

# **Video Streaming using Content Delivery Network, Parallel TCP Connections and Multipath TCP**

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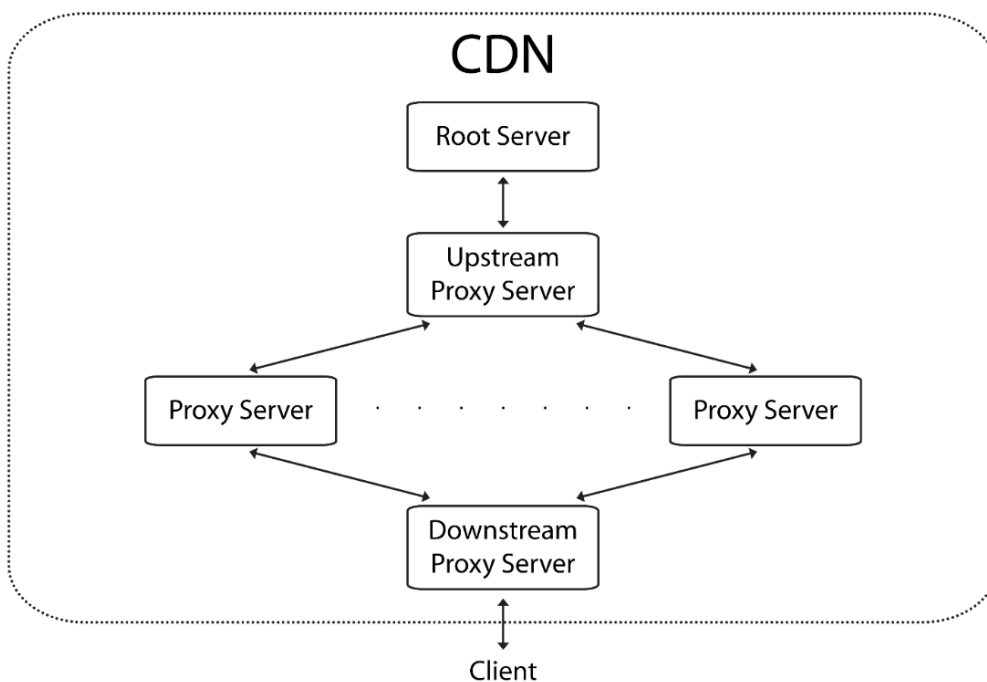
# Introduction

In this project, we design a system incorporating Content Delivery Network (CDN), parallel TCP connections and Multipath TCP (MPTCP) for improving the speed of data transmission in long distance connection.

The objectives of our project are as below:

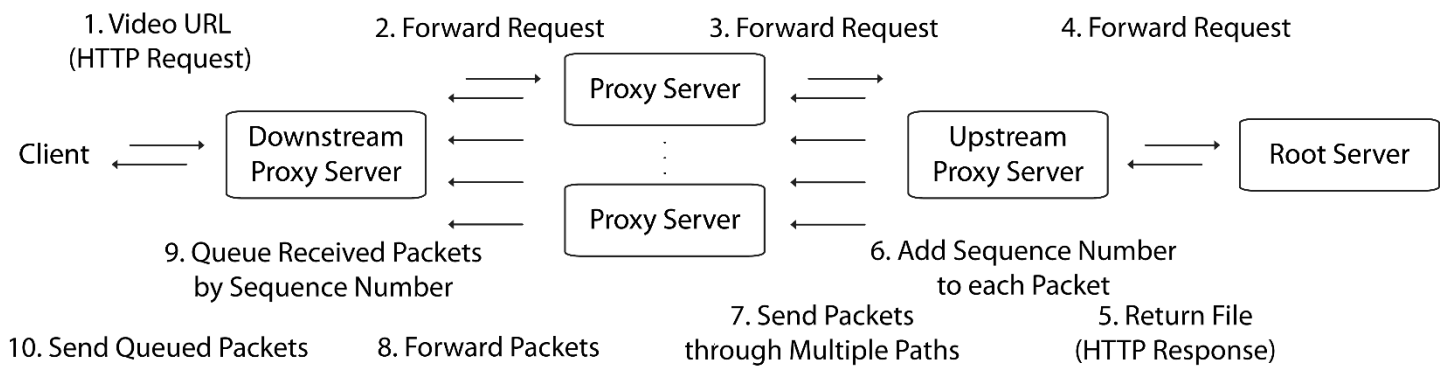
1. To make a low cost streaming method.
2. To provide a fast and reliable connection for VOD.

# Design



**Structure of CDN**

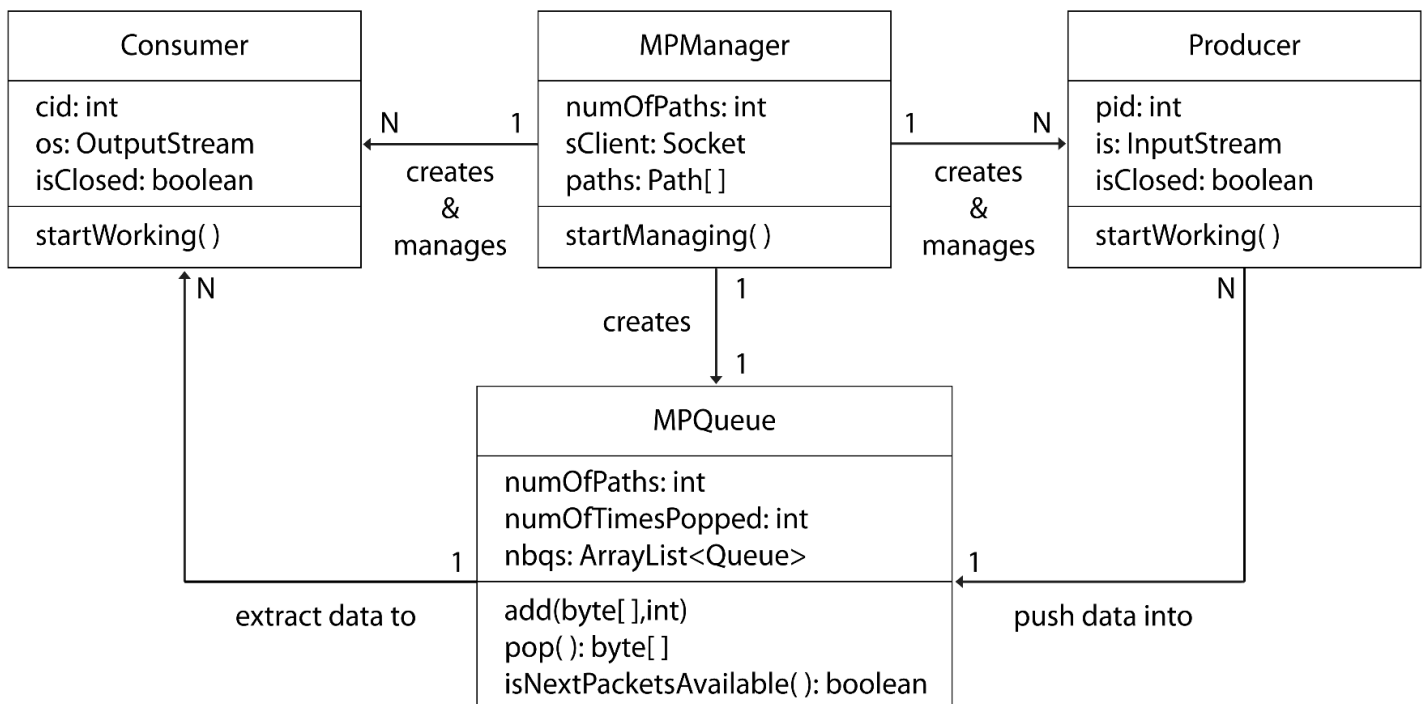
The system contains a CDN which consists of a root server and several proxy servers (upstream proxy and downstream proxy). The root server is responsible for storing all the videos and delivering requested files if they cannot be found elsewhere. Proxy servers are servers distributed worldwide. These servers can act as intermediate servers between the root server and clients.



## Structure and flow of system

- A client send an HTTP request by entering a video URL.
- Downstream proxy forward the request to the upstream proxy through several proxy servers.
- Root server receive the request and start returning a file to upstream proxy in HTTP response.
- The upstream proxy will insert sequence number into the packets.
- The downstream proxy will store the received packets in order and send the packets to the client eventually.

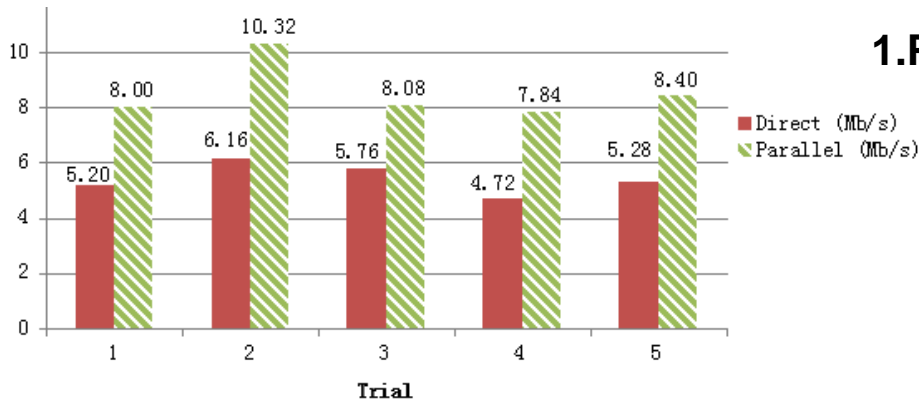
# Implementation



- A MPManager will be first created.
- The MPManager initialize producers, consumers and a MPQueue.
- Producers keep pushing data to the MPQueue.
- Consumers keep extracting data from the MPQueue and write it to the output stream.
- The data written to output stream will be sent to the client.

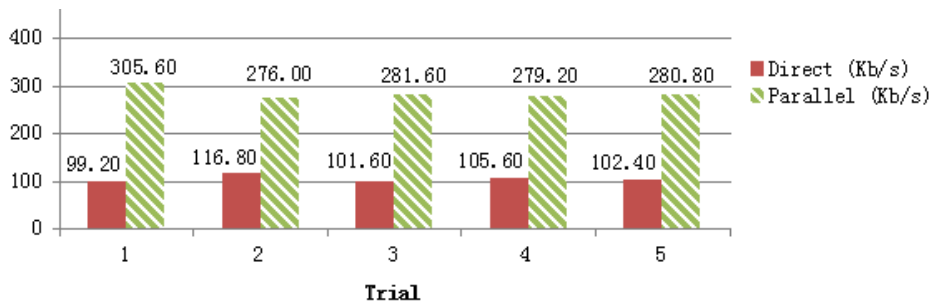
# Test Result

We had recorded the file transfer rate by transferring a 200MB file under different situations. The test was carried out 5 times in each case. Direct means direct connection without using our system while Parallel or MPTCP means parallel TCP connections with 2 connections or multipath TCP through 2 different proxy servers in Hong Kong.

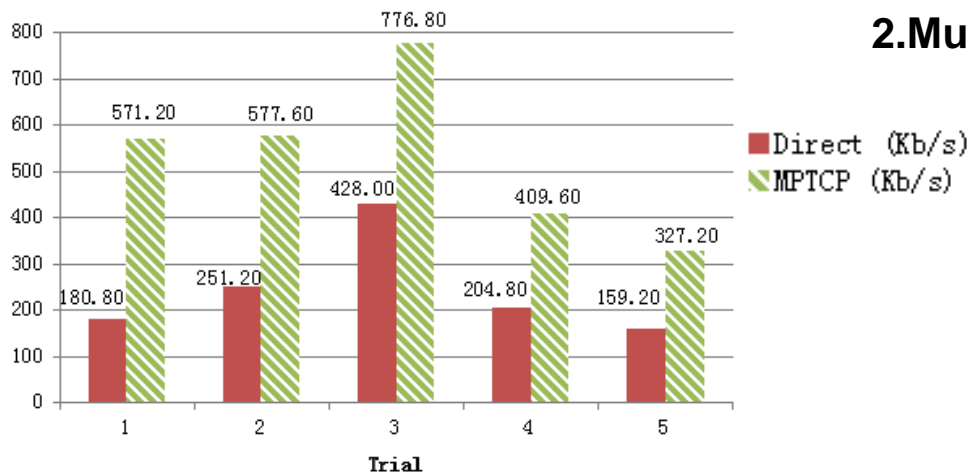


## 1.Parallel TCP connections

From Beijing to HKUST  
with 200ms delay



From Beijing to Mei Fu



## 2.Multipath TCP

From Beijing to HKUST

# Conclusion

- Improves the file transfer rate in areas with poor network quality.
- Supports different video file types including MP4 format or videos streamed in HLS
- Supports the enhancement of system by simply adding more proxy servers in our CDN.