

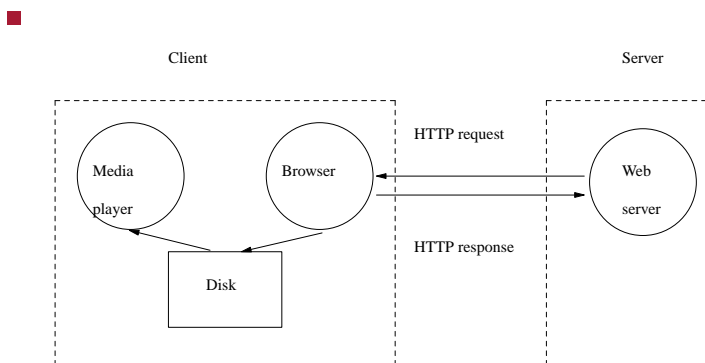
RTSP Real time Streaming Protocol

- Tanenbaum, Computer Networks, Prentice Hall, 5th Edition, 2011, p727..738
- MPEG standards exploit the fact that video normally consists of different scenes
 - each scene has limited pixel changes between frames
- thus MPEG output consists of three types of frames

MPEG video

- **I** **ntacoded** frames
 - self contained compressed still pictures
- **P** **redictive** frames: block by block difference with previous frames
 - difference of blocks of pixels, ie as a car travels down a street
- **B** **idirectional** frames
 - block by block difference with previous and future frames
 - not often used as client needs to buffer outstanding frames and also maintain knowledge when blocks of data can be calculated
 - as succeeding frames appear

Simple streaming of stored media



Simple streaming of stored media

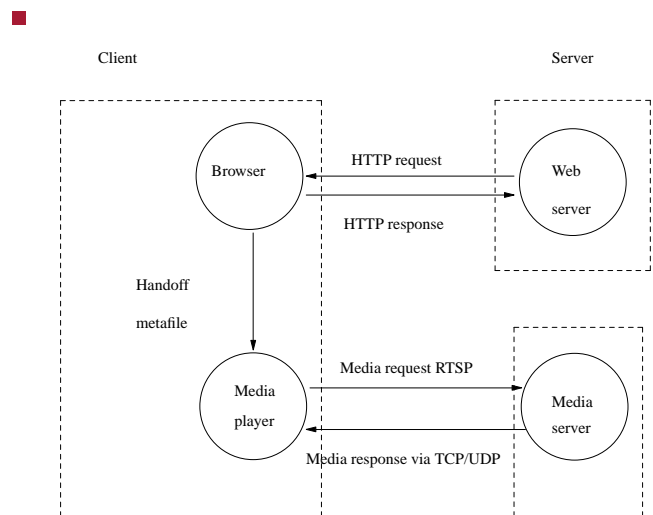
- disadvantages
 - you might need to wait until the whole file has been downloaded before playing
 - worse, downloading a movie file could result in a high throughput of data over a short period of time
 - in turn could render the network useless for other users
- imagine using NFS to download a MPEG stream and mplayer to playback the stream
 - it might result in heavy bursts of network activity
 - between periods of network inactivity

RTSP (real time streaming protocol)

- resolves these problems by allowing the browser to download a **metafile**
 - typically a small text file which looks like:

```
rtsp://mcgreg.comp.glam.ac.uk/film.mp4
```

Browser and RTSP



RTSP

- may use either TCP or UDP
- both present problems
 - TCP might cause jitter
 - displacement of digital signal over time
 - UDP might incur loss of packets

How RTSP solves UDP limitations

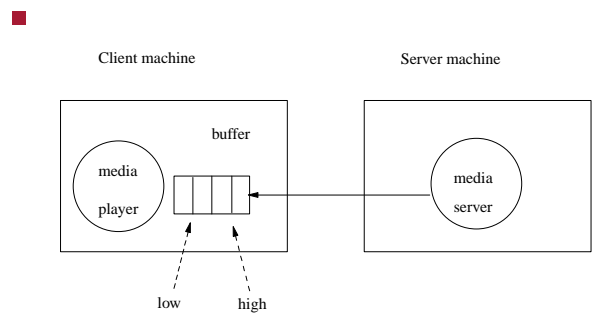
- FEC
 - forward error control
- introduces a 5th parity packet after every 4 packets
 - allows any of the previous 4 packets to be reconstructed from the 5th and remaining packets

How RTSP solves UDP limitations

- Interleaving
 - mix the order of the frames before transmission
 - the client corrects the order prior to playback

- the loss of a single packet (or burst of packets) will be spread out over time

How RTSP solves TCP limitations



How RTSP solves TCP limitations

- notice that the client uses a low and high water mark

- which in turn is mapped onto the `pause` and `play` RTSP commands

- which brings flow control into the application layer
 - thus the flow control is very closely connected to the application decoding requirements of the film
 - though the processing of the I, P, B frames

RTSP client commands

Command	Server action
describe	list media parameters
setup	establish a logical channel between client/server
play	start sending data to client
record	start accepting data from client
pause	temporarily stop sending data
teardown	release the logical channel

Using a media player over NFS vs RTSP

- NFS will likely occasionally produce very demand a large network utilisation
 - then there will be periods of inactivity

- causes the network to be unusable by other network users

- RTSP tries to keep the median throughput as close as possible to the average throughput
 - consider multiple broadband users streaming iplayer content and browsing the web