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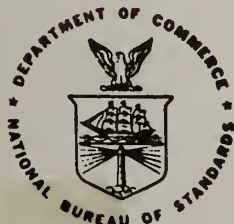
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# Proceedings of the Third LAN-Transport Workshop

Report of the Third Workshop for Local Area Network Implementors of the NBS Specifications of the International Standards Organization Transport Class 4 Protocol — Special Interest Group on File Transfer Protocol

U.S. DEPARTMENT OF COMMERCE  
National Bureau of Standards  
Institute for Computer Sciences and Technology  
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July 18 - 20, 1983



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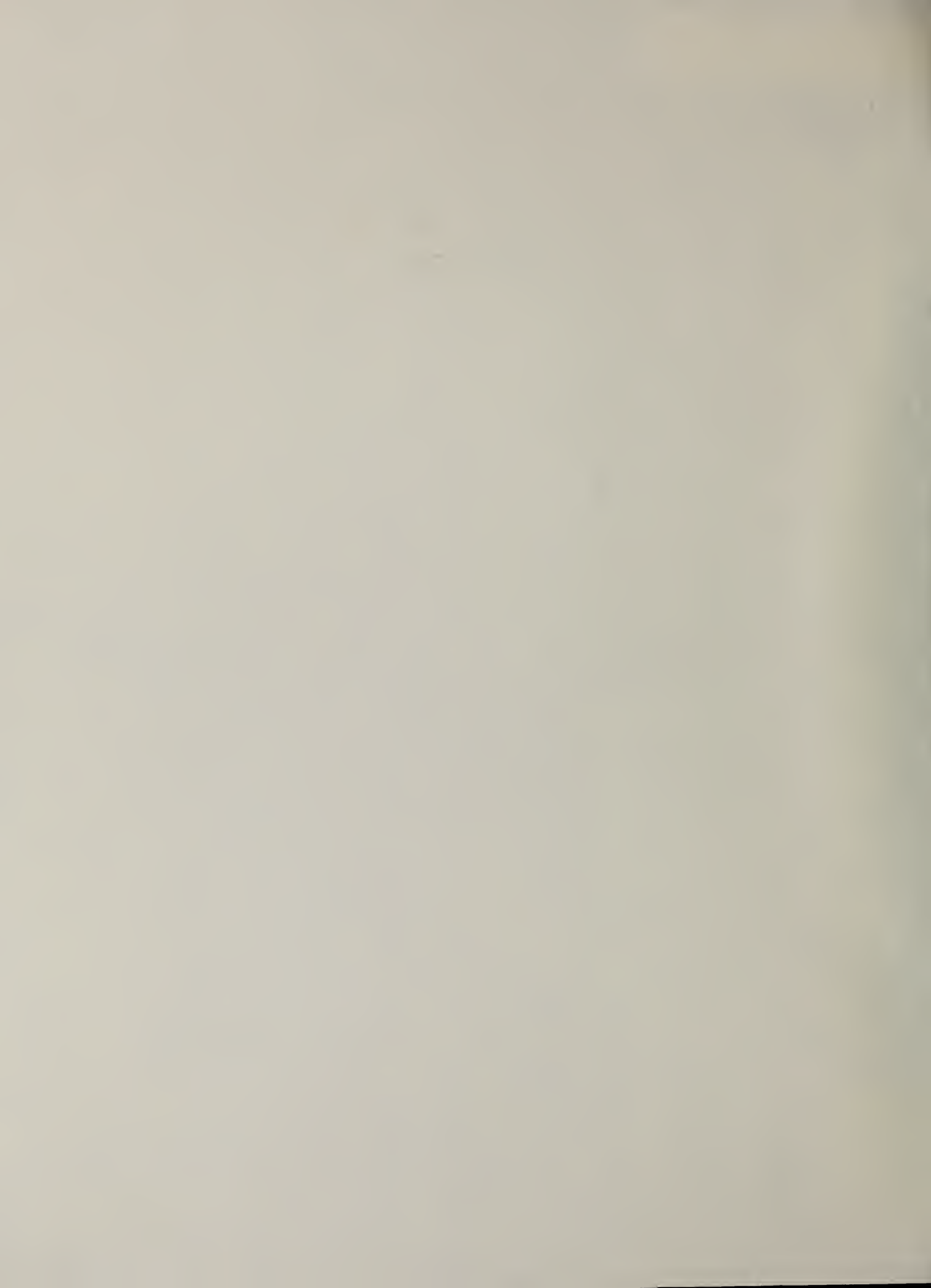
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**U.S. DEPARTMENT OF COMMERCE, Malcolm Baldrige, *Secretary***  
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## CONTENTS

Abstract

Summary

1. Participants in the Third Workshop
2. Technical Matters
  - 2.1 FTP Presentation and Agreements
  - 2.2 File Management Services: Presentation and Agreements
  - 2.3 IEEE Statement on Addresses
3. Administrative Matters
  - 3.1 Fourth Workshop Arrangements
  - 3.2 Participants Indicating Intent to Participate in Demo
  - 3.3 Document Distribution: Tentative Schedule
    - FTP Service and Protocol Description
    - FTP Formal Description
    - Write/Create Services and Protocol
    - File Management
  - 3.4 Current LAN/Transport Series Mailing List

Reference

Bibliography



## ABSTRACT

The National Bureau of Standards' Institute for Computer Sciences and Technology (ICST) has prepared specifications for the International Organization for Standardization's (ISO's) Class 4 Transport Protocol. At the request of a number of companies, ICST organized a workshop series for implementors of these specifications using local area networking technology. The first workshop focused on implementation techniques and strategies so that a multi-vendor demonstration of these protocols can occur at a major computer conference in 1984 — targeted for the NCC 1984. Primarily, the details of CSMA/CD and Transport Class 4 were discussed and parameters were selected. A second workshop focused on token bus LANs and file transfer applications to be run at the targeted 1984 demonstration. This report covers the third in the series of LAN/Transport Workshops, and reports agreements on the specifics of the file transfer protocol.

**Keywords:** file transfer protocol; communication protocols; computer networks; local area networks.

## SUMMARY

This report documents the third workshop of the LAN/Transport Workshop Series for implementors of the ICST specification of the ISO Class 4 Transport Protocol over IEEE 802 compatible LANs using local area networking technology. Specifically, this report describes the agreements reached by participants concerning the service and protocol of file transfer protocol (FTP). During the second workshop, a subset of the ISO emerging FTP was chosen to operate over transport to provide demonstrable applications. Following the second workshop, NBS prepared a more complete service and protocol description of the selected FTP subset. That document constituted the primary input to the third workshop.

The agreements reached concerning the specification of the FTP subset of service and protocol are documented in the body of this report. A revised service and protocol textual description will be produced and distributed as a result of the third workshop. Differences from the present ISO specification will be clearly marked in that document. They are of two forms. In some instances (for purposes of easing implementations for the projected demonstration) restrictions have been placed upon the ISO specification. The maximum length of file names and their ASCII character composition are examples. In other instances the ISO work has not progressed to the point of defining the protocol in sufficient detail. An example is Protocol Control Information (PCI) encoding. After the forthcoming textual description of the FTP service and protocol, a formal description



will be prepared and distributed using ISO SC16/WG1 Subgroup B notation.

In addition to work on the FTP, some file management services were presented and discussed. These services, in the form of utilities, will provide the basis for file creation on file server systems for the demonstration. A document describing these utilities will be distributed in the near future.

The participants agreed to the need for a fourth workshop, to be held as earlier planned on October 27 and 28 in Gaithersburg, Maryland. An announcement will be mailed to the current LAN/Transport Workshop Series distribution list in the near future.



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## 2. TECHNICAL MATTERS

### 2.1 FTP Presentation and Agreements

An outcome of the second workshop was the selection of a file transfer protocol to support applications for the demonstration. NBS agreed to prepare a document for the third workshop discussions, based upon the emerging ISO work on FTP. The document was to further define a subset of the ISO FTP service and protocol. This document was prepared by Bolt, Beranek, and Newman, Inc. under contract to NBS, and was presented by Mr. James Berets of BBN.

Agreements reached by the participants with respect to this document follow.

#### 2.1.1 File Length

The maximum file length will be 64K octets. Larger sizes are permitted only by mutual agreement between/among participants desiring to demonstrate bulk data transfer applications.

#### 2.1.2 File Data End (FDE) Request

Three proposals were offered and discussed:

1. Permit combining all or the remaining portion of the data to be transmitted with the FDE. That is, allow "piggybacking" of data PDUs with the FDE PDU.
2. Replace the FDE PDU by an EOT bit in the data PDU as done in Transport.
3. Send the FDE as a separate PDU after all data PDUs have been transmitted. This corresponds to present ISO documentation.

It was decided to support the third proposal, corresponding to the ISO method.

#### 2.1.3 Interpretation of Even Length Protocol Control Information (PCI)

For lower layer protocols it is desirable to insure an even length header (protocol control information) to assist DMA transfers. Several proposals were discussed.

1. The length of the total PDU would be an even number of octets. The end of the header would be padded (if necessary) to achieve an even octet count.
2. Each of the header and the data portions of the PDU would be an even number of octets. Padding would be applied at the end of each as necessary.

Both proposals were rejected. The FTP will not concern itself with whether or not the PDU length is even or odd.

#### 2.1.4 F-Abort Request Diagnostic

It was noted that the Request did not carry a diagnostic field whereas the Indication did permit a diagnostic message to the user of FTP. This is consistent with the ISO specification and was thus left as is. It was noted that the FTP issuing an F-Abort.Indication could specify whether the abort was caused by the network service or initiated by the peer FTP.

#### 2.1.5 F-Transfer End

It was noted that in the NBS input document[1] the F-Transfer End state appeared to be superfluous. It was decided to leave the state (consistent with the ISO specification). Although the state is not logically necessary for the subset of FTP chosen for the demo, it would be logically required for a complete implementation of the ISO FTP.

#### 2.1.6 Maximum PDU Size for Peer FTPs

There shall be no restriction on length of PDUs other than that required by file length. See section 2.1.1.

#### 2.1.7 Write/Create

The possibility of including write and create services for the demo was discussed during the second workshop. A decision was postponed until further discussion at the third workshop. From the discussion during the third workshop it was evident that some participants felt that the write/create should be included in order to lend more credence to the demo. Others felt that schedules did not permit the inclusion of write/create. The following decisions were reached: 1) the prose description of FTP service and protocol will be revised and distributed; 2) the formal description (subgroup B notation) of the protocol will be produced and distributed; and 3) write/create will be described in a separate prose document. If it can be prepared before the fourth workshop in October, then it will be reintroduced for discussion at that time.

#### 2.1.8 Interpretation of ASCII String

The following agreements were reached with respect to files and file contents.

1. In general, there is a need for all 256 characters.
2. For text files a CR should be followed by an LF.
3. Text file applications should expect lower case characters from the network and should convert to upper case if terminal requirements dictate.
4. File names will be a maximum of eight characters in length; the first character will be alphabetic.

The only characters permissible in the file name are: upper case A through Z and 0 through 9. The file name used in the select service primitive will be identical to the name returned; that is, no suffixes



such as generation or version will be appended to the file name appearing in the select.

5. Admitted file types will be:
  - i) text,
  - ii) NAPLPS graphics,
  - iii) 3270,
  - iv) binary data,
  - v) variable length record of ASCII characters; each read request obtains a separate logical record, and
  - vi) Regis graphics.
6. Participants will supply a hardcopy list of all files provided. The file type (see 5 above) will be indicated.
7. Any unrecognizable file name will be treated as a text file.
8. The data field of the FDR will be structured as: one octet specifying data type, followed by the data.

#### 2.1.9 Protocol Errors

Upon receiving an error notification from the peer FTP or upon receiving an error notification from the transport protocol, the FTP will abort. User signalled errors are treated in any way the implementor decides.

#### 2.1.10 User Diagnostics

Reasonable ASCII strings denoting common errors will be documented in the revised prose description of the service and protocol. These strings will be supplied by the document editor and will be reviewed at the fourth workshop.

#### 2.1.11 PDU Format and Encoding

It was decided to follow the format and encoding style used in transport, session, and internetwork. This includes a fixed portion of the header, beginning with two octets of length followed by one octet of PDU type. Following the fixed portion of the header, there may appear a variable portion of the header. Optional header parameters will be encoded using Header Item Coding (HIC). The data portion of the PDU follows the header. The exact format and encoding for each PDU type will appear in the revised prose description of the FTP service and protocol.

It was noted that ISO has not defined the PDU formats and that ANSI has only recently begun to address this problem. The initial ANSI work on FTP PDU formats differs from that of Layers 3, 4, and 5. Participants of the LAN/Transport workshops will alert ANSI to the formatting decisions made for purposes of the demonstration.

### 2.1.12 Addressing

1. There will be a one-to-one mapping of FTP connections onto Transport connections.
2. A system-wide convention was accepted such that the called address will be eight characters in length. A list will be published for each end-system. The called address translates into a transport address (which is composed of a prefix and a network address).
3. A determination of whether or not the called and calling fields are required or optional in the FCR PDU will be made. If required (according to ISO), then a null address (i.e., value of the length field equal zero) will be used. If optional, then they will be omitted. Called and calling addresses will adhere to the same encoding and conventions accepted for file names. See section 2.1.8, item 4 above.

### 2.1.13 Octet Ordering in Multi-Octet Fields

In multi-octet fields, such as the 2-octet length field, the least significant octet appears first and the most significant octet appears last. Ordering was debated and the participants were evenly divided in their opinions. It is noted that the decision reached is consistent with multi-octet encoding in Transport PCI. It was further agreed that, should ISO choose a different ordering, that the LAN Transport workshop participants would change accordingly.

### 2.1.14 Concatenation of PDUs

It was decided that FTP PDUs would not be concatenated as a single TSDU.

### 2.1.15 Data Discard

It was decided that upon abort, cancel, or T-disconnect, that data received would be discarded.

## 2.2 File Management Services: Presentation and Agreements

Mr. Allen Rochkind presented a proposal for voluntary implementation of a set of utilities for file server and user. These utilities provide the basis for file installation on file server systems and provide for the display of file directory contents. A document describing this proposal, which was accepted by the participants, will be produced by Mr. Rochkind and distributed by NBS.

## 2.3 IEEE Statement on Addresses

The IEEE 802 committee met the week of July 11. The proposal (by LAN/Transport participants) for the IEEE to assign the LSAP as 01000001 for this demonstration was discussed. The value chosen by the IEEE was 01111111.

### 3. ADMINISTRATIVE MATTERS

#### 3.1 Fourth Workshop Arrangements

The participants agreed to the need for a fourth workshop, to be held on October 27 and 28 at the Marriott Hotel in Gaithersburg, Maryland. Announcements will appear in the Federal Register and will be mailed to the current participant list (see section 3.4) of the LAN/Transport Workshop Series.

#### 3.2 Participants Indicating Intent to Participate in Demo

The participants asked that the list of organizations intending to participate in the demonstration be listed in these minutes. After August 15, the deadline established by NBS for companies to make commitments, the participants will be notified of those intending to participate in the demonstration.

#### 3.3 Document Distribution: Tentative Schedule

##### 3.3.1 FTP Service and Protocol Description

A revised version of the input document to the third workshop will be produced and distributed about the first of September.

##### 3.3.2 FTP Formal Description

The protocol as described in the above referenced prose document will be specified using the subgroup B notation of TC97/SC16-WG1. This specification should be available about the middle of September.

##### 3.3.3 Write/Create Service and Protocol

Following development of the above documents, a prose description of the write and create services and protocol will be specified. This document may contain only those services/protocol, or it may be specified as an extension of the document referenced in 3.3.1, but under separate cover. It is hoped that this document can be made available for discussion at the fourth workshop.

##### 3.3.4 File Management

Intel will produce a document describing optional file management services. (See section 2.2.) This document will be distributed by NBS upon receipt from Mr. Rochkind.



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<b>9. SPONSORING ORGANIZATION NAME AND COMPLETE ADDRESS</b> <i>(Street, City, State, ZIP)</i> Institute for Computer Sciences and Technology National Bureau of Standards U.S. Department of Commerce Washington, DC 20234			
<b>10. SUPPLEMENTARY NOTES</b>  <input type="checkbox"/> Document describes a computer program; SF-185, FIPS Software Summary, is attached.			
<b>11. ABSTRACT</b> <i>(A 200-word or less factual summary of most significant information. If document includes a significant bibliography or literature survey, mention it here)</i> <p>The National Bureau of Standards' Institute for Computer Sciences and Technology (ICST) has prepared specifications for the International Organization for Standardization's (ISO) Class 4 Transport Protocol. At the request of a number of companies, ICST organized a workshop series for local area network implementors of these specifications. The first workshop focused on implementation techniques and strategies so that a multi-vendor demonstration of these protocols can occur at a major conference in 1984--targeted for the NCC 1984. Primarily, the details of CSMA/CD and Transport Class 4 were discussed and parameters were selected. A second workshop focused on token bus LANs and file transfer application to be run at the targeted 1984 demonstration. This report covers the third in the series of LAN/Transport Workshops, and reports agreements on the specifics of the transfer protocol.</p>			
<b>12. KEY WORDS</b> <i>(Six to twelve entries; alphabetical order; capitalize only proper names; and separate key words by semicolons)</i> file transfer protocol; communication protocols; computer networks; local area networks			
<b>13. AVAILABILITY</b> <input checked="" type="checkbox"/> Unlimited <input type="checkbox"/> For Official Distribution. Do Not Release to NTIS <input type="checkbox"/> Order From Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.  <input checked="" type="checkbox"/> Order From National Technical Information Service (NTIS), Springfield, VA. 22161			<b>14. NO. OF PRINTED PAGES</b> <p style="text-align: center;">19</p> <b>15. Price</b> <p style="text-align: center;">\$7.00</p>

