contains FTP77.

FTP80 and PAD with TS29 over X.25 will be available, possibly in 3Q 82.

Special "hooks" exist in FTP77, as supplied by UCL, which enable mail to be sent and received by using FTP77 as a transport medium. Thus "mail protocol" is FTP and not, as yet implemented, a separately defined pro-tocol.

8. PACX LINE CONNECTION

PACX connections are currently available to the SYSTIME 11/34, PDP 11/70 and PRIME systems. The PERQ operates in terminal emulation mode and thus cannot itself be called from PACX.

Using PACX connections from a PERQ to either the PDP 11/70 or SYSTIME 11/34 it is possible to execute a wetstring file transfer mechanism, which uses the PERQ FTP utility, but this is non-standard and is provided strictly as an interim facility.

9. HARDWARE REQUIREMENTS

Reference to Table 1 shows the storage media available for backup should the listed systems be attached to the ring.

10. SOFTWARE REQUIREMENTS

Reference to Table 2 provides data on the communications software requirement, and its present or future availablity.

11. CAMBRIDGE RING INSTALLATION (PERQ RING)

The cabling required to provide a PERQ Project Ring has been installed in buildings R27 and R30. Office and system connections are allocated as follows:

BUILDING R27

G6	David Duce	PERQ
G8	Keith Jeffry	PERQ
G10	Chris Wadsworth/Gill Jones	PERQ
G11/G12	Bill Sharpe/Keith Fermor	PERQ
G17	Ian Benest	PERQ
G18	Demonstration Room	PERQ
G21/22	DCS secretaries	PERQ & DIAMOND Word Processor
DCS Plinth		PDP 11/70, SYSTIME 11/34
ICF Plinth		PRIME "D"
Telecom (monitor unit)		

BUILDING R30

Rm 2	Trudy Watson/Liz Fielding	PERQ
Rm 7	Tony Williams/Colin Prosser	PERQ
Rm 8	Chris Webb/Jim Loveluck	PERQ
New DCS machine room		(will be as DCS Plinth)

The cable in R30 New DCS Machine room has been terminated to provide access to equipment which may be located at the furthest diagonal.

There are currently two sets of ring cables in R30 Rm 2, one of these has been left over from previous cabling demands and will be removed within the near future.

Future machine movements from the R27 DCS plinth to R30 New DCS Machine room have been allowed for by the movement of PRIME's from the ICF plinth to the R27 DCS plinth.

12. DISCUSSION POINTS

(1) How will the implementation of ACCENT effect existing software which utlises UNIX i/o.

(2) When will the requirement for access to ARPANET , for obtaining updates of ACCENT, become critical.

(3) Considering the following throughput data:

BSP->BSP 60K bits/s

BBP->BBP 600-800K bits/s

What consideration for protocol implementation should be taken considering possible backup requirements.

e.g. Using a light-weight protocol directly to BBP
for backup of PERQ systems.

(4) With an operational ring, what are the first and subsequent user facilities that need to be made available for general use.

e.g. Time of day & date server for UNIX systems.
Lineprinter spooling.
Diablo spooler.
Backup.
Name Server.

(5) Is there any additional hardware requirement for satisfying user facilities.

(6) Will PERQ's retain PACX lines for terminal emulation, and could PERQ's require parallel processing on PACX and ring.

(7) How urgent is the remote login facility, and who could be expected to write and develop the necessary software.

(8) Considering TSBSP to have both local and remote applications, which concept of its operation should be developed.

e.g. Local and remote are transparent applications
of incorporating the UNIX "device/file" concept,
where a remote host is treated similarly to a
local host.

13. PUBLICATIONS/REFERENCES

1. FORUM 195 computer newsletter - No. 20 Jan'82.

2. LOCAL AREA NETWORK
P.Bryant 18th Jan'82.

Figure 1

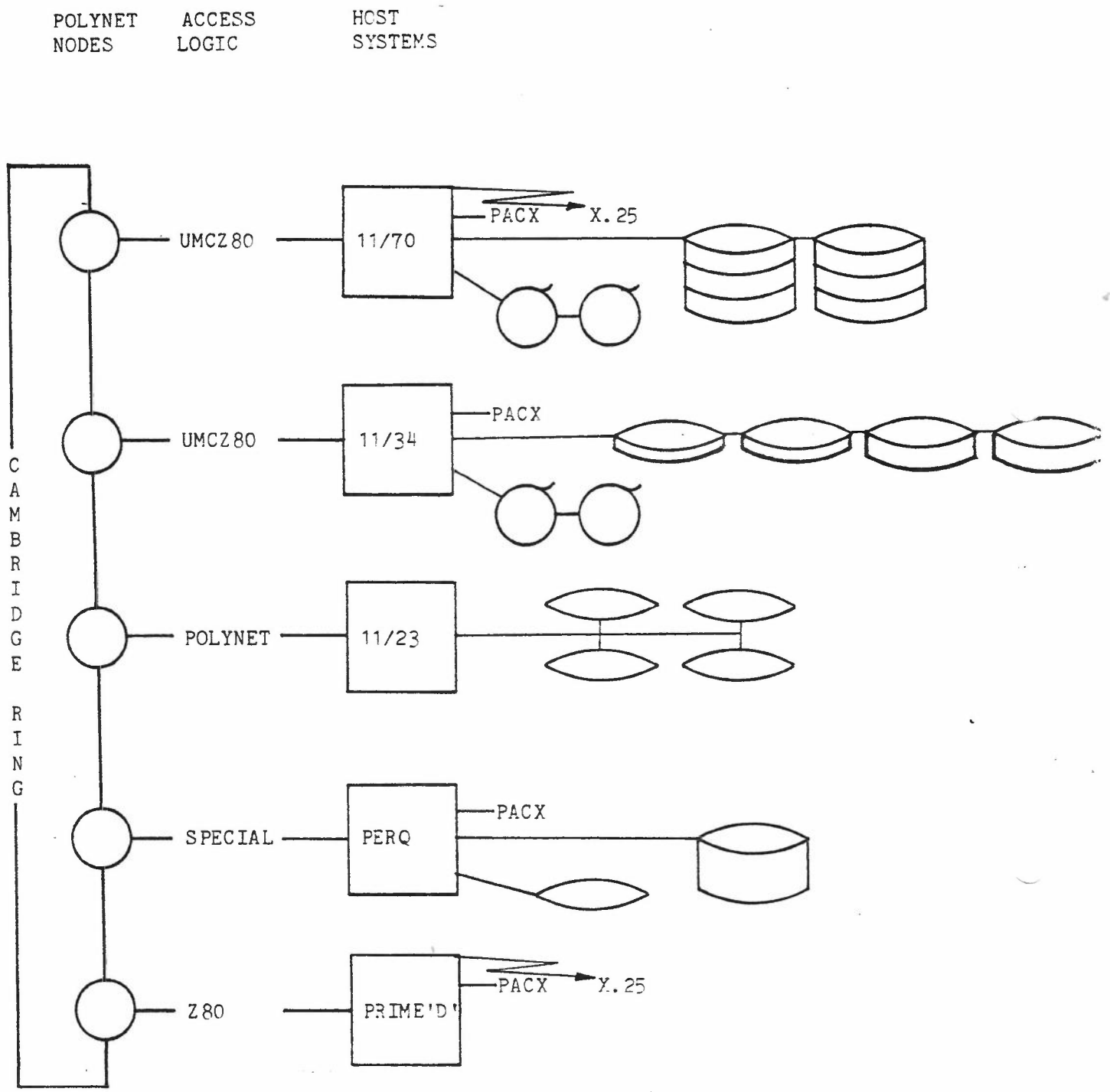
POLYNET NODES
ACCESS LOGIC
HOST SYSTEMS
CAMBRIDGE RING
UMCZ80
11/70
PACX
X.25
UMCZ80
11/34
PACX
POLYNET
11/23
SPECIAL
PERQ
PACX
Z80
PRIME'D'
PACX
X.25

TABLE 1

Backup distribution of storage media.

(See APPENDIX 2 for Floppy Disc Formats.)

SYSTEM	STORAGE MEDIA
PDP 11/70	two 67M byte multi disc packs one tape drive
SYSTIME 11/34	two 2.4M byte disc drives (cartridge) two 4.8M byte disc drives (cartridge) two tape drives
LSI 11/23	two 2.4Mb disc drives (fixed) two 2.4Mb disc drives (cartridge) four floppy disc drives
LSI 11/02 (DICOLL)	two floppy disc drives
PERQ	24M byte Winchester disc drive (fixed) one floppy disc drive

TABLE 2

Communications software requirements and availability

SOFTWARE	AVAILABLIITY	REMARKS
MP	now	MP handlers have been developed at RALabs for PERQ -RS232 for PERQ to PERQ and PERQ to PACX. -GPIB for PERQ to Cambridge Ring (interim).
BSP	now	versions in C and UCSD-PASCAL
BBP	now	versions in C, PASCAL, Macro 11
TSBSP	being written	U.of Strathclyde urgently require this, and will probably write a version. RALabs are also developing an implementation based on the Kent University definition.
X.25 + TS (PAD)	April '82	Coded at York U. - currently under test at RALabs and various Universities. At RALabs on PDP 11/34 with LSI 11/02 FEP.
MAIL	Easter '82	Coded at UCL - currently operating with spool queue interrogation facilities (ARPANET protocol.) FTP77 has a mail transport medium capability.
JTMP	Test version to be defined by Feb '82	Bristol U. are developing a "bare bones" system - this requires a similar "bare bones" FTP80 for in line testing. (No further information.)
FTP77	April '82	Coded at York U. - for UNIX using C & S interface for X.25 at RALabs. (Received but not yet implemented.)
FTP80	Easter '82	Being coded by York U. from FTP77 definition formulated at UCL.
REMOTE LOGIN	now	using a PACX line via SRCnet (ITP protocol)

APPENDIX 1

BBP - Basic Block Protocol

BSP - Bytes Stream Protocol

CMU - Carnegie Mellon University

ERCC - Edinburgh Regional Computing Centre

FTP - File Transfer Protocol

JTMP - Job Transfer and Manipulation Protocol

MP - Mini Packet

LAN - Local Area Network

POS - PERQ Operating System

PSS - Packet Switching Service

SUS - Single User System

TSBSP - Transport Service Byte Stream Protocol

WAN - Wide Area Network

APPENDIX 2

The following FLOPPY DISC FACILITIES copy is from a memo 18th January '82 under Computer Facilities (general) DCS index.

SUMMARY OF FLOPPY DISC FACILITIES

MACHINE	FLOPPY DRIVE	SIDES	DISC FORMAT	No. OF DRIVES
PDP11/70	none			
PDP11/34	none			
LSI11/23	AED6200	1	C	2
LSI11/23	RX02	1	A,B	2
LSI11/02	AED6200	1	C	2
Terak LSI11/02	RX01	1	B	2
PERQ	Shugart	2	B	1

Note: 'Sides indicates whether the drive can read one or two surfaces of a disc.

DISC FORMATS	A	B	C
Tracks per disc	77	77	77
Sectors per track	26	26	1-210 *
Bytes per sector	128	256	9380-1 *
Recording techniques	FM	MFM	MFM
Bit density at inner track	3200 bits/in	3200 bits/in	6200 bits/in
Capacity (8 bit bytes)	256,256	512,512	*

* Format is configurable and affects the capacity.

COMPATIBILTY

"A" is compatible with IBM 3740; "C" can be configured for compatibility, but not with any software available to DCS.