

**PC Communication in an OSI environment**= *TM&T: Mail and Talk on TAINS* =

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2-1-1 Katahira, Sendai, Japan**INTRODUCTION**

Tohoku University has constructed a large-scale information network TAINS (Tohoku University Academic Information Network System). This network has adopted the OSI (Open System Interconnection) network architecture in its entirety and is the first of its kind.

However, there is a dearth of applications which realize the various potentials of such communication networks. This may be due to the fact that the protocol regulation for some of the upper layers is fairly recent while those of higher layers are still in the process of being finalised. In any case, the methodology of constructing these type of applications has not been fully explored.

The environment of TAINS has the rich potential of supporting various features e.g. distributed processing, distributed databases, various kinds of data-communication facilities, etc. In this paper we will report on an attempt to develop a communication application which provides PC-users on TAINS with mail handling and simultaneous-keyboard-talking capabilities.

**OVERVIEW OF TAINS**

**Network facility:** TAINS is a packet-switching network with a two-layer structure. One layer is the

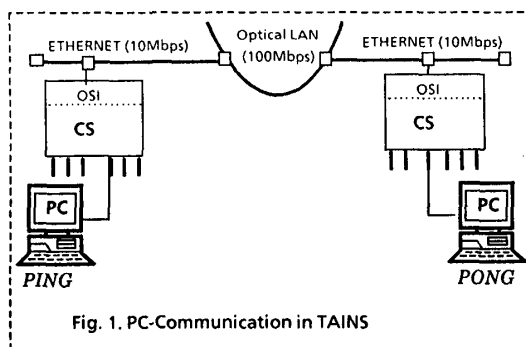


Fig. 1. PC-Communication in TAINS

100Mbps multi-mode optical fiber cable which forms the backbone of the network. The other layer comprises of numerous 10Mbps coaxial cable each supporting an in-house network. The inhouse network is a bus type network and is set in the building of each faculty, research institute and so on. The branches formed by

the coaxial cables are connected to the trunk line formed by the optical fiber cable, via node control units. The optical fiber trunk-loop forms a ring network and adapts the ANSI FDDI token passing protocol. The ISO8802.3 protocol is followed as the MAC level protocol in the in-house networks. The Node control equipment have a built-in learning function for addressing. Therefore, packets transmitted to destinations in the same inhouse network never appear in the trunk network. Thus, highly efficient transmission will be maintained. As TAINS has the appearance of one large ISO8802.3 network and addressing is carried out using MAC addresses, though it is based on the OSI protocol, other network architectures such as TCP/IP XNS, DECNET, DINA also co-exist in the network.

**CS: the communication server** CS provides the interface between the RS232C port of personal computers and the 10Mbps coaxial cable transmission line which serves as the in-house Ethernet. PCs can be connected to the Ethernet through this interface, and provided with 9600bps (Half Duplex) communication capacity. Packet transmission and reception is carried out in the Ethernet using the CSMA/CD (Carrier Sense Multiple Access with Collision Detection) protocol regulated by ISO8802.3.

Fig. 1. shows schematically the environment in which PC-communication is contemplated. The two PCs PING and PONG are connected to CS-ports. In the existing configuration, the ports are by default in *passive state* listening for requests for connection from other parts of the network. In this case the port and the connected PC is said to be in the *server state*. If a PC (PING) wants to 'TALK' to another PC (PONG), it first changes to the *client state* by going into the *active mode* and sends the communication request (*oc / otelnet*) through the port to the network. The change of state from server to client (*passive to active*) and vice-versa is carried out at runtime depending on the users requirement. The mechanism of the change of state is shown in Fig. 2. Once the (TELNET) link is established the two PC's can communicate with each other through the RS232C interface as if there is a direct cable connection between them. This is the basis on which the *TM&T (TAINS Mail & Talk)* application is built.

**The TM & T SYSTEM**

*TM&T* is a terminal application program which supports key board talking and mail handling

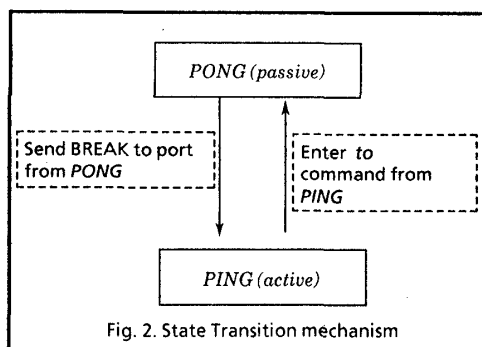
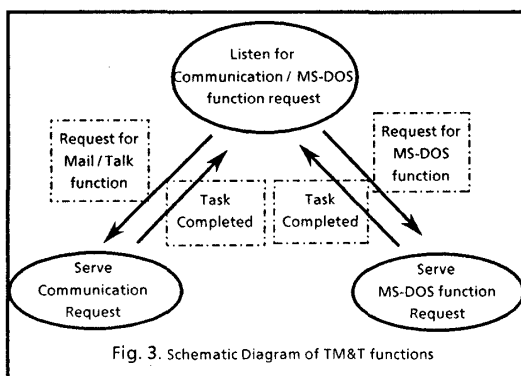


Fig. 2. State Transition mechanism

functions on PC's in TAINS. The CS provides the necessary interface between the RS232C port of personal computers and the 10Mbps in-house Ethernet. The schematic diagram of the *TM&T* system

Fig. 3. Schematic Diagram of *TM&T* functions

is shown in fig. 3. The *communication request service* involves capturing the character string received at the CS-port, separating CS status information from the communication data and taking necessary action depending on the extracted information.

**Addressing:** To start communication *TM&T* first requests the CS to establish a connection. The addressing in *TM&T* is carried out in terms of the destination CS name and port number. There are two levels at which address resolution facilities are provided, *Network wide resolution* and *Local resolution*.

The address server also provides a directory service using which details of network users may be referred. At start-up *TM&T* sets the port in the *passive* mode and waits for a request. Requests may be of the following categories.

From the user

- For some MS-DOS operation
- A communication request :  
(send mail or talk to someone).

From the network

- someone wants to talk to the user
- some one is sending some mail.

The service of a communication request from the user basically consists of three phases- establish link &

session, communicate, close link / session. To establish a link *TM&T (caller)* sends a request to the network indicating the destination with which a link is being sought. *TM&T (callee)* services the link request by completing the link and returning an acknowledgment. Following the establishment of the link negotiation for starting the communication session is carried out.

The session is reliable, full-duplex, flow-controlled, stream between two *TM&T* programs. Once established the data-communication between the *caller* and the *callee* across the network, can be carried out without bothering about lower-level details of error-checks, corrections and retransmissions.

Once the communication is over *TM&T* orders lower level protocols to close the link and returns to the *passive wait & listen* state.

In general, if one is not sure about the address, help may be sought from the address server.

### THE IMPLEMENTATION

**T-Mail:** The Mail part of *TM&T* offers the standard mail features. The sender of a message indicates the destination which may be a address and user-name or a set of destination-user pairs.

In case the target machine is busy or is not up when the transmission of the mail is attempted, the message is retained in the local machine to be delivered when the target machine comes up or returns to the *not-busy state*. The arrival of a mail is announced to the receiver by *TM&T*. The received message is stored in a certain directory defaulted to *MAILBOX*. The user interface part of *TM&T* enables the user to *read, write, forward and delete* mails.

**T-Talk:** T-Talk provides functions which allow users to chat with each other (silently!) through the keyboard. The system closely mimics the telephone system. When a 'talk' request arrives, the system announces it by sounding the buzzer and displaying the callers identity on the CRT. The called party is supposed to answer the call by keying in the appropriate reply, after this a regular dialog can be carried out. If there is no reply, after a certain time period, the system offers the T-Mail facility to the caller for leaving messages.

If the called party responds the talk session is started. During the talk session, the screen is split into horizontal windows one for speaking (writing) the other for listening (reading).

### CONCLUSION

We have developed an application software *TM&T* on MS-DOS, to meet the demand of an easy communication link among personal computer users in TAINS. This system enables the users to actively participate in the networking with relatively cheap equipments. *TM&T* offers E-mail and E-talk features by utilizing CS's services. A prototype of the application is already operational on TAINS.