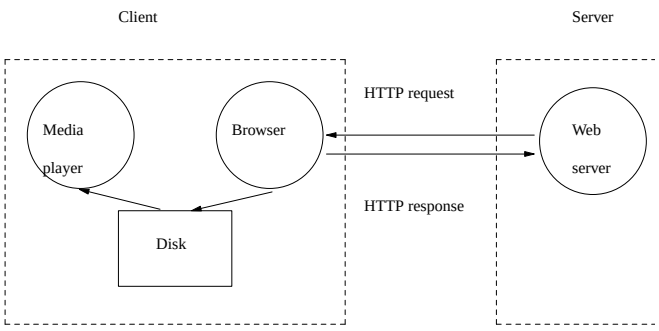
RTSP Real time Streaming Protocol

- 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 **intacoded** frames
  - self contained compressed still pictures
- P **predictive** frames: block by block difference with previous frames
  - difference of blocks of pixels, ie as a car travels down a street
- B **bidirectional** 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

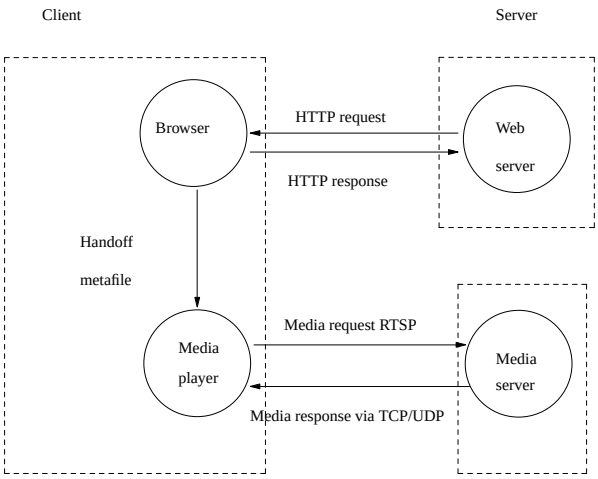
- disadvantages
  - you might need to wait until the whole file has been downloaded before playing
  - worse, downloading a movie file could result in a high throughput of data over a short period of time
  - in turn could render the network useless for other users
- imagine using NFS to download a MPEG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

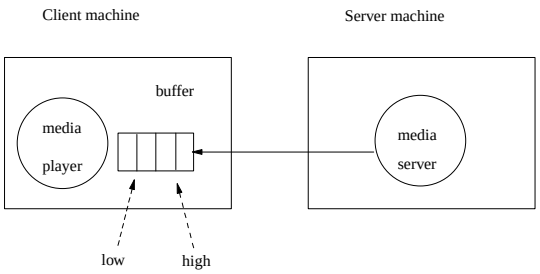
How RTSP solves UDP limitations

- 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/serv
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