

CS 305 Lab Tutorial

Lab 6 CDN DASH

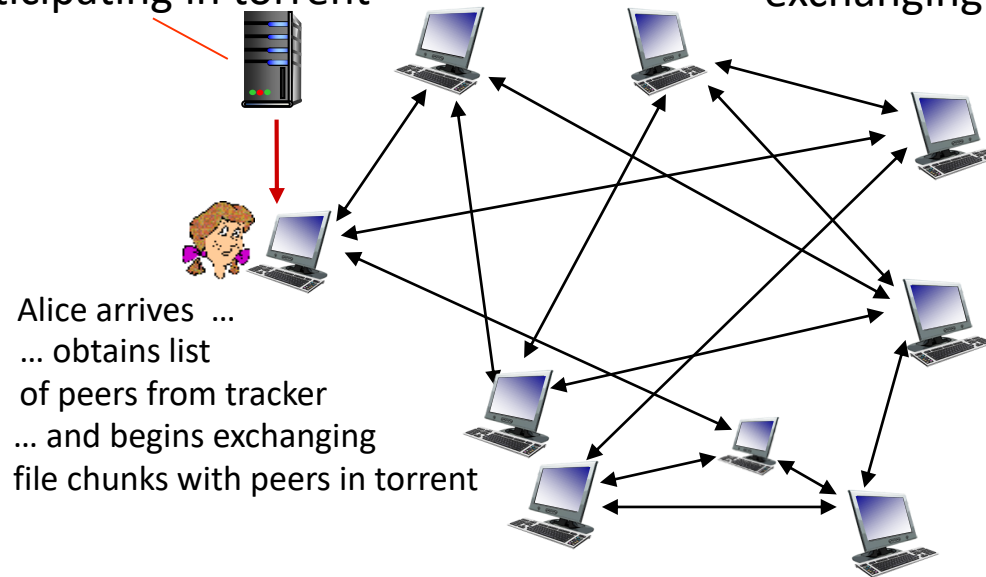
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Part A.1 P2P file distribution: BitTorrent

- file divided into 256Kb chunks
- peers in torrent send/receive file chunks

tracker: tracks peers participating in torrent

torrent: group of peers exchanging chunks of a file



Part A.1 P2P BitTorrent: requesting, sending file chunks

Requesting chunks:

- at any given time, different peers have different subsets of file chunks
- periodically, Alice asks each peer for list of chunks that they have
- Alice requests missing chunks from peers, rarest first

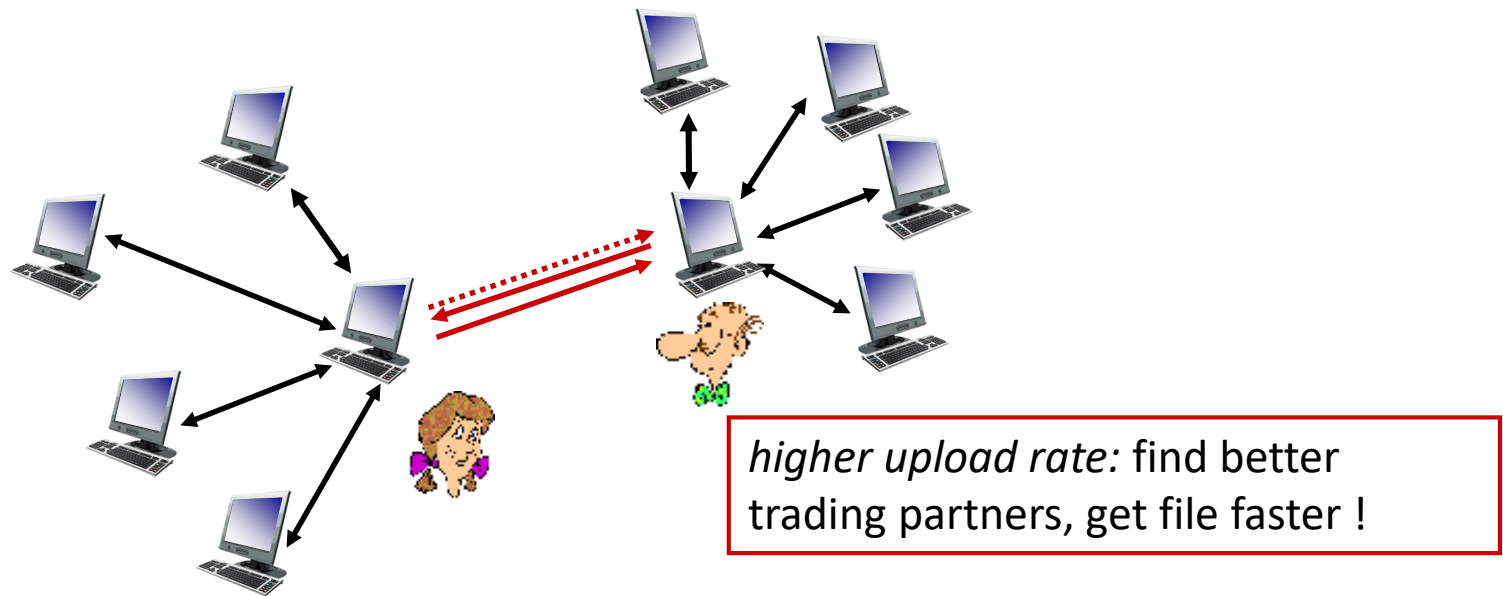
Sending chunks: tit-for-tat

- Alice sends chunks to those four peers currently sending her chunks *at highest rate*
 - other peers are choked (堵塞) by Alice (do not receive chunks from her)
 - re-evaluate top 4 every 10 secs

Part A.1 BitTorrent: tit-for-tat

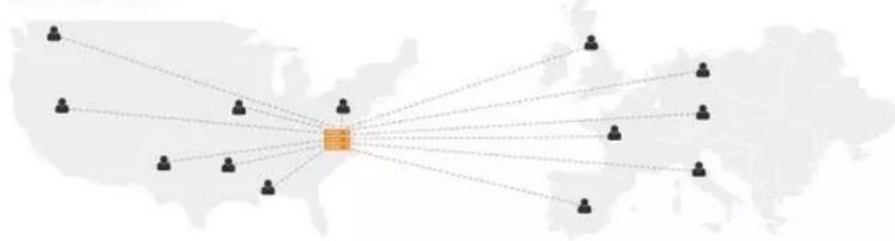
(一报还一报)

- (1) every 30 secs: randomly select another peer, starts sending chunks, say Bob
- (2) Alice “optimistically unchokes” Bob
- (3) Alice becomes one of Bob’s top-four providers; Bob reciprocates
- (4) Bob becomes one of Alice’s top-four providers



Part A.2 CDN

Without a CDN



With a CDN

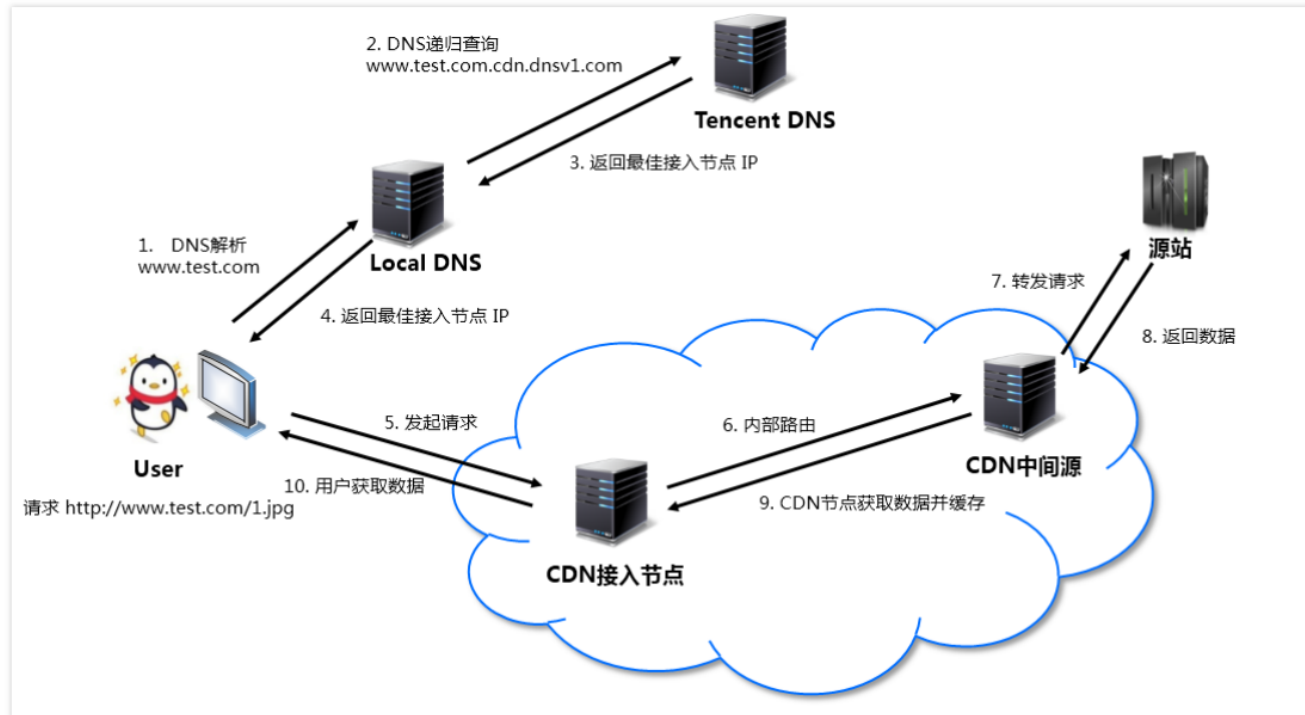


CDN is to cache content on a node closer to the user to improve the user experience;

What are the scenarios of CDN?

- **Big flow** website, such as: online video, games, pictures, audio, social, e-commerce, download stations, etc.
- CDN is suitable for a certain level of **static resource** access, including html, js, css, apk, mp3, flv, jpg, gif, mp4, flv and all other static resources.

Part A.2 CDN



If: X-Cache(HIT): TCP_MEM_HIT means hit cache.
If: X-Cache(MISS): TCP_MISS means Miss cache.

Part A.2 CDN

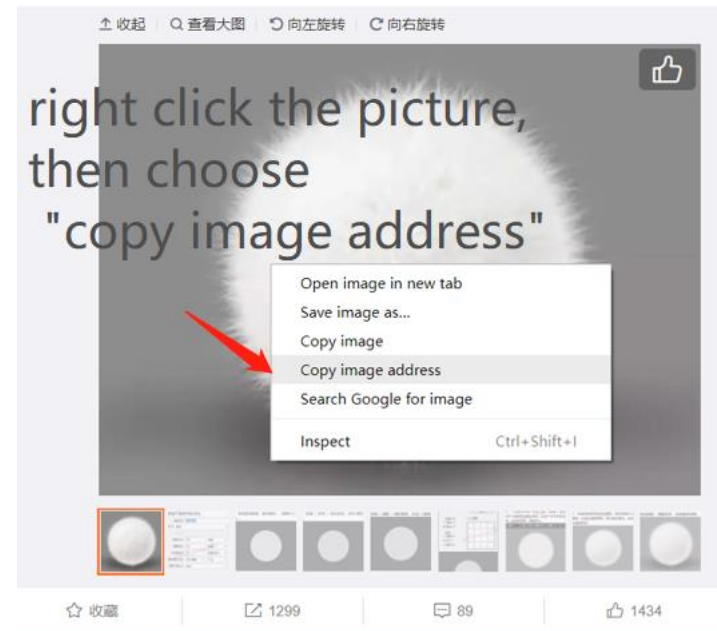
Q: How long is the cache time of file on the CDN server ?

A:

- The caching time of files refers to the cache time cycle of files in browsers.
- The CDN cache server strictly adheres to the standard HTTP protocol, and the cache time is controlled by the Cache-Control and Expires response headers in the HTTP response header
- Html file cache time viewing: Look at the Cache-Control in the HTTP header, such as "Cache-Control max-age = 2592000 (seconds)" to indicate that the file will be cached for 30 days. At this point, unless you use manual refresh, the newly opened browser page will not go back to the source to retrieve the file during the file cache cycle.

Demo 1

1. Find a web sit which may use CDN, find a static resource on it
2. To get the URL of this static resource(such as a picture)
3. Using command “curl” to get the content of this static resource
4. Check if this is on the CDN node or not based on the command output

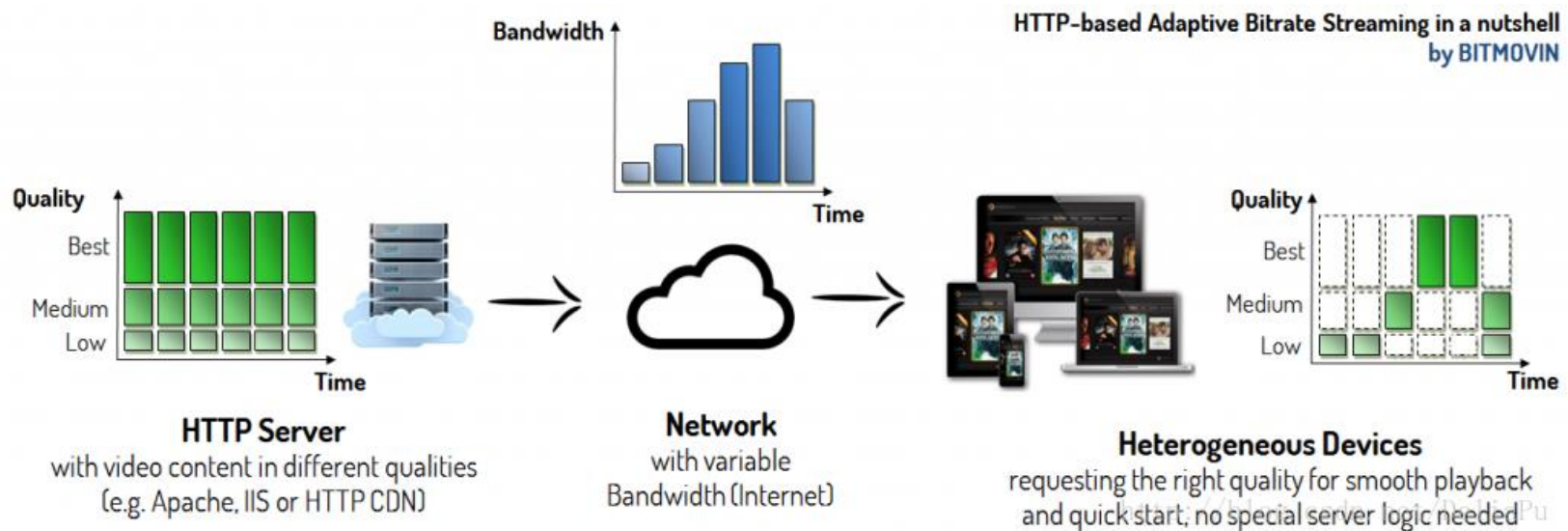


The result of curl

```
C:\Users\Administrator>curl https://d4.sina.com.cn/202110/15/1581703.jpg --head
HTTP/1.1 200 OK
Server: nginx
Date: Mon, 18 Oct 2021 01:25:27 GMT
Content-Type: image/jpeg
Content-Length: 86080
Connection: keep-alive
X-RequestId: 0cbc680a-2110-1809-0045-0894eff93828
X-Requester: GRPS000000ANONYMOUSE
Last-Modified: Fri, 15 Oct 2021 07:16:45 GMT
X-Filesize: 86080
ETag: "96292990b34d783193938a31187d892c"
x-amz-meta-crc32: 12D0DBA9
x-amz-meta-uploadlocation: /ad4
Cache-Control: max-age=604800
Access-Control-Allow-Headers: Origin, Content-Type, Accept, Range, Content-Length
Access-Control-Allow-Methods: GET, PUT, POST, DELETE, OPTIONS, HEAD
Access-Control-Max-Age: 31536000
Access-Control-Allow-Origin: *
Expires: Mon, 25 Oct 2021 01:00:45 GMT
Edge-Copy-Time: 1634518845207
Age: 1483
Via: https/1.1 dfwx.guangdong.union.163 (ApacheTrafficServer/6.2.1 [cRs f ])
X-Cache: HIT.163
X-Via-CDN: f=edge,s=dfwx.guangdong.union.163.nb.sinaedge.com,c=10.245.100.15;f=Edge,s=dfwx.guangdong.union.163,c=103.116
123.163
X-Via-Edge: 16345203279890f64f50aa37b74676d6ca013
```

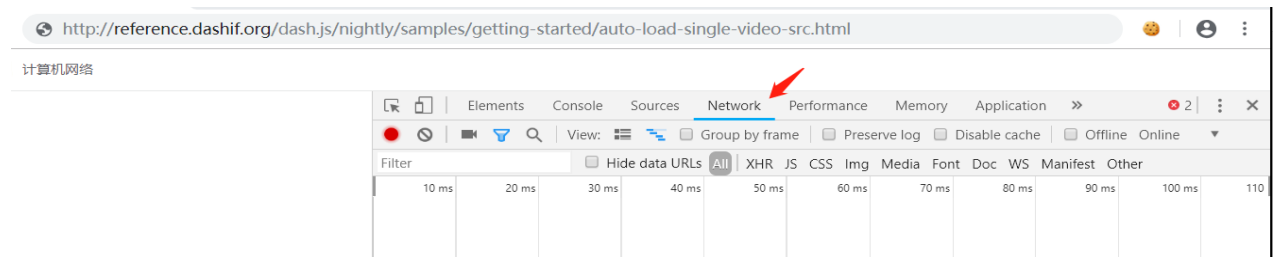
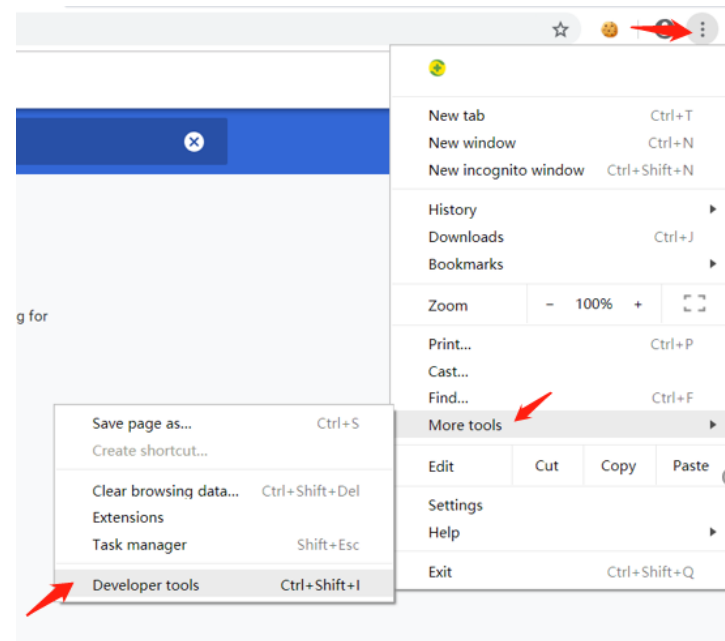
A static resource which is cached on a CDN node

Part A.3 DASH



Demo 2

1. open “chrome”
2. open the “developer tools” of chrome
3. visit the url:
<https://reference.dashif.org/dash.js/nightly/samples/dash-if-reference-player/index.html>
4. Observe what happened on the ‘Network’ view of “developer tools”



Testing result

reference.dashif.org/dash.js/nightly/samples/getting-started/auto-load-single-video-src.html

1024x576 / 2500 kbps / 30 fps

Frame 403: PTS= 00:00:13.433

0:13 / 10:34

Source code

```
<div>  
<video data-dashjs-player="" autoplay="" src="https://dash.akamaized.net/akamai/bbb_30fps/bbb_30fps.mpd" controls="true"></video>  
</div>
```

Copy to clipboard

Network

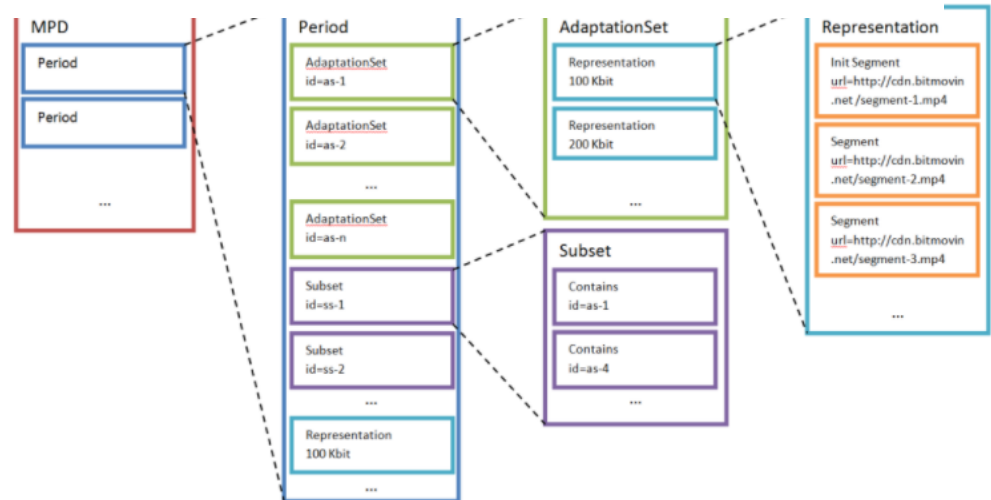
Name	Sta...	Ty...	Initiator	Size	T.	Waterfall
bbb_30fps.mpd	200	xhr	XHRL...	1...	4..	
bbb_30fps_102...	200	xhr	XHRL...	(d...	2..	
bbb_a64k_0.m4a	200	xhr	XHRL...	(d...	4..	
bbb_30fps_102...	200	xhr	XHRL...	74...	4..	
bbb_a64k_1.m4a	200	xhr	XHRL...	(d...	9..	
bbb_a64k_2.m4a	200	xhr	XHRL...	(d...	3..	
bbb_a64k_3.m4a	200	xhr	XHRL...	(d...	4..	
bbb_30fps_640...	200	xhr	XHRL...	(d...	8..	
bbb_30fps_640...	200	xhr	XHRL...	45...	1..	
bbb_30fps_102...	200	xhr	XHRL...	1...	2..	
favicon.ico	404	te...	Other	1...	7..	
bbb_30fps_102...	200	xhr	XHRL...	(d...	7..	
bbb_a64k_4.m4a	200	xhr	XHRL...	(d...	5..	
bbb_30fps_102...	200	xhr	XHRL...	1...	2..	

30 requests | 5.3 MB transferred | 8.9 MB resources | Finish: 1.2 mi

Console

MPD FILE

Name	Headers	Preview	Response	Initiator	Timing
bbb_30fps.mpd			<pre> 1 <MPD mediaPresentationDuration="PT634.566S" minBufferTime="PT2.00S" profiles="urn:hbbtv:dash:profile:isoff-live:2012,urn:mpeg:dash:profile:isoff-live:2011" type="static" xmlns= 2 <BaseURL>./</BaseURL> 3 <Period> 4 <AdaptationSet mimeType="video/mp4" contentType="video" subsegmentAlignment="true" subsegmentStartsWithSAP="1" par="16:9"> 5 <SegmentTemplate duration="120" timescale="30" media="\$RepresentationID\$/RepresentationID_\${Number\$.m4v" startNumber="1" initialization="\$RepresentationID\$/RepresentationI 6 <Representation id="bbb_30fps_1024x576_2500k" codecs="avc1.64001f" bandwidth="3134488" width="1024" height="576" frameRate="30" sar="1:1" scanType="progressive"/> 7 <Representation id="bbb_30fps_1280x720_4000k" codecs="avc1.64001f" bandwidth="4952892" width="1280" height="720" frameRate="30" sar="1:1" scanType="progressive"/> 8 <Representation id="bbb_30fps_1920x1080_8000k" codecs="avc1.640028" bandwidth="9914554" width="1920" height="1080" frameRate="30" sar="1:1" scanType="progressive"/> 9 <Representation id="bbb_30fps_320x180_200k" codecs="avc1.64000d" bandwidth="254320" width="320" height="180" frameRate="30" sar="1:1" scanType="progressive"/> 10 <Representation id="bbb_30fps_320x180_400k" codecs="avc1.64000d" bandwidth="507246" width="320" height="180" frameRate="30" sar="1:1" scanType="progressive"/> 11 <Representation id="bbb_30fps_480x270_600k" codecs="avc1.640015" bandwidth="759798" width="480" height="270" frameRate="30" sar="1:1" scanType="progressive"/> 12 <Representation id="bbb_30fps_640x360_1000k" codecs="avc1.64001e" bandwidth="1254758" width="640" height="360" frameRate="30" sar="1:1" scanType="progressive"/> 13 <Representation id="bbb_30fps_640x360_800k" codecs="avc1.64001e" bandwidth="1013310" width="640" height="360" frameRate="30" sar="1:1" scanType="progressive"/> 14 <Representation id="bbb_30fps_768x432_1500k" codecs="avc1.64001e" bandwidth="1883700" width="768" height="432" frameRate="30" sar="1:1" scanType="progressive"/> 15 <Representation id="bbb_30fps_3840x2160_12000k" codecs="avc1.640033" bandwidth="14931538" width="3840" height="2160" frameRate="30" sar="1:1" scanType="progressive"/> 16 </AdaptationSet> 17 <AdaptationSet mimeType="audio/mp4" contentType="audio" subsegmentAlignment="true" subsegmentStartsWithSAP="1"> 18 <Accessibility schemeIdUri="urn:tva:metadata:cs:AudioPurposeCS:2007" value="6"/> 19 <Role schemeIdUri="urn:mpeg:dash:role:2011" value="main"/> 20 <SegmentTemplate duration="192512" timescale="48000" media="\$RepresentationID\$/RepresentationID_\${Number\$.m4a" startNumber="1" initialization="\$RepresentationID\$/Represent 21 <Representation id="bbb_a64k" codecs="mp4a.40.5" bandwidth="67071" audioSamplingRate="48000"> 22 <AudioChannelConfiguration schemeIdUri="urn:mpeg:dash:23003:3:audio_channel_configuration:2011" value="2"/> 23 </Representation> 24 </AdaptationSet> 25 </Period> 26 </MPD> 27 </pre>		
bbb_30fps_480x270_600					
bbb_a64k_0.m4a					
bbb_30fps_480x270_600					
bbb_a64k_1.m4a					
bbb_a64k_2.m4a					
bbb_30fps_3840x2160_1					
favicon.ico					
bbb_a64k_3.m4a					
bbb_30fps_3840x2160_1					
bbb_a64k_4.m4a					
bbb_a64k_5.m4a					
bbb_a64k_6.m4a					
bbb_a64k_7.m4a					
bbb_a64k_8.m4a					
bbb_30fps_3840x2160_1					
bbb_a64k_9.m4a					
bbb_a64k_10.m4a					
bbb_a64k_11.m4a					



Practise 6.1 Loading a Dash resource

- Using dash.js to load a dash resource
- Open “Network” view in ‘developer tools’ of browser (such as chrome) to observe
 - Is there any ‘mpd’ files, What’s its name, what is the description of ‘mpd’ in mime
 - Is there any ‘m4s’ or ‘m4v’ or ‘mp4’ files, what’s its related rate, will the files’ ‘rate’ change along with the changing of network condition (especially the bandwidth)
- Reference:
 - A html embedded a dash.js which maybe helpful for loading a ‘mpd’ file
 - <https://reference.dashif.org/dash.js/nightly/samples/dash-if-reference-player/index.html>
 - A dataset of dash resources
 - https://dash.akamaized.net/akamai/bbb_30fps/

Practise 6.2 Finding a CDN user

- Using curl to get a resource from web which using CDN to upgrade the accessing speed and balance the traffic load
 - How can you tell that this web is using CDN
 - Using nslookup/dig in your computer to find the IP address of this web sit
 - Ask your friend who is in another province to practice the same thing(using nslookup/dig to find the IP address of the web site which using CDN, find the IP address of this web site.)