IPTV and its transportation ...

Broadcast Multimedia course – TUT - 2008

Adrian Hornsby

IPTV…like in IP + TV ??

Yea !!

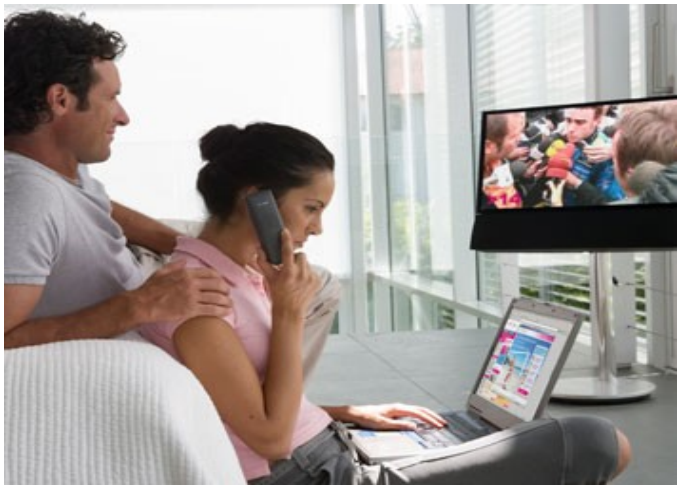
IP + TV = IPTV !!

Sending television-like content over an IP network

And even more !!

Trip Play

A/V Content + Internet Access & Services + VoIP ..... (= Convergence)



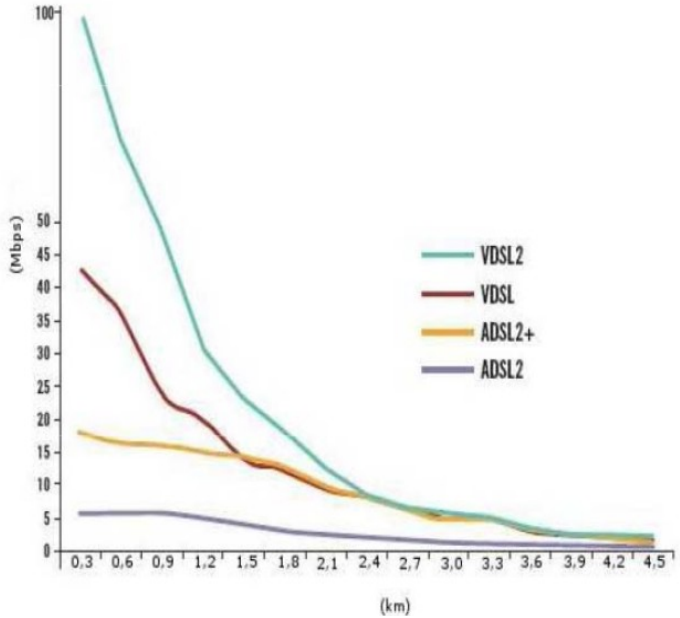
What do I need to get it ??

1) Digital TV
2) High speed internet connection
3) IPTV provider and contract (€€€)
4) Set-top-box

Ok !! but how did we get there ?? .... and why??

Where it all begin ...

- Evolution of High-Speed Internet Access
  - Since 1995 ...
  - Evolution in Internet access business.
    - connection, routing and content were 3 separate parts
    - Then affiliation with third-party providers to create high-speed access combination of connection and routing
    - Moved toward a more integrated approach to the provision of high-speed access.
    - However, content still (mostly) separated from connection and routing.
  - Evolution in Broadband technology
    - XDSL (Digital Subscriber Line)
    - ISDN (Integrated Service Digital Network)
    - Satellite
    - Ethernet
    - But also Optic fiber



Remember that one ??

Digital Media Revolution …

- Huge increase in media content
- Faster communications
- New user experience
- New consumer demand

New digital devices + new digital transmission systems =
New digital transmission standard

Lets start from the beginning ...

Just to remind you !!

- SDTV (NTSC)

720 pixels x 525 lines x 24bits (3x8,red,green,blue)x30frames/sec

= 272.16 Mbps

- HTDV

1920 pixels x 1080 lines x 24bits (3x8, red, green,blue) x 30 frames/sec

= 1.493 Gbps

Still unsure we need to compress all that ?? :)

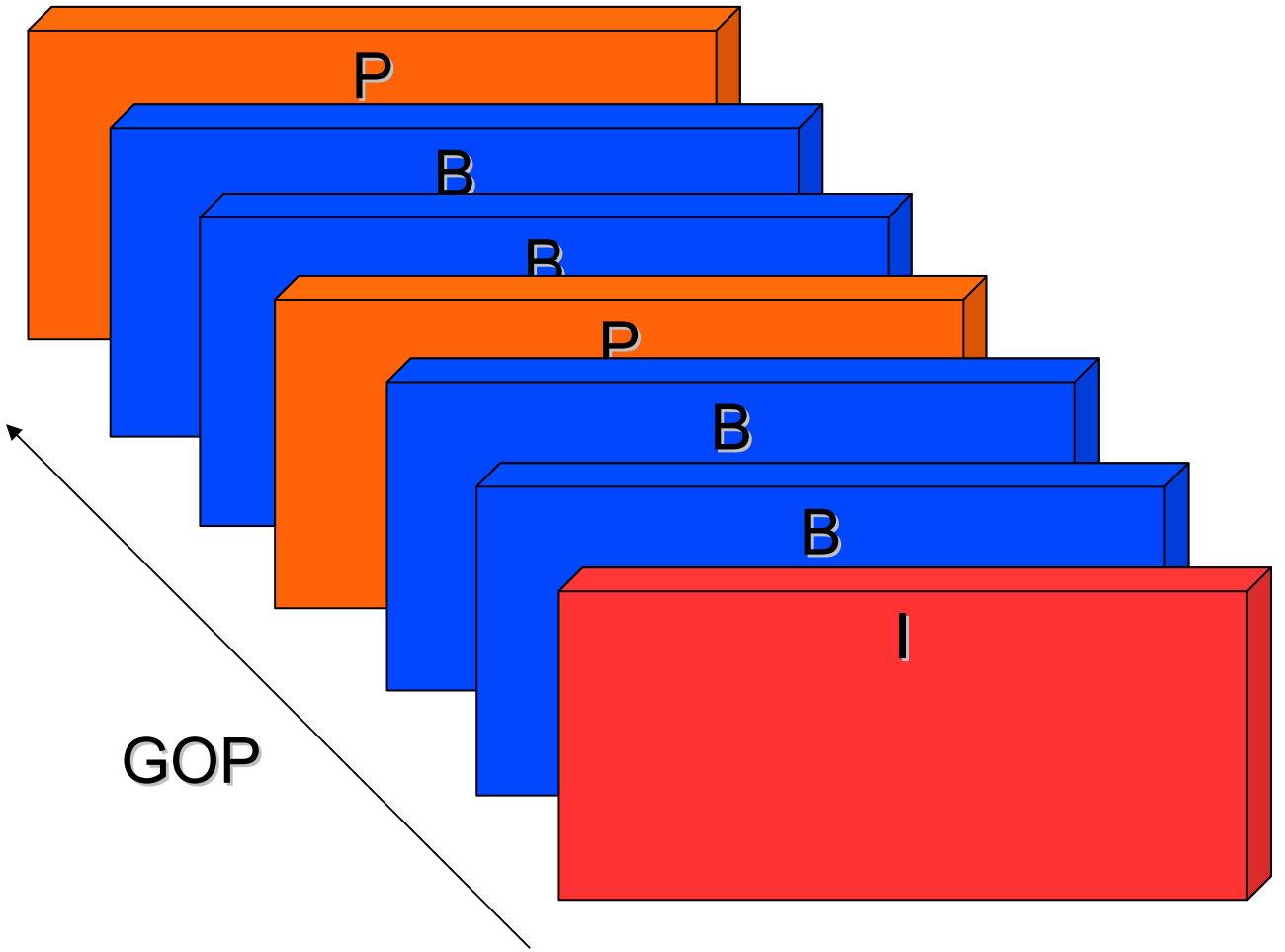
How to compress ??

- Video Codecs
  - MPEG-2
  - MPEG-4
  - WM9
  - H.264

H.264:

- *up to 50% bite rate saving compared to mpeg4 simple profile*
- *Consistent good quality for high and low bit rates*
  - *From ~50 Kbps (mobile) to 10 Mbps (broadcast VOD)*
- *Necessary tools for error resilience (packet loss, bit errors ...)*
- *Network adaptation layer (transport friendly)*

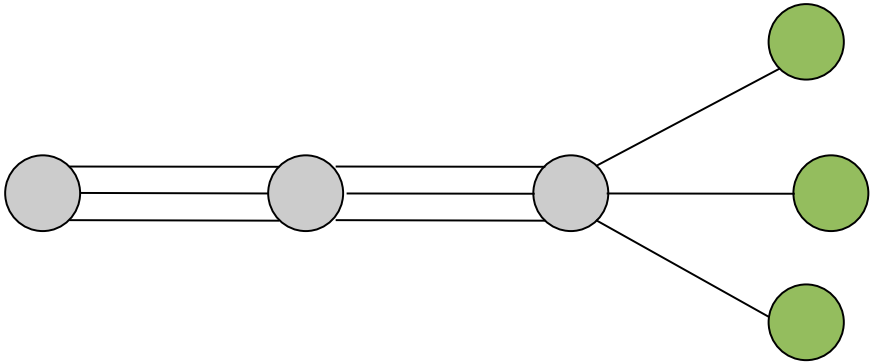
How does it work it a nutshell ...



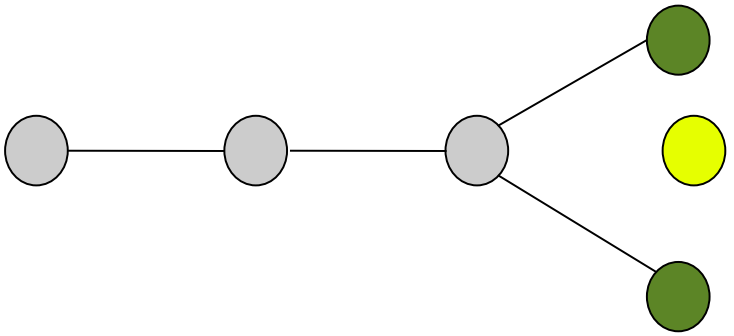
Display order different than sending order (IPBBPBB)

How to send all that to people ??

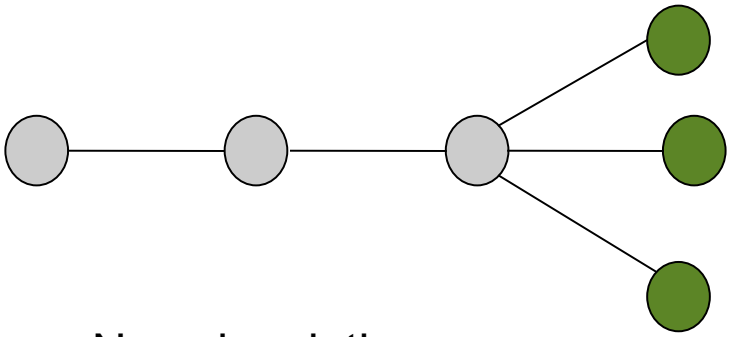
- One-to-one (Unicast)



- One-to-many (Multicast, Broadcast)



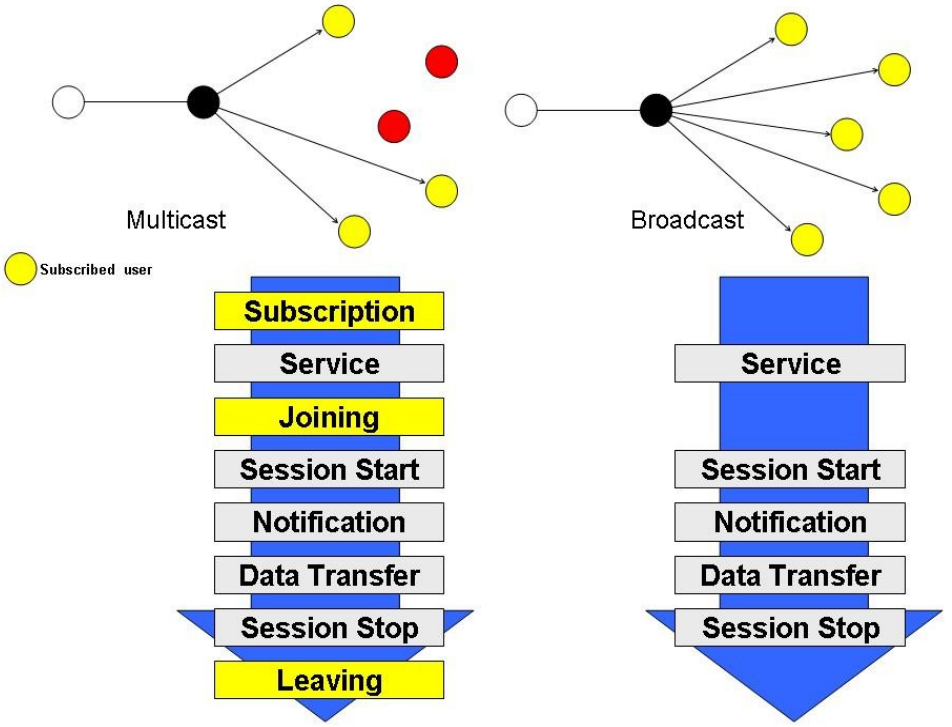
subscription



No subscription

How do I join a multicast group ??

- IGMP (Internet Group Management Protocol)
  - Defines multicast group membership registration between hosts and router
- PIM (Protocol Independent Multicast)



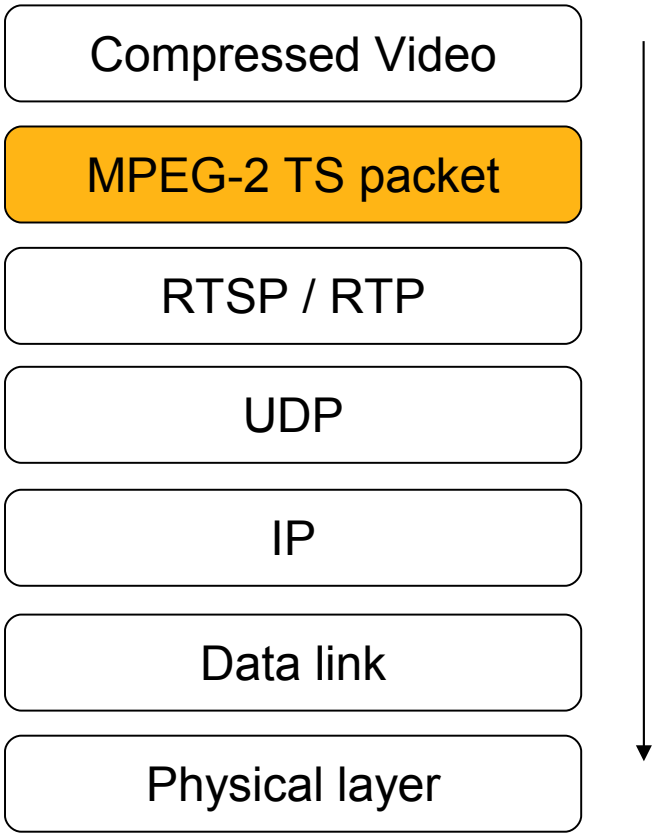
Who will do the transport job ?

- Compressed Video
- MPEG-2 TS packet
- RTSP / RTP
- UDP
- IP
- Data link
- Physical layer

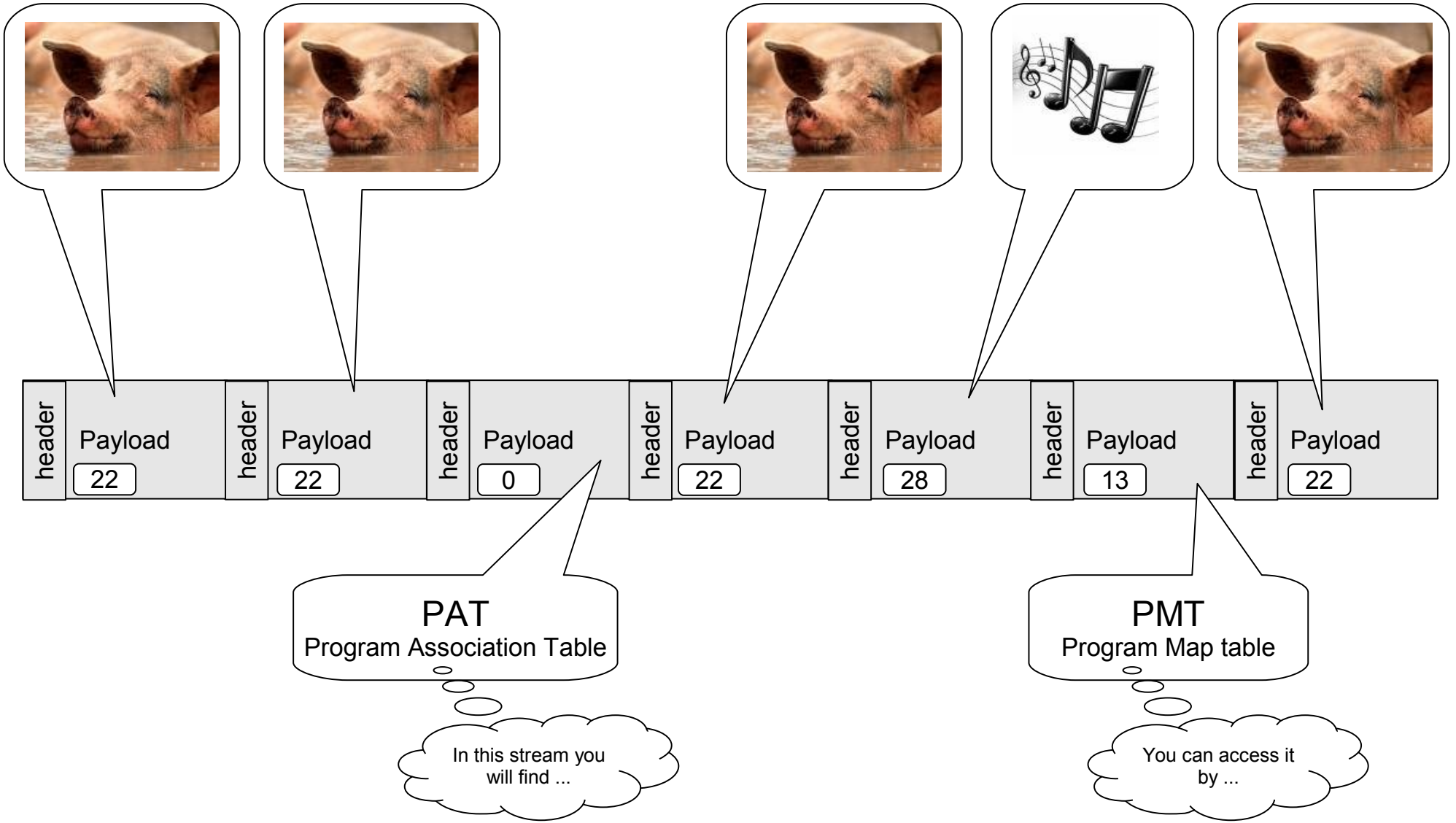
How ?

- MPEG-2 Transport Streams
  - > Not a codec but a “transport” mechanism !!

- Defines format of a multimedia program
- Video, Audio, Subtitles, Control, User data
- Short packets of 188 Byte
  - *4 Byte header, payload 184 Bytes*
- Can transport several compress video format
  - *Profiles*

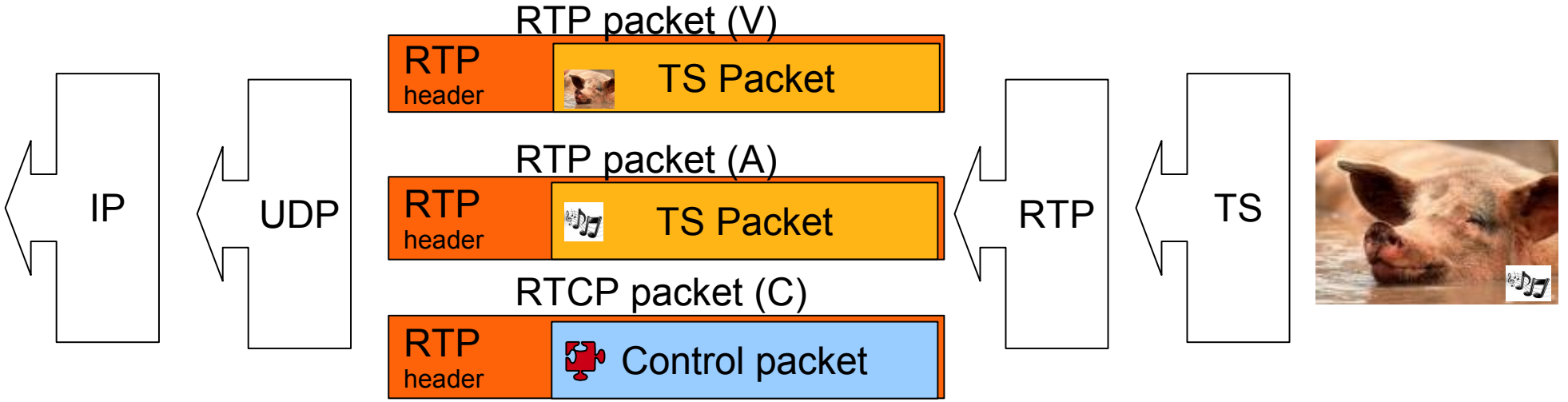


MPEG-2 TS in a nutshell ...



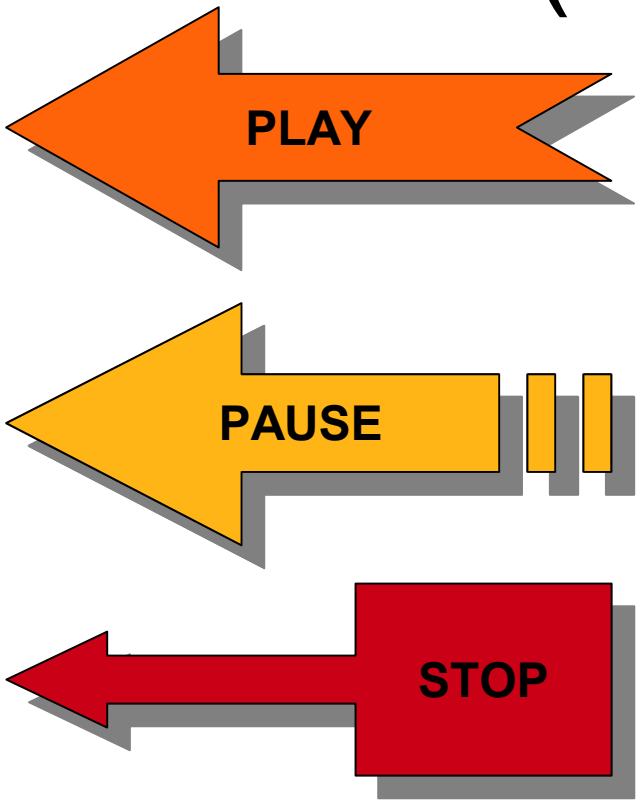
Real-Time Transport Protocol (RTP)

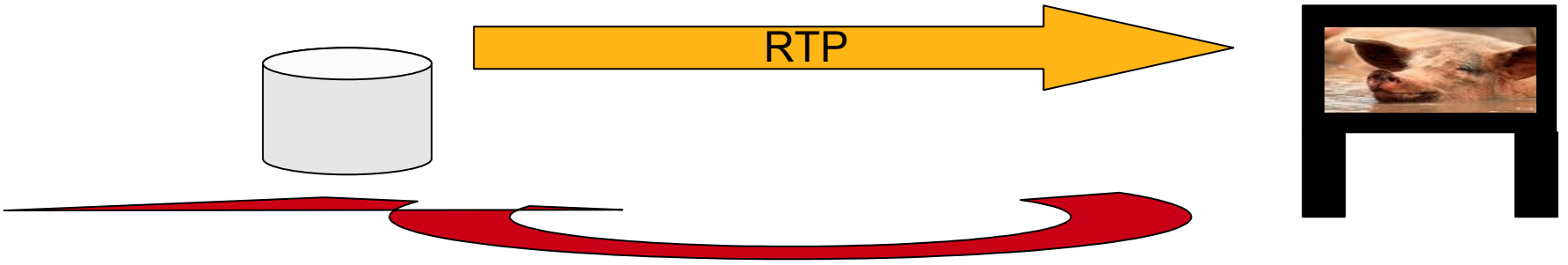
(optional)



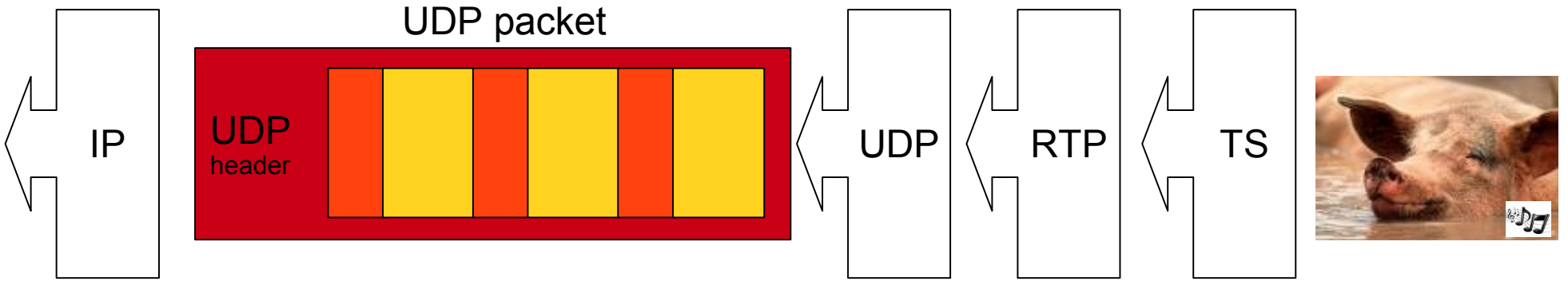
In some case, RTP is not used → TS over UDP

Real-Time Streaming Transport (RTSP)

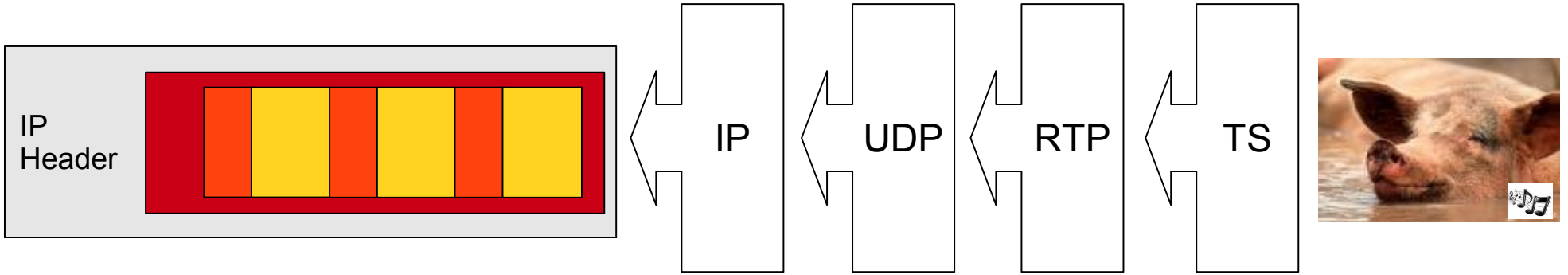


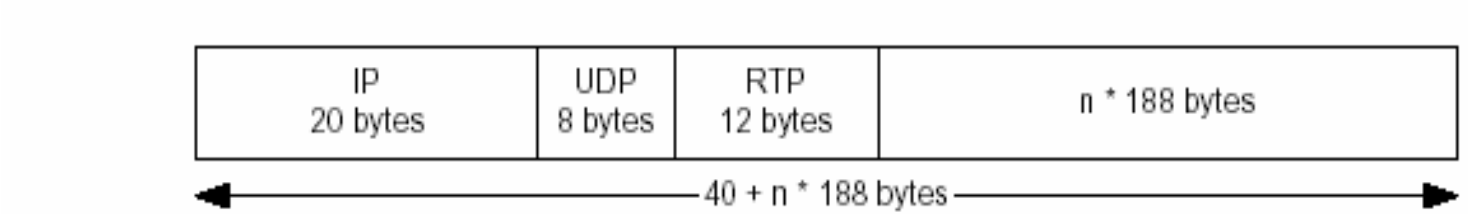


User Datagram Protocol (UDP)

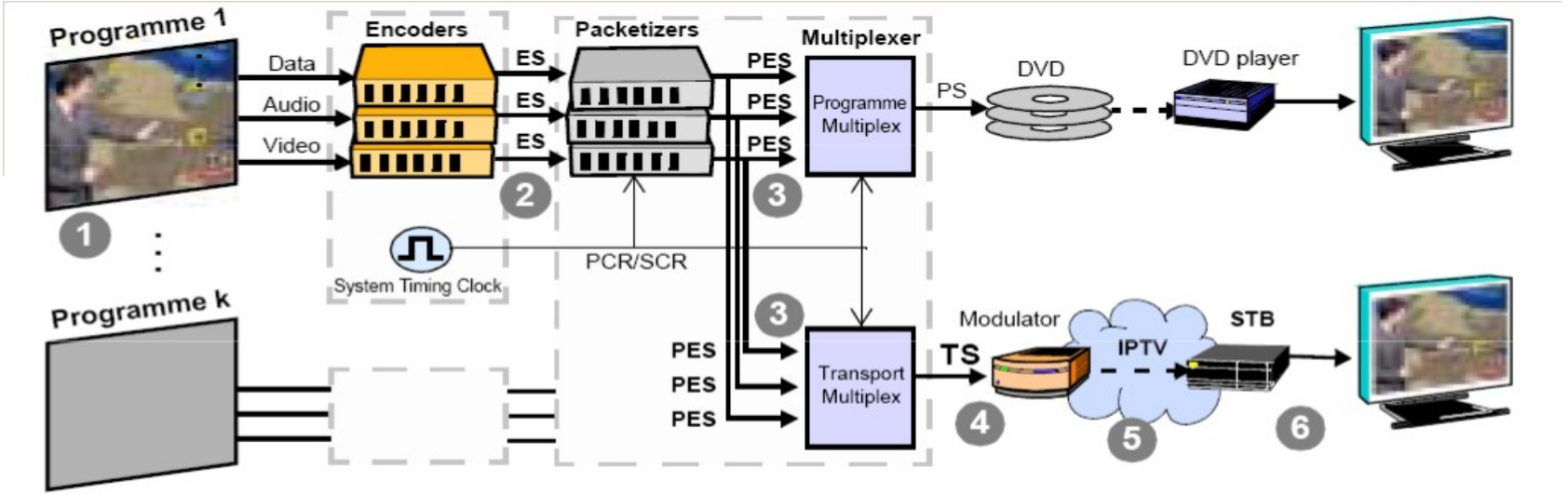


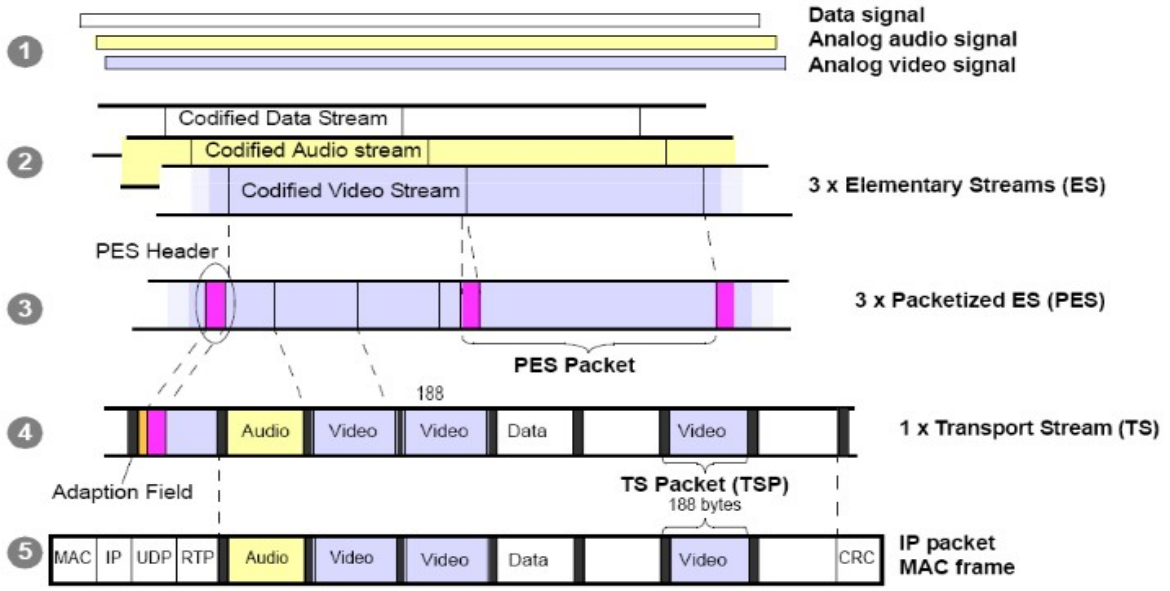
Internet Protocol (IP)





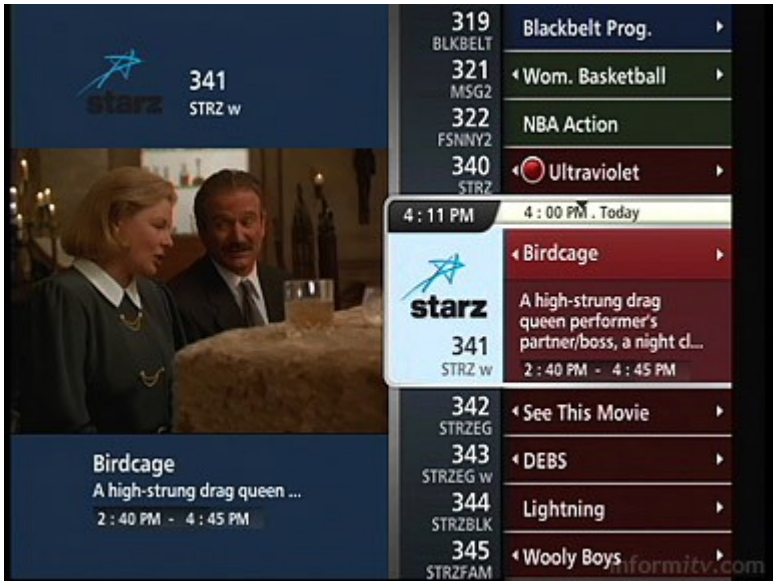
IPTV ... all chain





Service, Program Guide

- Web service like
  - XML based (TV anytime, OMA, ...)
  - HTTP requests



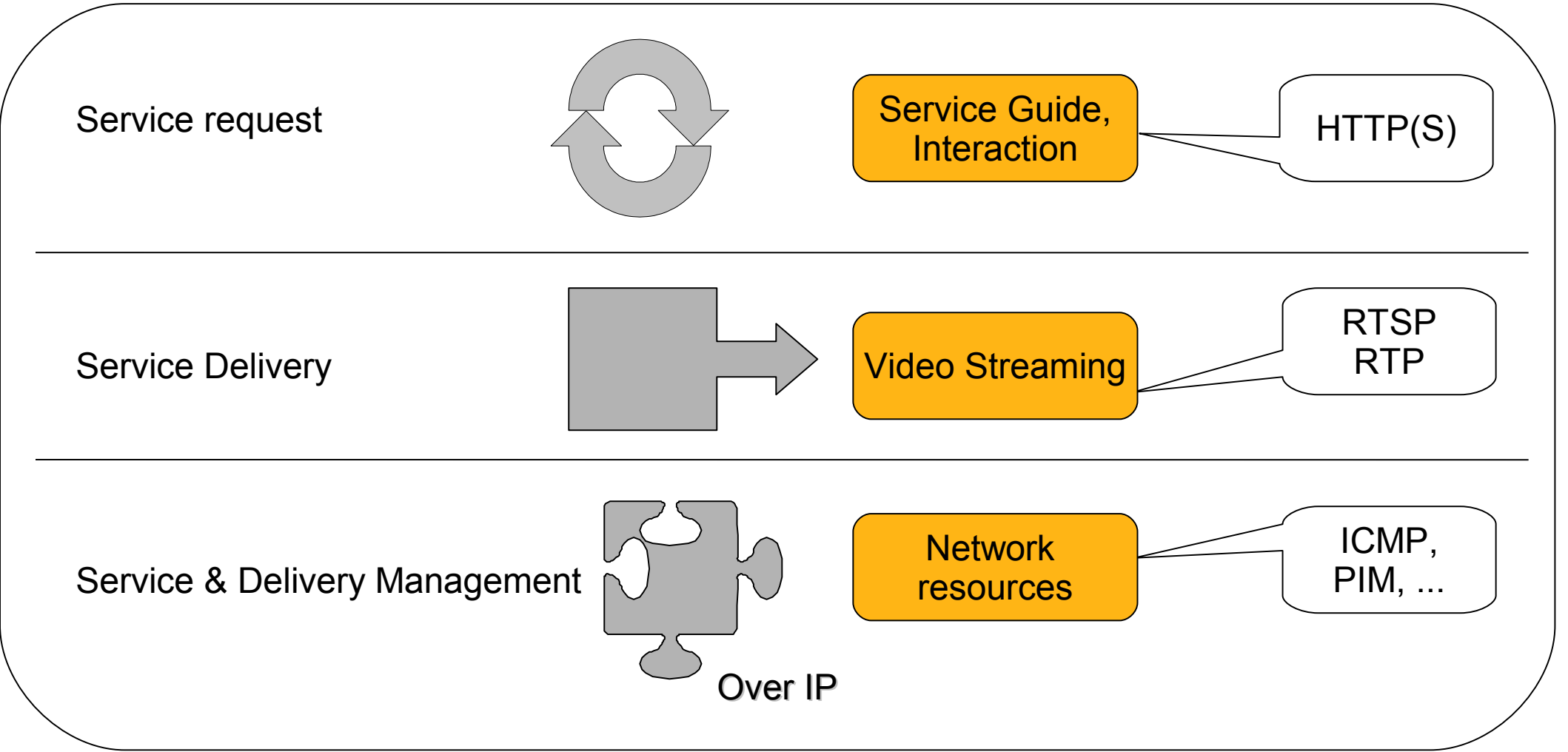
How does my device access the right media stream ??

- 2 Possible way
  - mpeg2-TS PSI/SI (if no RTP)
  - SDP (Service Description Protocol) (only if RTP,opt)

```
v=0
o=QTSS_Play_List 1460227057 502868560 IN IP4 130.230.50.48
s=stream-32
c=IN IP4 239.252.80.5/1
b=AS:375
t=0 0
a=x-broadcastcontrol:RTSP
m=video 5004 RTP/AVP 96
b=AS:248
a=rtpmap:96 MP4V-ES/90000
a=control:trackID=1
a=cliprect:0,0,240,320
a=fmtp:96 profile-level-id=1;config=000001...
a=mpeg4-esid:201
m=audio 5006 RTP/AVP 97
b=AS:127
a=rtpmap:97 mpeg4-generic/44100/2
a=control:trackID=2
a=fmtp:97 profile-level-id=1;mode=AAC-hbr;...;
a=mpeg4-esid:101
```

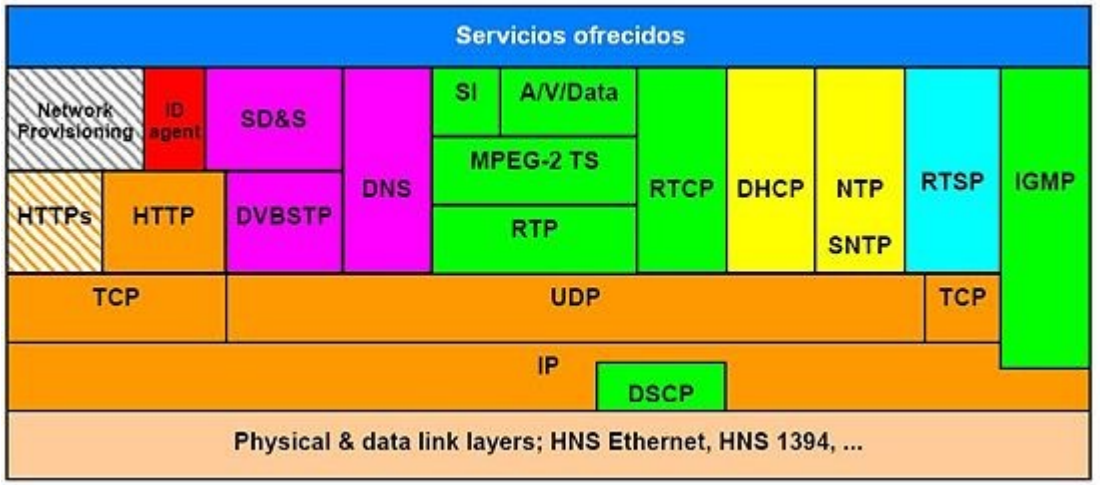
Now .. What is IPTV ?

- Delivery of Digital Television Service over IP network ....



In other words, IPTV is ...

- DVB services over IP network → DVB-IP
  - Achieve interoperability
  - Give confidence for investment
  - Avoid confusion in the market
  - Lower costs for everybody

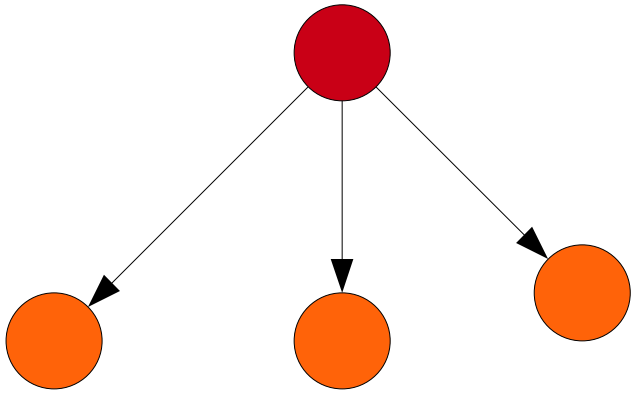


Now, how can I get IPTV ??
2 distribution models ...

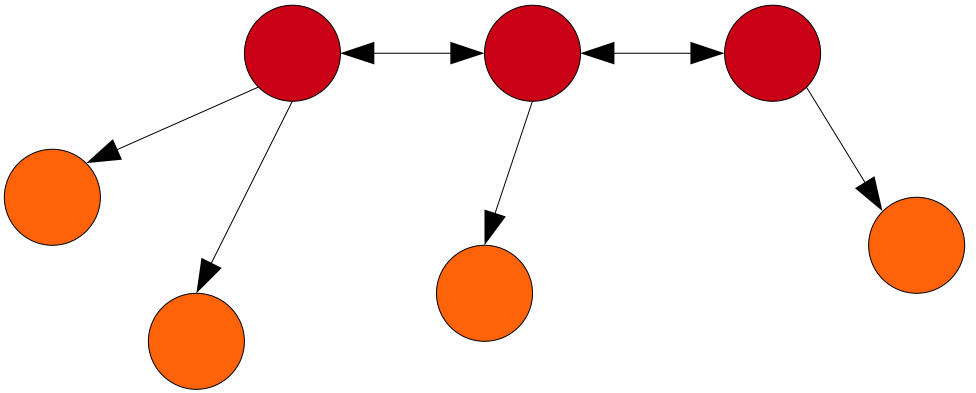
- Show me LIVE content
  - Multicast stream
  - start from where it is
  - no control
- Show me stored content - VOD
  - Unicast stream
  - start from beginning
  - Control it (play, pause, stop)

Distributed and Centralized transport model

- Centralized
  - from one broadcast center
  - easy to set up
  - cheaper
  - bandwidth limitation

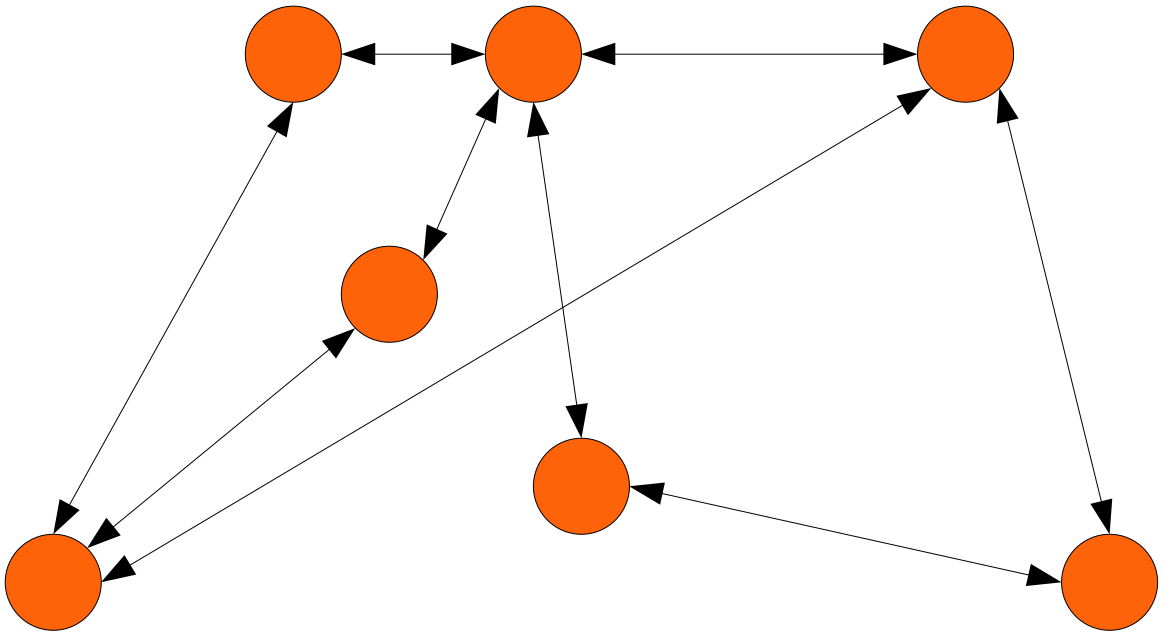


- Distributed
  - several systems
  - synchronization
  - added costs
  - more maintenance
  - very reliable
  - no limit on usage

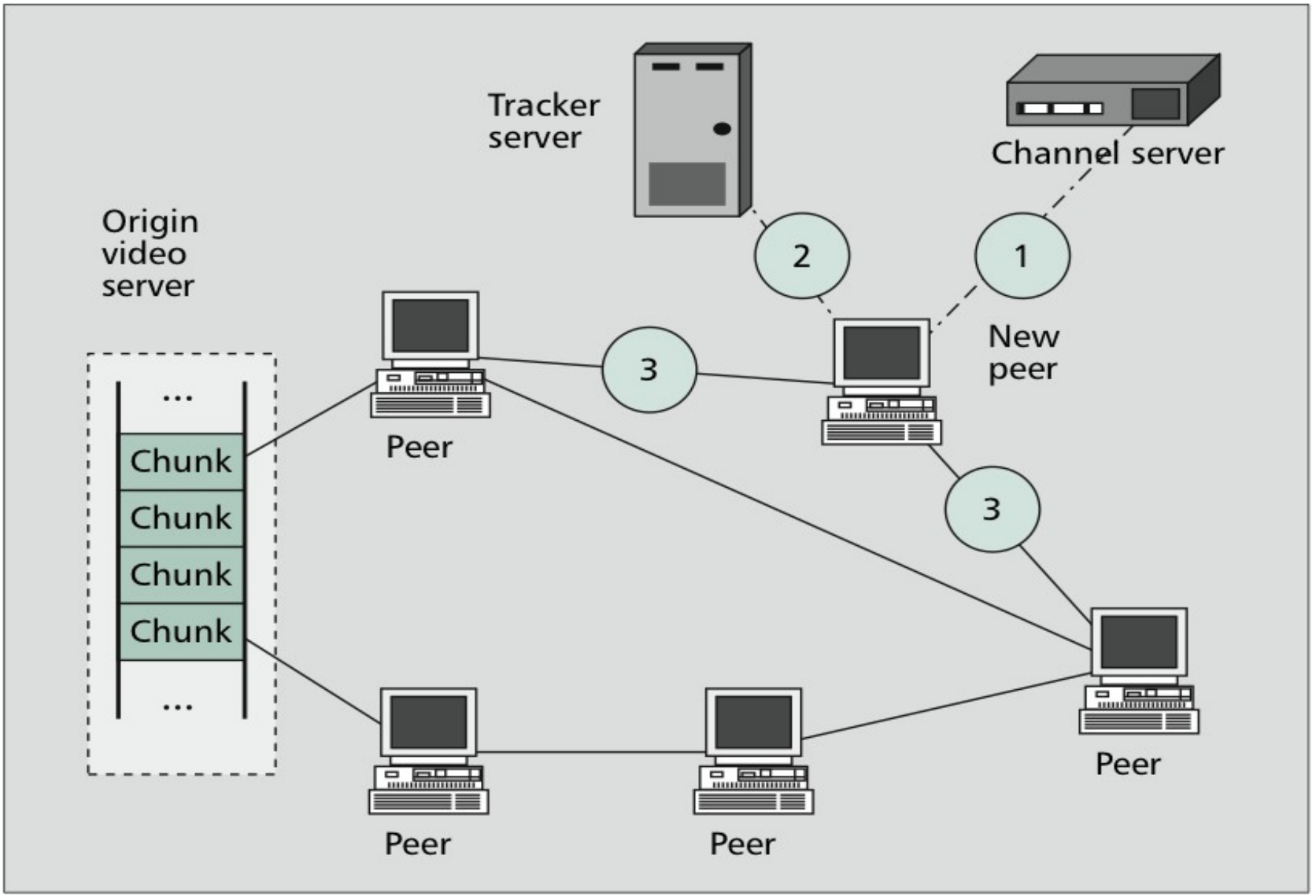


But also P2P distribution model !!

- Two issues
  - How to form topology between peers?
  - Efficient delivery of video content
- Current approaches
  - tree-push
  - mesh-pull



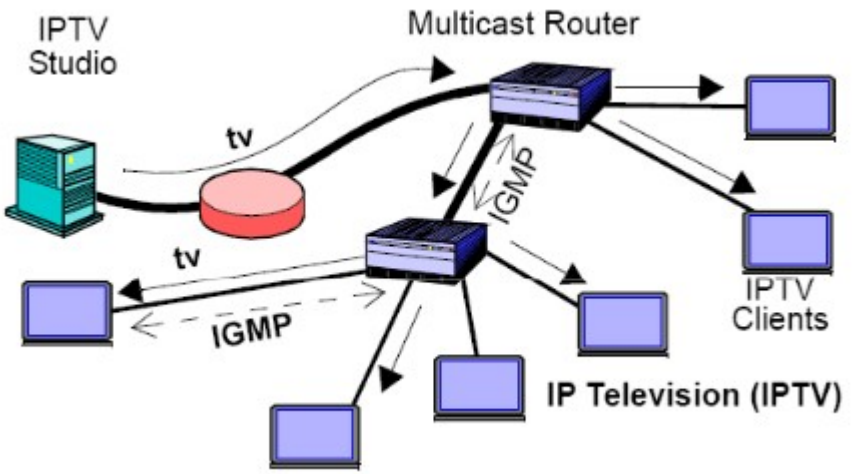
P2P in a nutshell ...



Xiaojun, H., Yong, L., Ross, K. W. IPTV over P2P Streaming Networks: The Mesh-Pull Approach. 2008. IEEE Communications Magazine, February 2008 issue.

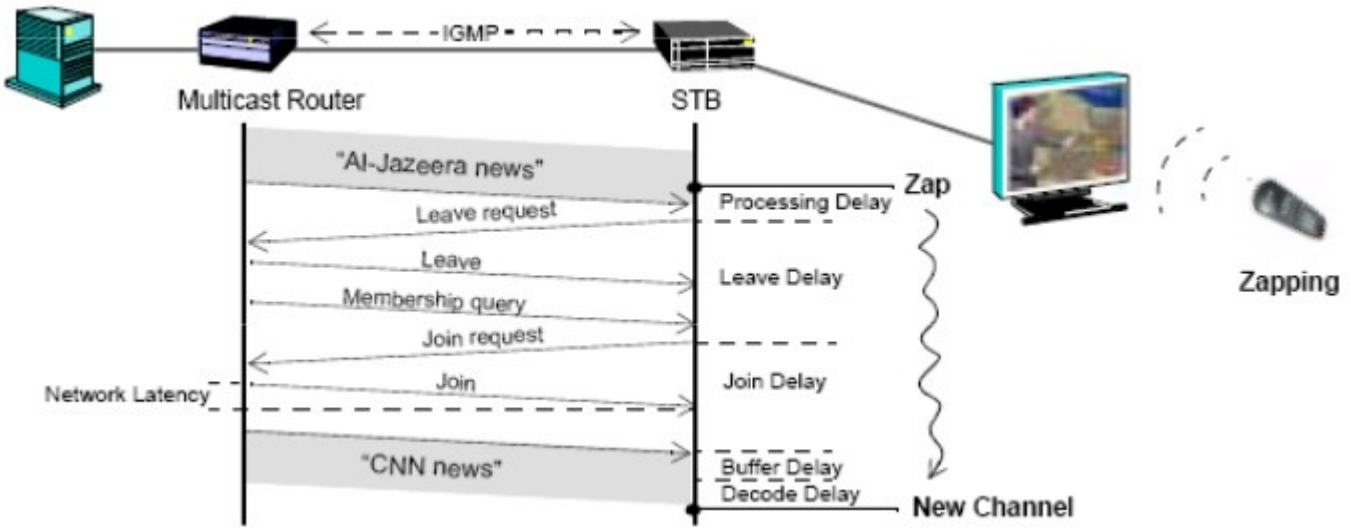
IPTV and some limitations ...

- IP network
  - Limited bandwidth (€)
  - 1 TV program / channel = 3Mbit/s
  - Provider organize the network by group of users that watch the same channel (multicast_groups)
    - Not suitable for VOD



IPTV and some inconvenience ...

- Channel zapping
  - Traditional TV, all channel received and decoded at the same time
  - Not IPTV
    - Channel request for each channel → delay



To sum up ..

-> Compressed TV in MPEG2-TS

(DVB service)

-> Sent over IP network

[ts/(rtp/rtsp)/udp/ip]

->VOD or LIVE

(multicast vs unicast)

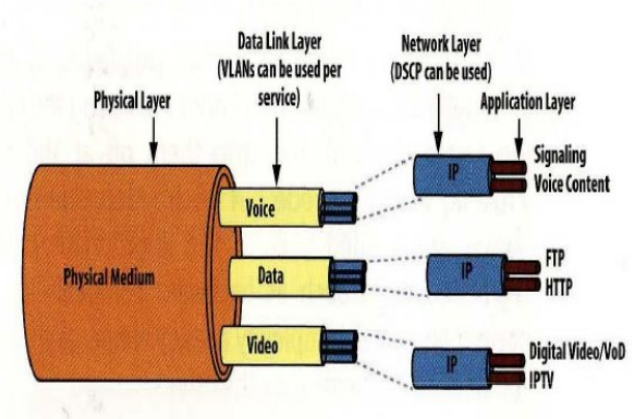
->Centralized, decentralized and P2P

!! but watch out, IPTV is not InternetTV !!

(not same quality, protocols, architecture...)

IPTV offers ...

- Triple play
  - Television
  - VoIP
  - Internet access
- All in the same connection !!
  - Concurrence to traditional broadcasters (terrestrial, satellite) and Internet providers ...
    - ALL-IN-ONE = less € !



Future .. towards HD IPTV

- SD stream: about 3 Mb/s
- HD stream: about 8 Mb/s
- Demanding on the access network...
  - Several televisions in homes, increase bandwidth
  - Web-surfing and VoIP should still be possible
- ...and core network also
  - VoD and multicasting don't go together
- IPTV is often seen as the driving force for the next-generation Internet.