



# DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Discover. Learn. Empower.

## Experiment - 4

**Student Name:** Tanay Manish Nesari

**UID:** 23BCS13761

**Branch:** BE-CSE

**Section/Group:** KRG\_2B

**Semester:** 6<sup>th</sup>

**Date of Performance:** 04/2/26

**Subject Name:** System Design

**Subject Code:** 23CSH-314

### **Aim :**

To design an scalable OTT platform (Similar to Netflix or Amazon Prime)

### **Requirements:**

#### **Functional Requirement:**

- Client should be able to create account on the OTT platform.
- After the successfull login, client should be able to opt for the subscription plans.
- Client should be able to search for the shows/movies based on the video title or names.
- Client should be able to watch the videos / tv shows in multiple different resolutions (480p,720p,1080p, 4k etc.)
- Recommendation for TV shows and movies.

#### **Non-Functional Requirement:**

- **Scalability:** 200-300M, for which let's say total videos we are having are 20K videos (~1 hour each)
- **Consistency & Availability:** Availability >>>> Consistency.  
Availability on watching TV shows and movies and Consistency in making payments and in subscription plans.
- **Latency:** 50 - 80 ms  
Client should be able to see the video with zero or neglible buffering.

### **Core-entities of System:**

- Clients
- Clients metadata
- Video / TV shows
- Video metadata: (images(Thumbnails + description))

### **API endpoint creation:**

#### **1. Client-Onboarding**

1. POST Call: <https://www.netlfix.com/user/register>
2. POST Call: <https://www.netlfix.com/user/login>
3. PUT Call: <https://www.netlfix.com/user/update>
4. User Data Update: PUT API CALL: PUT / api / users / {user\_id} / profile



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## 2. Subscription

1. GET Call: <https://www.netlfix.com/Get-subscription-plans>
2. POST Call: <https://www.netlfix.com/subscription>

```
{  
    userMetadata, subscriptionID  
}
```

## 3. Searching & Video Playing

1. GET Call: [https://www.netlfix.com/search?q={movie\\_name}](https://www.netlfix.com/search?q={movie_name})

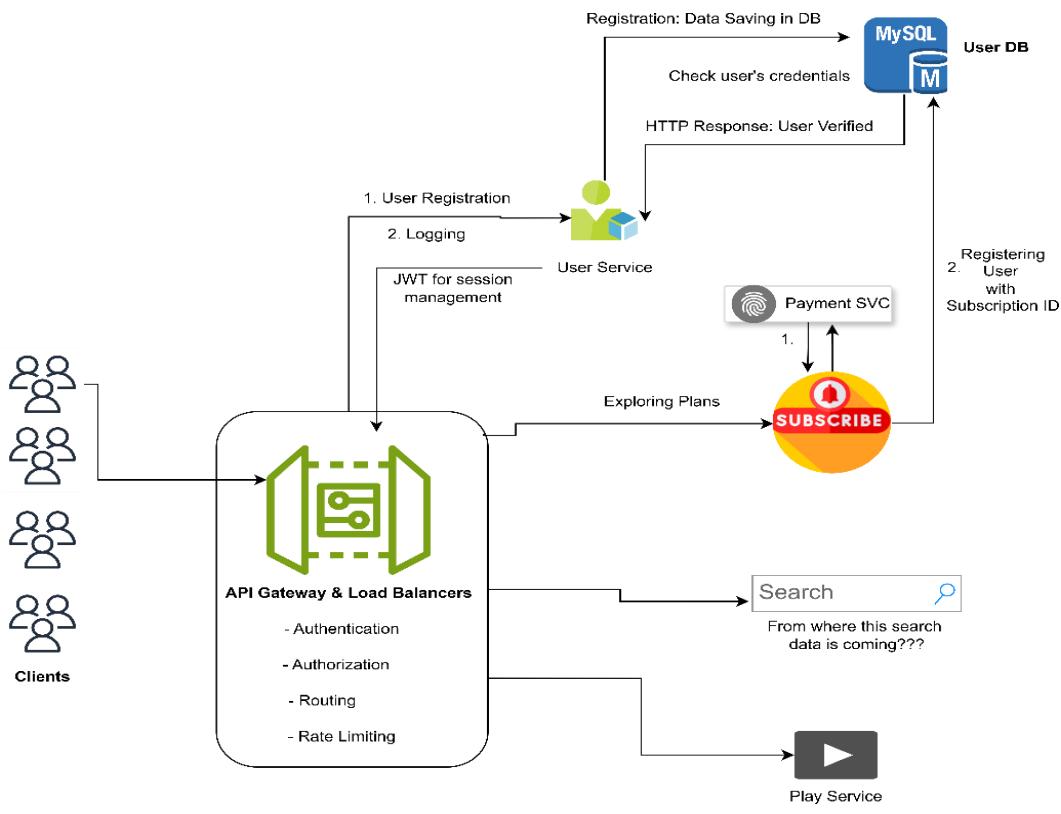
Response: List<Video\_ID> + some meta data of video

2. GET Call: [https://www.netlfix.com/{video\\_ID}](https://www.netlfix.com/{video_ID})

Response: Metadata of the video (JSON)

3. GET Call: [https://www.netlfix.com/play/{video\\_ID}](https://www.netlfix.com/play/{video_ID})

## High-Level Design:

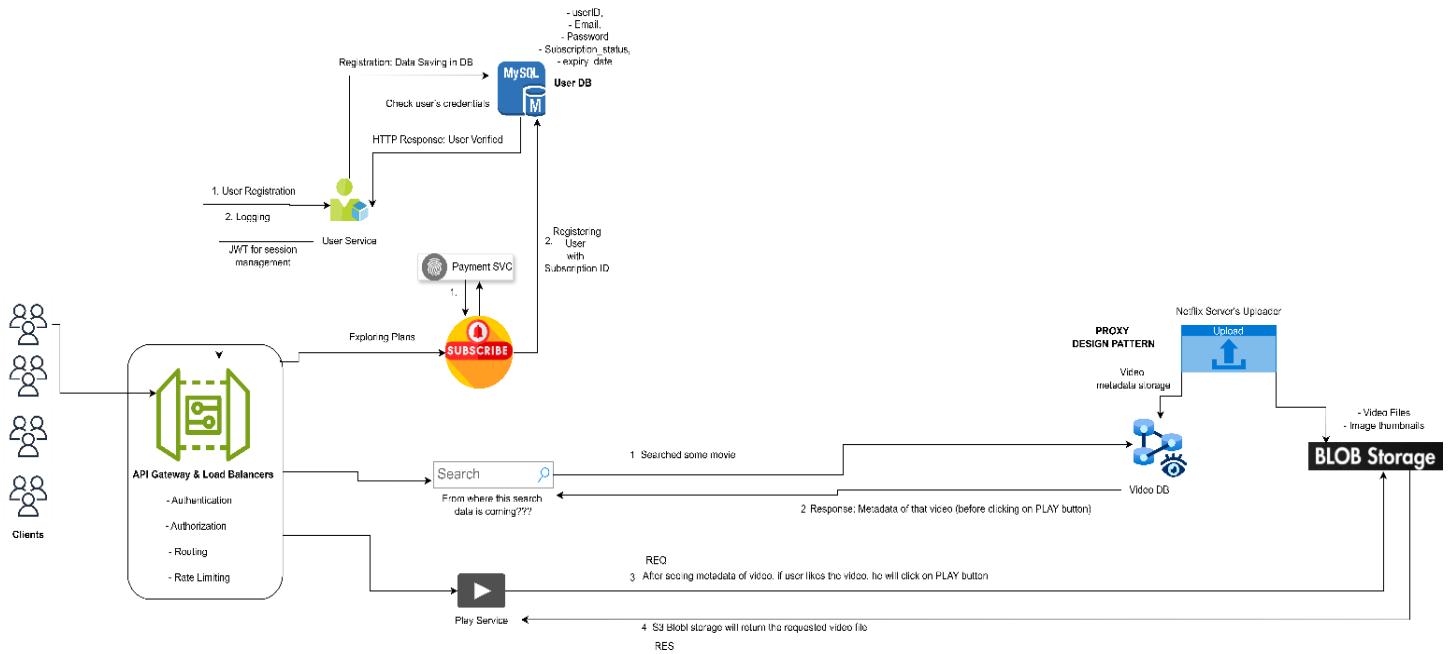




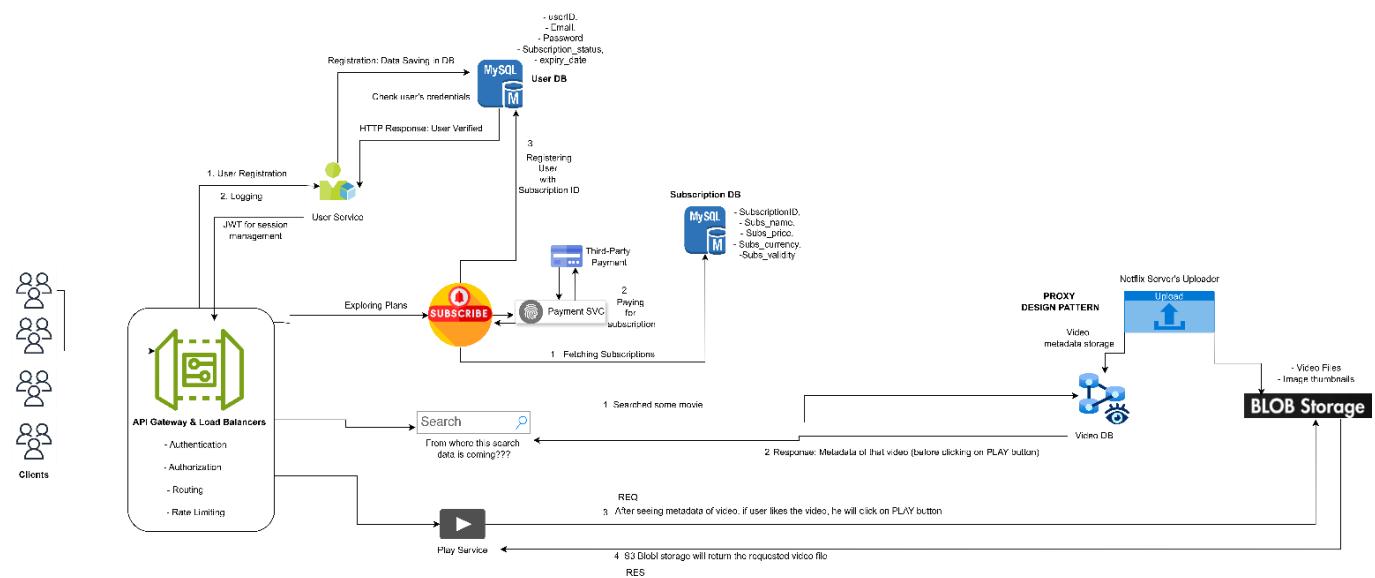
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## Low-Level Design:

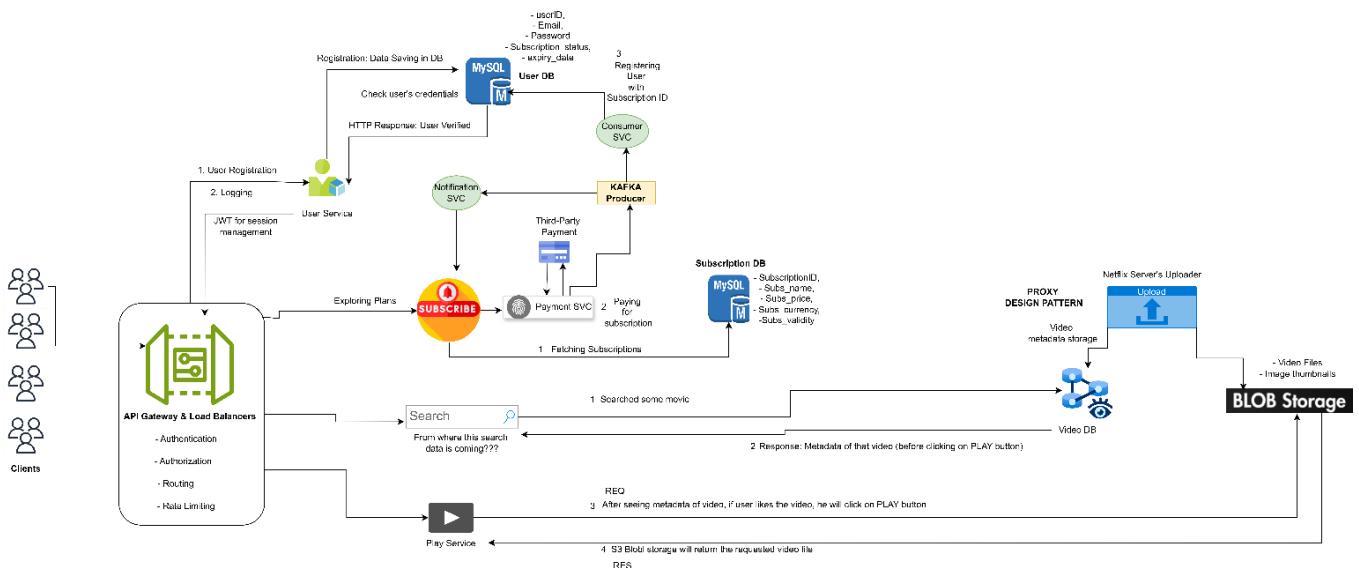


## Subscription Service:

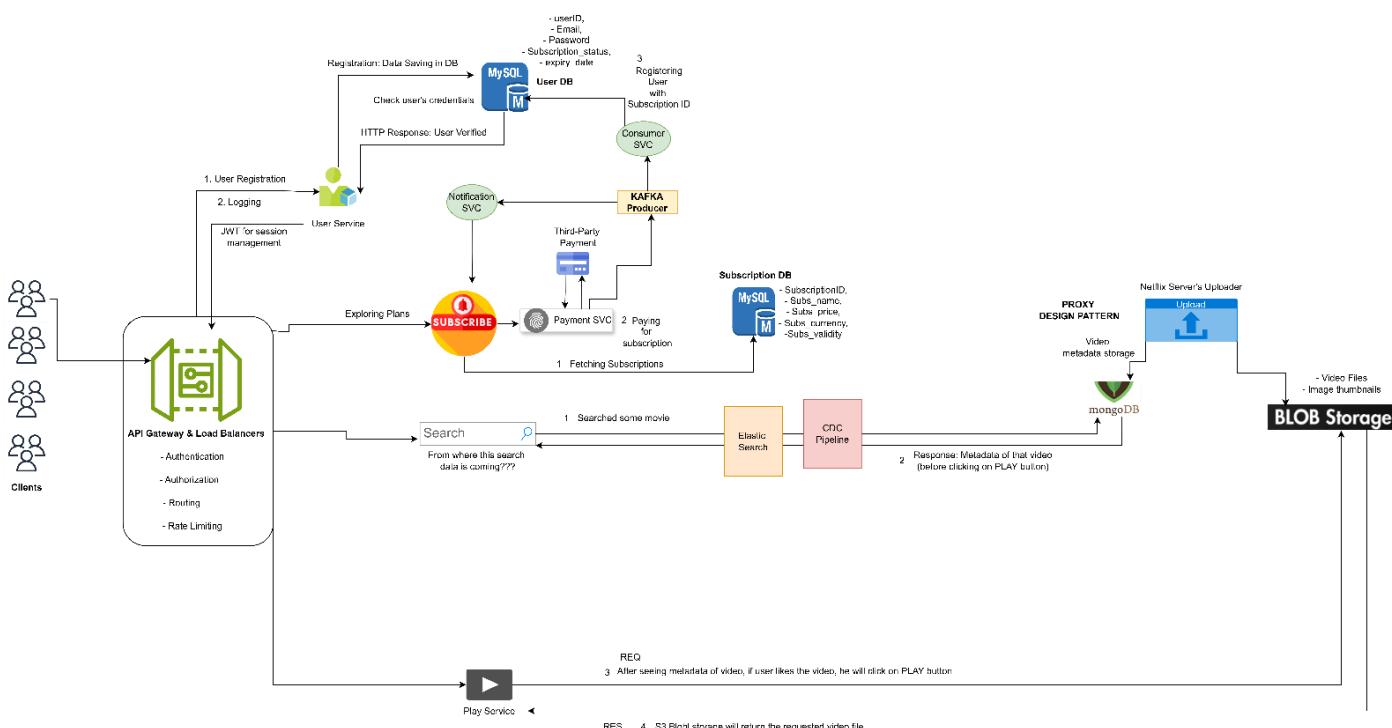


## Problem:

- To many API calls with Subscription Service  
Solution is to use KAFKA (P-C Architecture)



## Search Service



## Play Service

For play service

- Does the whole video of 5-10 GB loads prior in your OTT???
- If we change the resolution then how it changes everything in backend.

NOTE: If you have observed, while watching any movie on OTT, there can be chances that on first-load you get blurry video for 5-6 sec, after that when internet bandwidth is good, you see 720p automatically.

before the video is displayed on our devices, it has to go from 'n' no of operations.

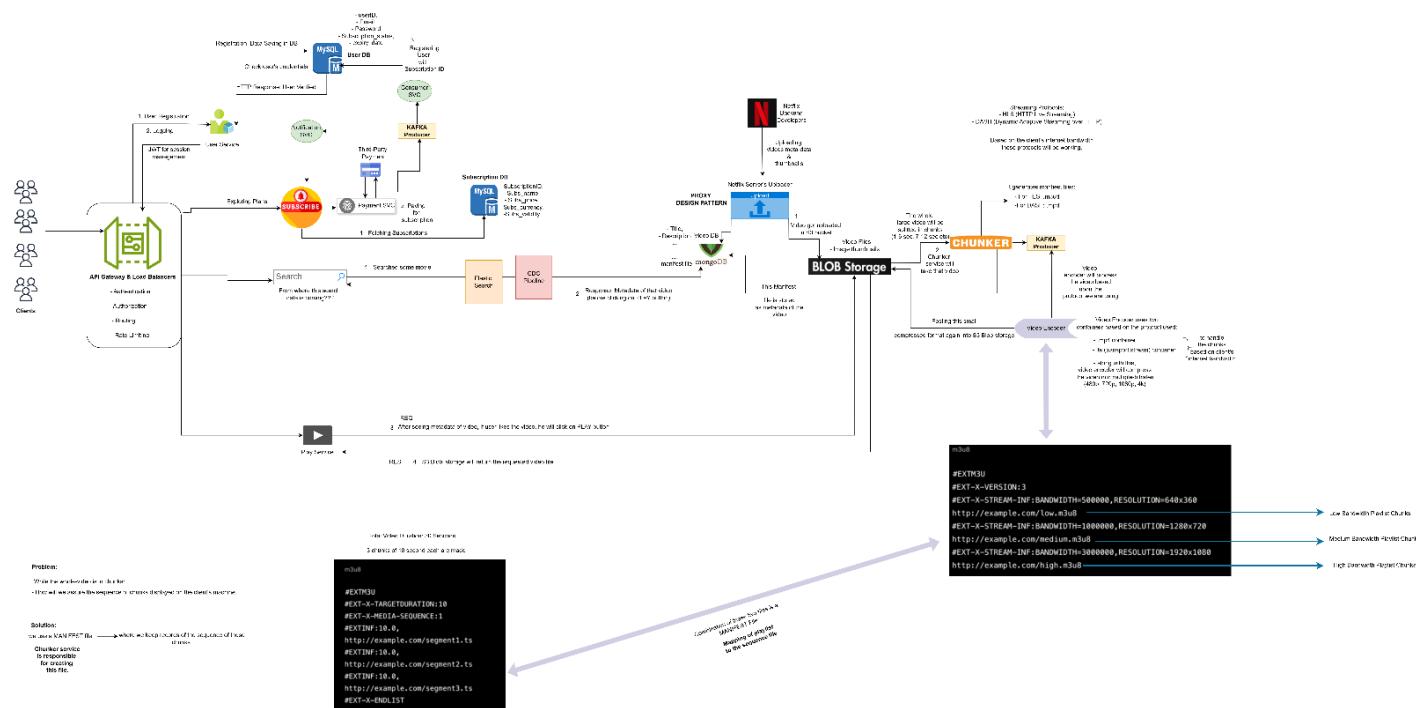
Imagine your video encoder creates **three versions** of the same movie segment:

1. **High Quality** (4K - for fast Wi-Fi)
2. **Medium Quality** (1080p - for standard 4G)
3. **Low Quality** (360p - for poor signals)

#### The Process:

- As you watch, your video player (the "client") constantly checks your internet speed.
- If your speed drops, the player automatically asks the server for the **Low Quality** 10-second segment instead of the High Quality one.
- **The result:** The video keeps playing without a "loading spinner," even if the picture looks a bit blurry for a moment.

### Adaptive bitrate streaming

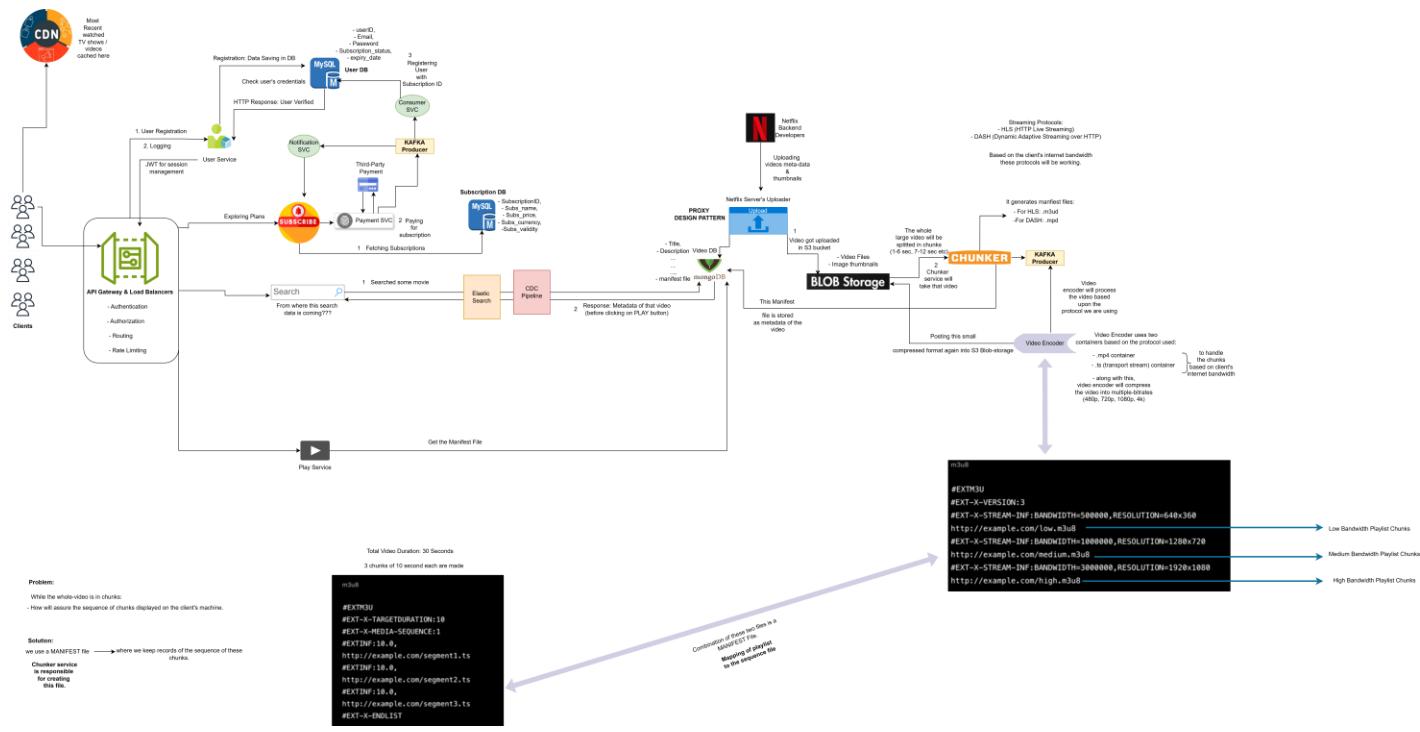


Now, Play Service will get manifest file from Video DB and will give back to the client. This manifest file will calculate the bandwidth on client side, and the video / show based upon the bandwidth will be fetched from S3 storage. But if, you observe clearly, there is a huge gap btw Clients and S3 to fetch the video / shows. **Resolution:** We'll use CDN



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Get the Manifest File

Play Service

**Problem:**  
Write the whole video is in chunks.  
- How will assure the sequence of chunks displayed on the client's machine.

**Solution:**  
we use a MANIFEST file → where we keep records of the sequence of these  
chunks.  
Manifest file is responsible for handling this file.

Total Video Duration: 30 Seconds  
3 chunks of 10 second each are made

m3u8

```
#EXTM3U
#EXT-X-VERSION:3
#EXT-X-STREAM-INF:BANDWIDTH=500000,RESOLUTION=640x360
http://example.com/low.m3u8
#EXT-X-STREAM-INF:BANDWIDTH=1000000,RESOLUTION=1280x720
http://example.com/medium.m3u8
#EXT-X-STREAM-INF:BANDWIDTH=3000000,RESOLUTION=1920x1080
http://example.com/high.m3u8
```

Combination of three ts files is a  
Manifest file.

Mapping of payload  
at the sequence file

manifest.m3u8

```
#EXTM3U
#EXT-X-VERSION:3
#EXT-X-STREAM-INF:BANDWIDTH=500000,RESOLUTION=640x360
http://example.com/low.m3u8
#EXT-X-STREAM-INF:BANDWIDTH=1000000,RESOLUTION=1280x720
http://example.com/medium.m3u8
#EXT-X-STREAM-INF:BANDWIDTH=3000000,RESOLUTION=1920x1080
http://example.com/high.m3u8
```

Low Bandwidth Playlist Chunks  
Medium Bandwidth Playlist Chunks  
High Bandwidth Playlist Chunks

→

Get the Manifest File

Play Service