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## A Design of Protocol for High Speed File Transfer

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### Introduction

FTAM (File Transfer, Access and Management) provides the file service for OSI in the application layer. It allows applications to access files on remote file systems without the necessity of any vendor specific knowledge of how the filing system is being provided. The basic point of FTAM is the virtual filestore concept. This describes a conceptual model of a file service on a local system (Figure 1).

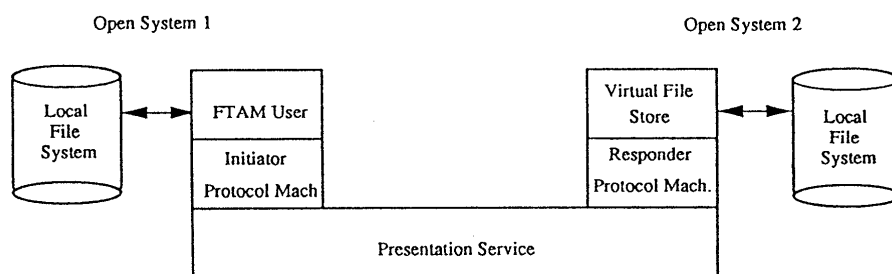


Figure 1. Architecture of the FTAM service

File transfers with FTAM on a fully connection oriented network seems to lack speed due to complex handshaking procedure in each layer. For example, the measured throughput of FTAM reported in [1] on Ethernet (10 Mb/s) is only around 150 kbyte/s for the binary transfer mode and worse for the ASCII transfer mode (measurements are for the FTAM protocol implementation from the ISODE software distribution package).

### A New Protocol

To improve the performance of FTAM, the authors developed an idea to use connection oriented (response oriented) protocol only in the application layer and to use connectionless (responseless) protocols in all the other layers. Accordingly, error recovery is performed on FTAM level. Error recovery in FTAM makes use of the identification of points in the file to form checkpoints. These are points inserted into the file data by the sender at appropriate points during the data transfer. The algorithm used by the sender to position checkpoints is a local matter, but it must be reproducible so that references to a checkpoint during error recovery shall imply the same point as was originally marked.

After an error, the restart point is negotiated by both sides. The overhead with all this task is to preserve a certain collection of information on both sides relating to transfer, called a docket.

Under these considerations, for a disk-to-disk file transfer between two sites, the scheme is modelled as a queueing network as shown in Figure 2.

In the model, the service times of the queues representing the disks consist of the disk access times and read/write times. The remaining queues and servers stand for the processing times of each layer and the transmission time in the physical media.

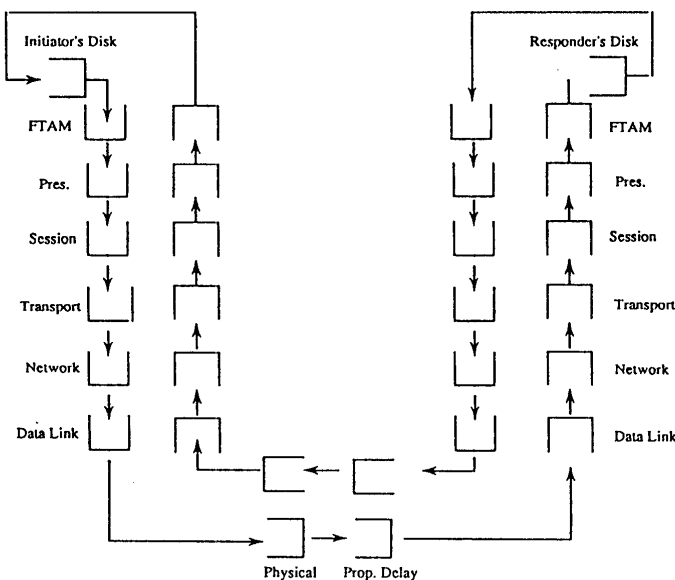


Figure 2. Queueing Network Model

### Future Studies

At this point, there remains some other issues to be decided. For example, since FTAM has a highly connection oriented structure there are several negotiations between two sites upto the data transfer phase. Because these negotiations and the accompanying connection establishment take a considerable amount of time [2], it is a difficult question whether to exclude this phase from the analysis or not. On the other side, modelling a connection establishment is an extremely difficult task at this point.

Another point that needs to be considered is that different document types in FTAM (structured / unstructured binary / ASCII) will require different processing times which have to be included in the analysis. Also, as for the error recovery in FTAM, a suitable distribution for checkpoint creation should be considered since there is no rule specified in FTAM.

The model presented above is a preliminary one and needs to be clarified more. In order to analyze the probable advantages of using connectionless protocols in the lower layers, comparative analyses considering several erroneous media.

### References

- [1] P. Gunningberg, et al, "Application Protocols and Performance Benchmarks", *IEEE Communications Magazine*, pp.30-36, June 1989.
- [2] B.W. Meister, P.A. Janson, L. Svobodova, "Connection Oriented Versus Connectionless Protocols: A Performance Study", *IEEE Trans. on Computers*, pp.1164-1173, Vol.C-34, No.12, Dec. 1985.
- [3] G. Conti, "RAP: A High Speed Protocol for Random Access Devices", *Proceedings of the International Conference on Communications*, June 1992.
- [4] ISO 8571-4, 1988.