

# Example (2)

```
//client to audio server
SETUP rtsp://audio.source.com/Mission_to_Mars/audio RTSP/1.0
CSeq:1
Transport: RTP/AVP/UDP;unicast;client_port=3056-3057

//audio server to client
RTSP/1.0 200 OK
CSeq:1
Session 12345678
Transport: RTP/AVP/UDP;unicast;client_port=3056-3057;server_port=5000-5001

//client to video server
SETUP rtsp://video.source.com/Mission_to_Mars/video RTSP/1.0
CSeq:1
Transport: RTP/AVP/UDP;unicast;client_port=3058-3059

//video server to client
RTSP/1.0 200 OK
CSeq:1
Session 23456789
Transport: RTP/AVP/UDP;unicast;client_port=3058-3059;server_port=5002-5003
```

# Example (3)

```
//play instructions to servers
PLAY rtsp://video.source.com/Mission_to_Mars/video RTSP/1.0
CSeq:2
Session: 23456789 #range: smte=0:10:00-

RTSP/1.0 200 OK
CSeq:2
Session 23456789 #range: smte=0:10:00-
RTP-info: url=rstp://video.source.com/Mission_to_Mars/video;seq=123122322;rtptime=78712811

PLAY rtsp://audio.source.com/Mission_to_Mars/audio.it RTSP/1.0
CSeq:2
Session: 12345678 #range: smte=0:10:00-

RTSP/1.0 200 OK
CSeq:2
Session 12345678 #range: smte=0:10:00-
RTP-info: url=rstp://audio.source.com/Mission_to_Mars/audio.it;seq=876655;rtptime=10325465
```

# Systems for real time streaming

- In the 90s VOD (Video on Demand) was considered as the “killer application” for broadband networks
- However, the prediction was not true
- The basic problem for setting up a full VoD service through the network is not technological: it is a business problem
- In fact, providing true VoD services is very costly and it is difficult to devise a business model in which costs are compensated by fares that users are willing to pay to obtain the service

# Systems for real time streaming

- Since the 90s technology has constantly improved and the main advances have been in the areas of:
  - Advanced codec at relatively lower bit rates
  - More efficient video servers
  - Large Bandwidth user access links

# Multimedia servers

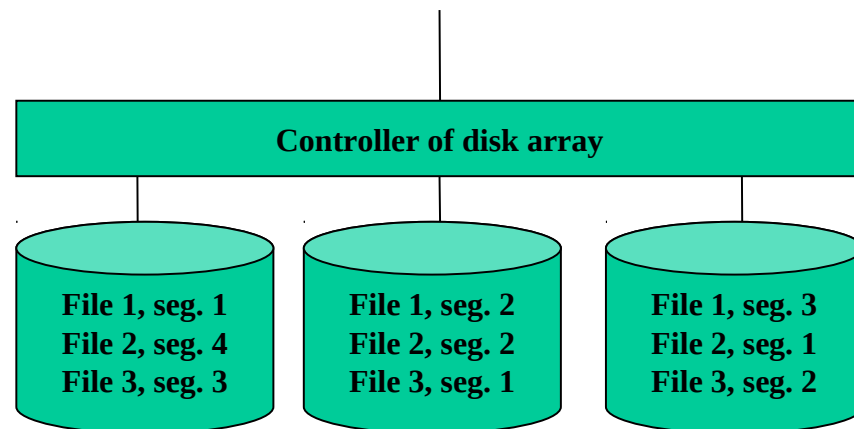
- Video (multimedia) server, must store a large number of contents, this calls for a very large storage capacity, on the order of many Terabytes
- The server's storage must also provide large access bandwidth, to accommodate concurrent requests from a large number of users

# Multimedia servers

- The cost efficiency of media storage is a critical issue
- Common techniques are hierarchical storage architectures, where low hit rate contents are stored on optical disks or even tapes
- Disks and disk arrays are used massively for high hit rate contents
- Striping is a common solution

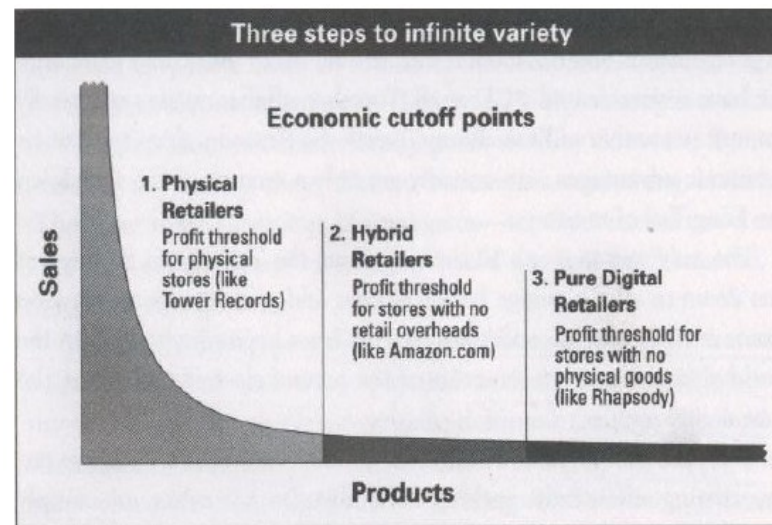
# Multimedia servers

- RAID (Redundant Array of Inexpensive Disks) storage is a cost-efficient architecture
- A large number of inexpensive disks is used to obtain a total large volume of storage
- Stripes (i.e. chunks of the same media) are stored on different disks



# The long tail of contents

- The term “long tail” has been firstly defined by Chris Anderson, the director of the Wired magazine, in 2004



Fonte: Anderson, 2006.



# The long tail of contents

- The digital distribution model allows providers to build virtually infinite catalogs of contents, in contrast to, for example, a DVD shop which is mainly limited by the physical space into which DVDs must be kept
- Google, Amazon, iTunes, are examples of log-tailed markets, in which digital contents with high hit rate are relatively few, compared to the vast set of low hit rate contents that the provider can distribute to its customers

# The long tail of contents

- A relevant example is that of the book market
- Traditionally, a physical library must choose books complying with the constraint of the available physical space
- In such a business, naturally the provider concentrates on high hit rate objects, leaving the virtually infinite set of low hit rate object untouched

# YouTube

- YouTube is a typical example of log-tailed distribution of digital contents
- You Tube provides both contents with high hit rate and contents with very small hit rates
- The number of contents distributed by You Tube is virtually unlimited
- You Tube also provides user-generated contents, a business that cannot be reached by classic content providers