ECMWF

Local Networking Workshop 15 - 16 Dec. 1981

Summary

D.Dixon - W.Jensen

1. The keynote presentations

2. The manufacturers' presentations
Control Data Corp., Testdata/Network Systems Corp.

3. The sites' presentations

4. The discussion

5. Concluding remarks

A1. List of attendees

A2. Participant replies to questionnaire.

ECMWF'S workshop on the systems aspects of large mainframe interconnection was very well received throughout Europe. Many major European computer centres attended the workshop. The (only) two vendors of high bandwidth interconnecting mechanisms - CDC and NSC - presented their development plans for LCN and HYPERchannel. Professor André Danthine and Dr. Brian Wood gave keynote talks.

1. The keynote presentations

Professor André Danthine, of the University of Liège, Belgium gave a very clear review of the present state of the local networking "art". His personal comments on the past, present and probable future developments were of particular value. Some of the highlights from his presentation were:

- The area of local networks is one of extreme popularity. Everybody knows about them, but sometimes one forgets that in order to understand where we "go to", we should carefully consider where we "come from"!

- The Cambridge Ring (empty slot technique) seems well adapted for terminal support, but some of its characteristics could be rather unsuitable for bulk data transfer: only 2 data bytes in the minipacket, the "capture" of the destination station and the burdening of the host with the basic block protocol.

- The Ethernet bus (CSMA/CD technique) system is designed for data traffic between personal computers (or "intelligent" workstations). The data field length should be between 46 and 1500 bytes which by and large make it unsuitable for terminal traffic. The long expected Ethernet chip will be available mid 82 and commercially available early 83 (?). The high speed and reliability invites to put application oriented protocols on top of frame level Ethernet protocol.

- The NBS-net (National Bureau of Standards, US) is a 1 Mbps terminal-traffic oriented CSMA/CD bus network.
  HYPERchannel is a backend mainframe interconnection system (50 Mbps) well adapted to its purpose (!).
  Broadband media are very interesting in the context of interpolated services network, and star networks - e.g. PABXs - will be useful for some applications, say terminal traffic.

- The Token Ring access technique has received substantial attention among manufacturers, notably IBM!

- Broadsite - or campus - networks will involve use of several interconnection techniques and technologies at the same time: high speed bus and ring systems, medium speed (1 Mbps) terminal support networks and low speed internets (10-500 Kbps) also providing access to public and remote networks.

- Interconnecting local networks will continue to be important. The encapsulation/fragmentation techniques for packets are not possible to avoid as long as network protocols are different.

  X.25 is a suitable vehicle for interconnecting to PSS;
  HDLC " " " leased lines nets;
  X.21 " " " satellite channels

  The complexity of the protocols is reduced as the capacity and quality of the medium increases! The internet protocol - i.e. gateway to

gateway protocol - should be as simple as possible and encapsulate or embrace the various native protocol vehicles.

Brian Wood, chairman of the BSI group on Open System Interconnection gave a well prepared tutorial contribution to the standardization work and the OSI Reference Model in particular. The work in ISO on OSI services and protocols is divided between SC6 (the three lowest layers) and SC16. A corresponding working structure is found in BSI. The OSI Reference Model is an abstract structure well adapted as a framework for all kind of activities on data communications. It is not an implementation oriented construct, and the Application Layer could be considered as the intersection with the real world in terms of humans, computer programs and various real time processes.

The progress and acceptance of the standardization work on OSI sevices and protocols is encouraging. However, it is a very complex and comprehensive undertaking involving commercial and political pressures as well as difficult technical problems and reconciliation of scientific cultures.

Timescales for OSI Standards
(Circulation of draft proposals)

Management	Service & Protocols	1983-84
Job Transfer & Manipulation	SERVICE & Protocols	1984-85
Files	Service & Transfer Protocol	1983
	Access & Management	1984-86
Virtual Terminals	Service & Protocols	1984-85+
Presentation Layer	Service	1983-84
	Protocols	1983-84
Session Layer	Service	1983-4
	Protocols	1983-84
Transport Layer	Service	1982
	Protocols	1982-83
Network Layer	Service	1983
	Protocols	1983-84+
Data Link Layer	Service	1983-84
	Protocols	1983-85
Physical Layer	?	?

2. The manufacturers' presentations

Loosely Coupled Network (Control Data Corporation)

The Loosely Coupled Network is Control Data Corporation's high-bandwidth local networking product. It is offered as an integral part of the Cyber 200 range of high-performance mainframes, on which it is the only I/O mechanism available. Control Data are not marketing the LCN very vigorously as a product in its own right: there is at present only a single commercial site using LCN without a Cyber 200 mainframe.

LCN is a complete hardware/software system, consisting of the RHF (remote host facility) software package running on the mainframes, plus the NAD's (network access devices) which themselves incorporate a considerable amount of software and processing capability.

LCN and the Network Systems Hyperchannel have a common historical origin, but the integrated hardware/software approach of CDC has moved the NAD design further away from its original form, in the interests of simpler and more efficient software implementation. As currently embodied, NAD's consist of:

- A bus interface unit (up to 4 bus cables)
- A processor unit
- 64 kilobytes of buffer memory
- Internal software implementing what is described as levels 1 through 4 of the ISO protocol model.
- A 'Device' (i.e. computer) interface.

Code conversion is handled by special purpose hardware within the NAD. CDC claim to have implemented this while remaining within the spirit of the ISO model by passing through from the presentation layer the request for activation/deactivation of this feature.

The bandwidth of the system is nominally 50 Mb/s per installed trunk (up to 4 may be used), although user experience seems to indicate a maximum performance of 5Mb/s transferred through a single NAD.

Although the LCN trunk system is philosophically a CSMA/CD type of bus, bus allocation is additionally controlled by a protocol known by the acronym TRACE - Trunk Access Contention Elimination. This is a type of token-passing system in which the token permitting trunk use is implicitly held for a short, fixed time period (but longer than the maximum trunk transit delay) by

each NAD in turn. If a NAD initiates a transmission, token passing continues with the succeeding NAD on termination of that transmission: dummy transmissions are initiated from time to time in an idle network to maintain synchronisation. The effect of this feature should be to eliminate collisions, and to share opportunity of trunk access equally. There appears to be no provision for prioritised access.

The RHF software product is a considerable endeavour. Currently available for CDC, IBM and DEC machines, it provides support for transfer of queue files (including jobs) and permanent files. A user-callable interface is provided for constructing distributed application systems.

The cost of LCN appears to be around 45000 dollars per NAD (in the USA), plus a variable cost (9000-30000 dollars) per attached processor for the RHF package.

This package is currently the only commercial offering which includes the whole local network subsystem. The degree of adherence to ISO modelling in its protocol structure is not great, and some of the facilities offered are not yet very highly developed, but it demands attention simply by virtue of being first in the field.

Hyperchannel/Hyperbus(Network Systems Corporation/Tesdata Limited)

The basic specification of the hardware of Hyperchannel resembles LCN very closely. The trunk capacity is likewise 50Mb/s; up to 4 trunks may be attached to a single adaptor, and the adaptor contains similar functional components to the NAD:

- A bus interface unit (up to 4 bus cables)
- A processor unit
- 4 kilobytes of buffer memory
- Internal software implementing what is described as levels 1 through 3 of the ISO protocol model.
- A device interface. Network Systems have available device interfaces for a wide range of computers, and also for stand-alone peripherals.

Notice that the level of function implemented within the adaptor is lower than for LCN, and also that the amount of buffer memory is substantially smaller. This can give rise to blocking effects within the adaptor since the buffer resources are time shared between all logical communication paths via that adaptor. If a data receiver stops receiving without obeying the proper

protocol (external to the adaptor), the preceding message can remain stuck in the adaptor buffer, effectively disabling it.

The Hyperchannel system is closer to a pure CSMA/CD protocol than is LCN, but still has the concept of reserved time slots. The first time slot following a transmission is reserved for the receiver to reply: if no reply is forthcoming, there follows a series of reserved time slots in which each adaptor in priority order is given the opportunity to initiate a transmission. If no adaptor initiates a transmission, the time slots do not cycle indefinitely as in LCN; instead, the network reverts to free-for-all access, which may of course result in some collisions.

Network Systems Corporation has in the past not offered any kind of complete system based on its own network hardware. The limit of software support has been the supply of device driver subroutines for various mainframes, plus in some cases the support of packages allowing the driving of peripheral devices directly via Hyperchannel (i.e. effectively extending the host machine's own channel cables). To some extent this isolated point of view has been reflected in the company's hardware: the design of the adaptors has changed little since they first appeared, and changes which have been made were mostly by request of users of the equipment, rather than from the company's own initiative.

This situation is due to change this year, with the promised avaiability of a software package ('NETEX') which will implement ISO levels 4 and 5 within the host mainframe, plus generalised file transfer and network job entry utilities. A user-callable network interface is also planned. All of this is supposed to be available for at least 4 different mainframes (IBM, DEC, UNIVAC and CDC) by the end of 1982. If true, this represents a massive investment of development effort which must considerably enhance Network Systems' position in the marketplace as a complete system vendor.

Although prices are not yet available for the NETEX system, the hardware costs are broadly similar to those for LCN, being around 50000 dollars for one network adaptor. Costs are normally significantly higher in Europe.

Some material was also presented on the Hyperbus system. Although often referred to as though it were a low-bandwidth version of Hyperchannel, Hyperbus is in fact only suitable as a replacement for point-to-point wiring: there is no software-determined routing capability. The projected application for Hyperbus is in an office systems environment, where the connection of a terminal to some kind of service can be manually set on a thumbwheel switch. A server cannot receive and reply to messages from multiple requestors: the connection provided by Hyperbus is therefore of a functionally different kind from that provided by Hyperchannel, and a decision between the two on grounds of cost/performance is not possible.

Overall, Network Systems covers a much wider range of hardware than CDC, but at present cannot offer a complete system. If the NETEX product becomes available on time and is of good quality, Network Systems Corporation must become the foremost vendor of high-bandwidth networks. Whether this will in fact happen remains to be seen.

3. The sites' presentations

Appendix 2 contains some details about each attending organization and its (plans for) local networks.

- RESEARCH
  The Italian CNET project is a most comprehensive effort involving development of Express-net which is a unidirectional bus as well as programming tools for distributed applications. The Demos project at NPL,UK is a multiprocessor system which as byproducts has developed very fast Rings as interconnecting mechanisms.

- DEVELOPMENT PLANS
  All sites were in various stages of planning and development. Most of them were concerned with the very low level interfacing of stations/host to a HYPERchannel cable. Only a few have clear and consistent ideas of the application oriented sevices and the associated high-level protocols. The HYPERchannel based installation at RRZN, Hannover is from an architectural point of view rather specialized and the protocols are mostly ad-hoc. Similar considerations are valid also for the projects at University of Stuttgart which has installed both HYPERchannel and LCN hardware. However, the NICS subproject on interconnecting a variety of local and wide area networks seems to take on a more modern and open approach.

  The Technical University of Denmark has some very interesting ideas of combined development (HYPERchannel-based) and research (optical fibres) in the area of local networks. A particularly interesting approach is the interconnection of two high speed l.a.n.'s by a PTT-provided PCM system (2-8Mbps). Their plan also includes use of standard OSI protocols at the higher levels (Transport Layer and above).

- OPERATIONAL SYSTEM
  Although both the Civil Aviation Authority (CAA), UK and the University of London (ULCC) are still working on their local networks - HYPERchannel based cable systems - their actual experiences appear to be more comprehensive than the others. Both institutions are satisfied with the degree of service and help received from Tesdata/NSC, but they stressed that substantial proprietary on-site hardware competence was absolutely necessary to be able to operate HYPERchannel and the associated adaptors. ULCC was particularly conscious about OSI standards, and they were quite determined to implement the prevailing British "academic standards" for Transport, File, Job and Terminal services.

4. The discussion session

The discussion was unfortunately cut short since a number of workshop attendees had early flights to catch. However, a number of topics were raised and discussed briefly in the time available.

A fundamental requirement for local networking was identified as a file transfer facility of some kind. This is required for mass storage or graphics subsystems, for example. It is possible to envisage a step-by-step approach to local network file handling in which bulk file transfer is only the first stage, to be followed later by file access (record selection) and manipulation.

An application to application protocol is also necessary, at first simply because the file transfer will be implemented in terms of this. Transfer of short messages must be readily available to permit e.g. file integrity control and other administrative and system functions to be distributed within the network.

Some discussion took place on the user interface for a file transfer facility. A simple system based on cataloged control procedures can make the different access commands for the various machines in the network look compatible. Libraries of subroutines can do similar things for file access initiated from user programs. But it is not in general possible to provide a universal interface to all features of all operating systems which may exist in the network. There was no clear consensus on whether it was in fact necessary to hide from the user the non-homogeneity of the distributed system - one possibility which was raised was the provision of a simple 'universal' command/procedure interface for the unsophisticated user: the universal interface for sophisticated application is probably not capable of economic realisation.

File record extraction was not clearly seen to be a feature of the network - although in the case of very large files, it may not be economically possible, even with a high-bandwidth net, to transfer the entire file and allow the receiver to perform the extraction. Record selection is probably a desirable objective, but is from the point of view of the network an application rather than an inherent property.

The topic of file code conversion generated some heat. Most were agreed that holding all files in some kind of network 'Universal Code' was not feasible, except for purely coded files: the CAA representatives on the other hand suggested the conversion of all files to coded representation, effectively eliminating the problem. The use of built-in conversion hardware in the network adaptors was discussed. A problem with these is that real files often do not have the very simple record structure which is needed to allow a basic hardware facility to function well. Professor Danthine suggested the not uncommon and intuitively attractive scheme of effectively stamping each file with the type of data which it contains - leaving open the possibility of an

'undefined' data type whose interpretation is strictly the responsibility of the receiver. Further discussion appeared to indicate that this attractive approach would be at some variance with current proposals for file transfer standards.

The possibility of giving maintenance of all files in the network to some kind of dedicated file management processor did not seem to gain much support. One common criticism was that this approach will generate a single point of failure for the network.

The question of network software was debated at some length. There was no clear verdict on the desirability of standards for their own sake. The Loosely Coupled Network was thought moderately close, at least in spirit, to the standard: all Network Systems installations so far have been based on ad-hoc solutions. No-one present had any clear idea of the status and possible degree of standardisation of Massnet (from Masstor corporation, USA). In general, commercial software products with full compliance to standards were thought to be at least 5 years away. ULCC in particular thought that no available commercial product was suitable for their particular application.

5. CONCLUDING REMARKS

1. Only HYPERchannel from NSC/Tesdata and LCN from Control Data Corporation are commercially available network products designed to meet the requirements of very high speed local mainframe interconnection. They are both very expensive. The hardware of HYPERchannel is reported to require substantial attention and maintenance from the vendors as well as the customers. **NO** comprehensive experience with LCN is reported. In both cases the software - in particular for higher level services and protocols - seems to be inadequate. Both vendors announce future developments including service and protocol architectures adhering to OSI standards.

2. All major efforts within local networks seem to have accepted the OSI Reference model as an architectural framework for service and protocol structures. A common substantial problem is to select the best temporary protocols for the various layers. There will still be a few years before a full set of standards are approved.

3. There seems to be a consensus on the urgent need for adequate file transfer services in an environment of mainframe interconnections. Services for graphics and message handling, and also general facilities for user program-to-user program communications will be needed as well.

4. Most sites foresee the coexistence and operation of several networks,

e.g.:

- a remote network connection (most likely a public service)
- one or more mainframe interconnecting networks (>30Mbps)
- one of more medium speed networks interconnecting terminals, in particular intelligent ones (0.5 - 20Mbps)
- a campus network taking care of the inter local area network traffic; the campus network will be of medium to low speed (10Kbps - 5Mbps).

The various networks will be interconnected through user of special nodes: gateways. Use of standards will make interconnection simpler. All resources or servers should be accessed through locally programmable units; i.e. mass storage, graphics equipment or simple terminals should not be directly coupled to a fast physical medium.

5. Among the present sites, ULCC is the one that seems to be most appropriate for collaboration from the point of view of ECMWF, in particular on higher level protocols. The Technical University of Denmark is also very interesting, but their work is for the time being more research oriented.

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LOCAL NETWORKING WORKSHOP

15-16 December 1981

Lecturers

Prof. A. Danthine	Belgium
Mr. B. Wood	U.K.

Attendees

Mr. J.D.K. Reid	U.K.
Mr. G.T. Starkie	"
Dr. L.C.Y. Lee	"
Mr. J. Down	"
Dr. P.K.T. Vaswani	"
Dr. P.T. Wilkinson	"
Mr. J.C. Almond	Germany
Mr. P. Christ	"
Prof. Dr. H. Scheidig	"
Mr. H. Frick	"
Mr. S. Heinze	"
Mr. L. Fratta	Italy
Mr. I. Lucht	Denmark
Mr. J.A. Richter	"
Mr. P. Holm	"
Mr. O. Larsen	"
Mr. R. Tribes	France

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International workshop on High-Bandwidth Local networking

Dec. 15-16, 1981

Participants' Questionnaire

It would be of great assistance to the objectives of the workshop if you would kindly cooperate by completing this questionnaire and handing it in at the workshop. A set of the collated questionnaires will be distributed to workshop attendees.

Name and full postal address of organisation.

E.C.M.W.F.,
SHINFIELD PARK,
READING RG2 9AX
BERKS (U.K.)

Individual(s) connected with the networking project.

Peter Gray, Dick Dixon, Willy Jensen

Do you currently have networking hardware installed or on order?
(If so, what manufacturer?)

No

What range of data transfer throughputs will your application require?

~15 Mb/s in production enviroment

How many mainframe/large minicomputers will your network include?
(Again, what manufacturers?)

1x CRAY-1, 2x CDC Cyber + future enhancements.

Do you expect to use 'standard' protocols of any kind?

If available

Who is writing the network software for your installation?

Either commercial supplier or consultancy

What is the target date for operational service on the network?

1984-85

What benefits do you expect to achieve from installing a network?
(Please continue on a separate sheet if you wish)

1. Reduce impact of future equipment changes
2. Give more flexibility in planning
3. Allow new services to be attached to existing configuration
4. Improve reliability of interconnected system.

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Name and full postal address of organisation.

CERN, European Organization for Nuclear Research
1211 Geneva 23
Switzerland

Individual(s) connected with the networking project.

G.R. Macleod (CERNET project leader) and others.

Do you currently have networking hardware installed or on order?
(If so, what manufacturer?)

Installed, ModComp and CERN.

What range of data transfer throughputs will your applications require?

Up to about 20 Kbytes/second required, about 80 Kbytes/second available.

How many mainframe/large minicomputers will your network include?
(Again, what manufacturers?)

2 IBM, 2 CDC, 7 VAX, many minis (PDP-11, Nord 10, HP 21MX), ≋

Do you expect to use 'standard' protocols of any kind?

A gateway to X25 is being developed.

Who is writing the network software for your installation?

CERN.

What is the target date for operational service on the network?

CERNET has been ~~in production since~~ in service since 1978.

What benefits do you expect to achieve from installing a network?
(Please continue on a separate sheet if you wish)

More effective use of a variety of services offered on different computer systems.
A reduction in the use of magnetic tape for transferring small to medium quantities of data between computers. Notably for transferring computer programs.

Julian Blake.
1981/11/20

[illegible] workshop on Dec. 15-16, 1981
High-Bandwidth Local networking

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Name and full postal address of organisation.

[redacted]

Systèmes et Automatique
Institut d'Electricité
Montefiore, B 28
Université de Liège
au Sart Tilman
B - 4000 Liège (Belgique)

Individual(s) connected with the networking project.

DANTHINE A,

Do you currently have networking hardware installed or on order?
(If so, what manufacturer?)

Yes home built (4 MB/sec ethernet)
3 Com Controller 10 MB/sec (on order)

What range of data transfer throughputs will your application require?

System to System > 500 Kbits/sec But < 2 Mbits/sec for most cases.

How many mainframe/large minicomputers will your network include?
(Again, what manufacturers?) IBM 4341 (2)/ DEC System 20(1)
PDP 11/45 (?)/PDP 11/34/... PRIME VAX Eclipse and others

Do you expect to use 'standard' protocols of any kind?

Yes Ethernet DIX on Level 1 and 2
Internet on 3 / Tiowpt on Level 4 (extended ECMA) | FTP not decided

Who is writing the network software for your installation?

What is the target date for operational service on the network?

1982 for the first local nets 1983 for the backbone network.

What benefits do you expect to achieve from installing a network?
(Please continue on a separate sheet if you wish)

Try to organize the existing and coming equipments into a system

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Name and full postal address of organisation.

Volkswagenwerk AG
FO-IT, FE-Rechenzentrum
3180, Wolfsburg, Postfach, Germany

Individual(s) connected with the networking project.

K. Pasemann, H. Müller, S. Jordan

Do you currently have networking hardware installed or on order?
(If so, what manufacturer?)

PACX, Gandalf
Dataswitch, Develcon
Tie-Line (3266), NOS-NOS/BE-Link(618

What range of data transfer throughputs will your application require?

Up to 50 Mbps

How many mainframe/large minicomputers will your network include?
(Again, what manufacturers?)

CDC
DEC
IBM

Do you expect to use 'standard' protocols of any kind?

Yes, if available

Who is writing the network software for your installation?

What is the target date for operational service on the network?

What benefits do you expect to achieve from installing a network?
(Please continue on a separate sheet if you wish)

Avoid present bottlenecks
Share data between various applications

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Name and full postal address of organisation.

Imperial College Computer Centre
South Kensington
GB-London SW7 2BX

Individual(s) connected with the networking project.

P. WHITEHEAD, G. HORSNELL.

Do you currently have networking hardware installed or on order?
(If so, what manufacturer?)

No; currently writing Operational Requirement.

What range of data transfer throughputs will your application require?

50Mbit

How many mainframe/large minicomputers will your network include?
(Again, what manufacturers?)

2 to 4 CDC Cybers; some minis such as VAX and PRIME.

Do you expect to use 'standard' protocols of any kind?

Yes

Who is writing the network software for your installation?

Intend to use 'standard' software. E.g CDC if we buy LCN.

What is the target date for operational service on the network?

Autumn 83

What benefits do you expect to achieve from installing a network?
(Please continue on a separate sheet if you wish)

Interlinking of many computers, to provide easy, immediate access to a large file store.

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Name and full postal address of organisation.

Rechenzentrum der Universität des Saarlandes
D 6600 Saarbrücken

Individual(s) connected with the networking project.

H. Frick

Do you currently have networking hardware installed or on order?
(If so, what manufacturer?)

Yes. AEG-hardware together with
self made hardware and software

What range of data transfer throughputs will your application require?

present: 9.600 Bd
future: ~1 MBd

How many mainframe/large minicomputers will your network include?
(Again, what manufacturers?)

self made

Do you expect to use 'standard' protocols of any kind?

yes, HDLC Lap B

Who is writing the network software for your installation?

self

What is the target date for operational service on the network?

1984

What benefits do you expect to achieve from installing a network?
(Please continue on a separate sheet if you wish)

The advantages of linking all the university's computer facilities together is obvious.

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Name and full postal address of organisation.

Div^n of Numerical Analysis & Computer Science,
NATIONAL PHYSICAL LABORATORY
Queens Road, TEDDINGTON, MIDDLESEX TW11 0LW

Individual(s) connected with the networking project.

DR VASWANI, DR WILKINSON

Do you currently have networking hardware installed or on order?
(If so, what manufacturer?)

Yes, an experimental high speed parallel ring, developed by ourselves, with a Mark II version now under development.

What range of data transfer throughputs will your application require?

10 - 50 Megabits/sec (we do not have a specific application, as you mean it)

How many mainframe/large minicomputers will your network include?
(Again, what manufacturers?)

None — we are developing a multi-microcomputer system, the ring itself being processor independent.

Do you expect to use 'standard' protocols of any kind?

No — ours is a highly integrated system using specialised protocols (although the hardware could be used with standard ones)

Who is writing the network software for your installation?

Homegrown — not network software in the conventional sense, but tools for developing distributed operating systems.

What is the target date for operational service on the network?

Mk I prototype multi-mini now operational. (Ferranti Argus 700s)
Mk II system using micros by April 1982 (Intel 8086s)

What benefits do you expect to achieve from installing a network?
(Please continue on a separate sheet if you wish)

The high speed parallel ring development is part of the Demos multiple processor project which aims to produce flexible and reliable multi-microcomputer systems for a fairly wide range of applications. These are highly integrated systems which are programmed as a whole, in distinct contrast to network systems. Demos is an R&D project examining ways of producing better computer systems. We also hope that the ring will find use in other applications, including high speed networking.

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Name and full postal address of organisation.

SIA Computer Services
Ebury Gate
23 Lower Belgrave St.
London, SW1W 0NW.

Individual(s) connected with the networking project.

Glenys Gallagher, Martyn Wright, Manny Caruana.

Do you currently have networking hardware installed or on order?
(If so, what manufacturer?)

Installed - not currently operational
NSC Hyperchannel

What range of data transfer throughputs will your application require?

Mainframe channel speeds

How many mainframe/large minicomputers will your network include?
(Again, what manufacturers?)

3 in total : 2 x CDC 1 x IBM

Do you expect to use 'standard' protocols of any kind?

No

Who is writing the network software for your installation?

Combination of CISI (parent company) software plus own interface routines

What is the target date for operational service on the network?

First Phase : February 1982

What benefits do you expect to achieve from installing a network?
(Please continue on a separate sheet if you wish)

To become a full node and therefore an integral part of the CISINET network.

The system will provide :

1. Access to SIA NOS batch services for CISINET users (in Europe)
2. Access to CISINET batch services for all SIANET users (in UK)
3. Access to SIA NOS batch services for IBM protocol remote batch terminals.

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Name and full postal address of organisation.

C-NET Istituto di Elettrotecnica ed Elettronica del Politecnico di Milano
Piazza Leonardo da Vinci, 32 - 20133 MILANO, Italy.

Individual(s) connected with the networking project.

Luigi Fratta, Flaminio Borgonovo.

Do you currently have networking hardware installed or on order?
(If so, what manufacturer?)

NO.

What range of data transfer throughputs will your application require?

30÷40 Mbits/sec.

How many mainframe/large minicomputers will your network include?
(Again, what manufacturers?)

VAX II/780, OLIVETTI S6000, S3000

Do you expect to use 'standard' protocols of any kind?

The EXPRESS-NET protocol at the communication level, standard protocols at higher levels (OSI architecture).

Who is writing the network software for your installation?

What is the target date for operational service on the network?

Two networks, one in Pisa and one in Milano, should be operating by 1982. An interconnection between the two systems is also planned.

What benefits do you expect to achieve from installing a network?
(Please continue on a separate sheet if you wish)

C-NET is mainly a research project and therefore most of the benefits will be achieved in the design and implementation phases. As far as applications are concerned C-NET is intended to support office automation, banking, tele phone exchange and process control.

ECMWF

International workshop on High-Bandwidth Local networking

Dec. 15-16, 1981

Participants' Questionnaire

It would be of great assistance to the objectives of the workshop if you would kindly cooperate by completing this questionnaire and handing it in at the workshop. A set of the collated questionnaires will be distributed to workshop attendees.

Name and full postal address of organisation.

NEUCC Bldg. 305
Technical University of Denmark
DK 2800 Lyngby DENMARK

Tlf. +45 2 881277
Telex. 37529 dthdia dk

Individual(s) connected with the networking project.

Jørgen Richter, Henrik Vinther, Ib Lucht · etc

Do you currently have networking hardware installed or on order?
(If so, what manufacturer?)

CENTERNET X.25. RC-computer, PDP, IBM S/1.
planned installation of HYPERCHANNEL©. in 1982. +planned LAN (opt. fibers)

What range of data transfer throughputs will your application require?

6,4 Mbit/s single end-end. (20-140 Mbit/s aggregated.)

How many mainframe/large minicomputers will your network include?
(Again, what manufacturers?)

IBM, UNIVAC, CDC, PDP, ND, RC

Do you expect to use 'standard' protocols of any kind?

YES, FTP-B(80), latest TS (not ECMA TS), OSI standards whenever possible.

Who is writing the network software for your installation?

NEUCC, RECAU, RECAU, RC (+? HYPERCHANNEL (NSC)?)

What is the target date for operational service on the network?

1982.

What benefits do you expect to achieve from installing a network?
(Please continue on a separate sheet if you wish)

Equal access to available "services by name" independant of end-users physical location. (+savings in investments)

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Regionales Rechenzentrum fuer Niedersachsen (RRZN)
Wunstorfer Str. 14
D 3000 Hannover 91
West-Germany

Individual(s) connected with the networking project.

W. Heerhorst, S. Ludwig, E. Hinrichs, C. Otto, S. Heínze

Do you currently have networking hardware installed or on order?
(If so, what manufacturer?)
NSC-Hyperchannel (A110, A120, A510, A4xx {connection of Modcomp, DEC PDP-11 and development by TESDATA to connect a SIEMENS 7.536)
A120, A110, A510 in use since November 81

What range of data transfer throughputs will your application require?

50 Mbps

How many mainframe/large minicomputers will your network include?
(Again, what manufacturers?) (SCOPE 2.1) (NOS/BE 1.4) (RSX-IIM)
in the first step CY 76, CY 70, DEC PDP-11, Modcomp 7840 (MAXCOM)

Do you expect to use 'standard' protocols of any kind?

our first step will be a "quick" solution, but we are looking for a "standard"

Who is writing the network software for your installation?

HO53, HO42, HO32, HO31 from NSC, higher levels by RRZN or in cooperation with other sites

What is the target date for operational service on the network?

target date for acceptance 4 Q. 82, we hope to have operational service for the front end system at 1 Q. 83

What benefits do you expect to achieve from installing a network?
(Please continue on a separate sheet if you wish)

- smooth transition by installing new mainframes
- opening the Control Data environment to other manufacturers (tape subsystem, front end system, mass storage/file system)
- support of high speed data transfer (mainly file transfer) to minis at the institute of the university
- longer distances for the coupling of main frames and the connection of peripherals

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Name and full postal address of organisation.

CIVIL AVIATION AUTHORITY
NATIONAL AIR TRAFFIC SERVICES (DDP(ATS) K724)
CAA HOUSE
45-59 KINGSWAY LONDON WC2B 6TE

Individual(s) connected with the networking project.

JOHN REID (PROJECT MANAGER), GRAHAM STARKIE SOFTWARE ENGINEER

Do you currently have networking hardware installed or on order?
(If so, what manufacturer?)

BEING INSTALLED (COMPLETED FEB 82)
NETWORK SYSTEM CORPORATION (A220 and A400 Adapters)

What range of data transfer throughputs will your application require?

800,000 bits to 24M bits/sec. for current needs but this will increase by 50% towards the end of the 80s.

How many mainframe/large minicomputers will your network include?
(Again, what manufacturers?)

4 FRONT-END IBM 360/50s, A MAGNUSON M80, A PDP 11/70
PLUS 4 MINI COMPUTERS (TENDERS TO BE EVALUATED EARLY 82)

Do you expect to use 'standard' protocols of any kind?

NOT AT PRESENT BUT EXPECT TO USE X25 AND CIDIN
PLUS DECNET FOR BUREAU WORK ON THE 11/70.

Who is writing the network software for your installation?

IN HOUSE GENERALLY, EXCEPT FOR THE MINICOMPUTERS TO BE PURCHASED FOR TWO NEW PROJECTS WHICH WILL BE SUPPLIED WITH SOFTWARE.

What is the target date for operational service on the network?

OCTOBER 1983

What benefits do you expect to achieve from installing a network?
(Please continue on a separate sheet if you wish)

- STANDARD INTERFACE FOR THE FLIGHT DATA PROCESSING SYSTEM (360/65s and 360/50s) AT THE LONDON AIRTRAFFIC CONTROL CENTRE (LATCC)
- STANDARD INTERFACE FOR NEW SYSTEMS INTRODUCED TO LATCC
- IMPROVED METHOD OF TESTING, DEVELOPING AND IMPLEMENTING NEW SOFTWARE DELIVERIES WITHIN AN OPERATIONAL ENVIRONMENT
- REDUCED DEVELOPMENT TIMES FOR THE IMPLEMENTATION OF NEW SYSTEMS.
- REDUCE THE IMPLEMENTATION PROBLEM OF TRANSITIONING FROM THE OLD TO THE NEW SYSTEMS.

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Name and full postal address of organisation.

Paul Christ Rechenzentrum Univ. Stgt.
Pfaffenwaldring 57
D 7 Stuttgart 80
Tel. 0711 - 784 - 2515

Individual(s) connected with the networking project called NICS

Dr. Christoph Leser, Dr. Liza Golka, Erna Heinzelmann, Horst Bannas, K.-D. Mayer

Do you currently have networking hardware (i)nstalled or on (o)rder?
(If so, what manufacturer?)

1. NSC Hyperchannel (i) (CYBER 174 - PDP-11 in Production)
2. CDC LCN (i) (CYBER 174 - PDP-11 just installed)
3. ETHERNET by Interlan (o) (to be installed 2182)

What range of data transfer throughputs will your application require?

1. Mini to Mainframe filetransfer ~ 1Mbit/sec
2. CRAY 'frontending' ~ 10Mbit/sec

How many mainframe/large minicomputers will your network include?
(Again, what manufacturers?)

1. Project NICS : DATEX-P (X.25) ↔ PDP-11 ↔ LCN ↔ CYBER 174 ↔ Intel 432 ↔ ETHERNET ↔ PDP-11
2. "The next mainframe" := IBM 3081 + CRAY (still pending) (+ NICS)

Do you expect to use 'standard' protocols of any kind?

1. Project NICS : on LCN CDC's protocols; ETHERNET + L3 (still open) + (L4 = PIX ML, L5-7 = HMI Virtual File) or CDC LCN Protocols
2. IBM - CRAY undecided (s. above) / interest in IEEE 802 etc, ECMA L4 + higher ... o

Who is writing [the] network software for your installation?

The NICS project

What is the target date for operational service on the network?

NICS : 1981 - 83

What benefits do you expect to achieve from installing a network?
(Please continue on a separate sheet if you wish)

(o dear! (oh schätzle)) : We say every (Campus) computing Center has to have 3 networks : 1. The Local Highspeed Net
(small, expensive, > Mainframe channel speed)
:= integration of the central facilities

2. The Campus Net
(large, cheap, ~ 1-10 Mbit/sec)
:= ~~integr~~ binding the minichaos to the central facilities.

3. The Public Network (access)
(long haul, X.25 etc. ...)

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Name and full postal address of organisation.

UNIVERSITY OF LONDON COMPUTER CENTRE
20 GUILFORD ST
LONDON W.C. 1

Individual(s) connected with the networking project.

H.J. DOWN, L. LEE

Do you currently have networking hardware installed or on order?
(If so, what manufacturer?)

YES, N.S.C HYPERCHANNEL

What range of data transfer throughputs will your application require?

EXPECT END-TO-END TRANSFERS IN 5MBit/SEC

How many mainframe/large minicomputers will your network include?
(Again, what manufacturers?)

AT LEAST 6

Do you expect to use 'standard' protocols of any kind?

YES, FTP, TRANSPORT SERVICE, JTMP

Who is writing the network software for your installation?

VARIOUS STAFF — REFER ABOVE AS REQD

What is the target date for operational service on the network?

IMMEDIATE FOR SPECIAL APPLICATIONS, FULL FTP BY 1983/4

What benefits do you expect to achieve from installing a network?
(Please continue on a separate sheet if you wish)

FLEXIBILITY, FAIL SOFT, EASY REPLACEMENT/ADDITION OF SUBSYSTEMS, COMMON SOFTWARE WITH WIDE AREA COMMUNICATIONS.

Dec. 1-10, 1991

High-Bandwidth Local Networking

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Name and full postal address of organisation.

CNES rue E. Belin
31055 TOULOUSE FRANCE

Individual(s) connected with the networking project.

Do you currently have networking hardware installed or on order?
(If so, what manufacturer?)
No and we do not have precise plans for the near future years.

What range of data transfer throughputs will your application require?

How many mainframe/large minicomputers will your network include?
(Again, what manufacturers?)

Do you expect to use 'standard' protocols of any kind?

Who is writing the network software for your installation?

What is the target date for operational service on the network?

What benefits do you expect to achieve from installing a network?
(Please continue on a separate sheet if you wish)