I. Problem
Every year there is an observable increase in the amount of data that is transmitted over the public telecommunication infrastructure.

The predicted future growth in data transfer (figure 1) creates challenges for network operators and service providers. Communication systems need to accommodate growing demand for bandwidth within justifiable budget limits.

II. Proposed solution
A research team at Unlimi-Tech Software Inc. developed the FileCatalyst technology for developing network computing and communication systems.

FileCatalyst has following features:
- Provides support for 10G (and beyond) infrastructure
- Does not need modifications to the hardware layer in telecommunication infrastructure
- Performs transmission control in the user application layer
- Performs transmission control in the network application layer
- Does not require any mechanisms for fragmentation and reassembly, flow control and congestion avoidance

III. Technologies implemented
User Datagram Protocol
User Datagram Protocol (UDP) is a connectionless protocol that, like TCP, runs on top of IP networks. It allows network hosts to send messages (datagrams) to other hosts across the network without setting up special transmission channels or data paths.

The UDP in its basic form (defined in standard STD-6/RFC-768) does not have any mechanisms for fragmentation and reassemblability, flow control and congestion avoidance.

UDP is connectionless. This means that a datagram can be sent at any moment without prior advertising, negotiation or preparation. An application running over UDP must deal directly with end-to-end communication problems that a connection-oriented protocol would have handled.

Java platform
Java is a programming language originally developed by Sun Microsystems (acquired later by Oracle Corporation) and released in 1995 as a core component of Sun Microsystems' Java platform.

Java offers versatile, efficient, portable, secure and platform independent technology for developing network computing and communication systems.

IV. Implementation

Sender

Receiver

Transmission control

The traditional model of data transmission requires TCP to perform transmission control.

The FileCatalyst system performs transmission control in the user application layer.

This model allows for significant flexibility in adjusting to customer network architecture and topology.

Data rate control

V. Performance evaluation setup
An optical communication link was built to perform benchmark tests and to evaluate performance of the system in different network environments. The Netropy 10G was used to introduce controlled packet loss and latency to the transmission link.

Benchmark tests were performed for different values of available bandwidth, latency and packet loss ratio. The effective data rate was measured when data was transmitted with standard FTP/TCP and with the FileCatalyst system.

VII. Conclusions
The combination of UDP, Java and custom transmission control technologies offers a flexible and cost efficient platform that significantly improves utilization of the available bandwidth.

FileCatalyst has following features:
- Does not need modifications to the hardware layer in telecommunication infrastructure
- Provides support for 10G (and beyond) infrastructure
- Is platform independent with low CAPEX and low OPEX