

Video Streaming summary

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Video Streaming



- **File Transfer**
- Media Streaming
- Media Streaming Technology
- Streaming Media Encodings
- Publishing and Communication
- Media players
- Videoconferencing
- Multimedia Frameworks
- Mobile TV

Progressive Download



- Also known as *Pseudostreaming*.
- Transfers the file.
- Allows playback, while the file is not fully transferred.
- Saves a copy on user's system.
- Easier and less costly than media streaming.

Web Server Streaming



- Also known as ***HTTP streaming***.
- Creates a locally-cached copy of the file.
- Users can copy the files.
- It can get through firewalls.

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Media Streaming



- **Media streaming** is defined as the continuous transmission of media files over a Local or Wide Area Network (LAN, WAN).
- Allows media reproduction during file transfer.
- Data are transferred, played back and then deleted.
- Performed real-time, allows live broadcast.

Media Streaming Categories



- ***Streaming on Demand:***
 - Files are placed on a media server.
 - Can be played back at any time.
 - Providers are not required to have a lot of bandwidth.
- ***Live Media Broadcasting:***
 - Real-Time encoding and uploading to a media server.
 - All users simultaneously connected to the server.
 - Requires a ***large bandwidth*** and ***multiple stream servers***.

A few interesting statistics



- Every minute, **Facebook** users view **2.7 million** videos.
- Each minute, **300 hours** of video are uploaded to **Youtube**.
- **1 billion hours** are spent watching **Twitch** each month.
- In 2018, **Netflix**:
 - had spendings of **12 billion** dollars and
 - a revenue of **16 billion** dollars.
- Global TV earned more than **265 billion** dollars in 2018.

Video Streaming

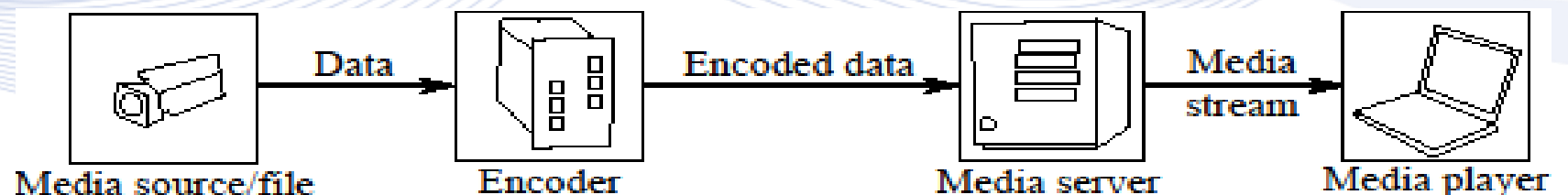


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Media Streaming Technology



- Streaming requires a specialized media server.
- Files must be encoded by a media encoder.
- Each encoding is optimized for different transmission rates.
- **Internet Transport Protocols** are used (TCP, UDP, etc.).
- **No error correction most times**, data are lost forever.
- Media players handle video playback.



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Streaming Media Encoding



- **Video codecs** must adopt a **bit rate distribution strategy** in order to improve transmission.
- Different encoding for different bit rates. Maximizes quality.
- **Key frames** are encoded first, then the difference frames.
- The higher the resolution, the more bits required.
- Many encoding methods.

Streaming Media Encoding



- **Constant Bit Rate (CBR)** encoding:
 - Uses a **video buffer** to control data rate.
 - Dynamically alters compression rate.
 - Cannot begin playback, until the buffer is full (memory delay).
- **Two-pass CBR** encoding:
 - **First pass** finds the bits required to encode each frame.
 - **Second pass**, determines bit allocation per video frame.
 - Better quality, doubles encoding time.
 - Requires future information.

Video Streaming



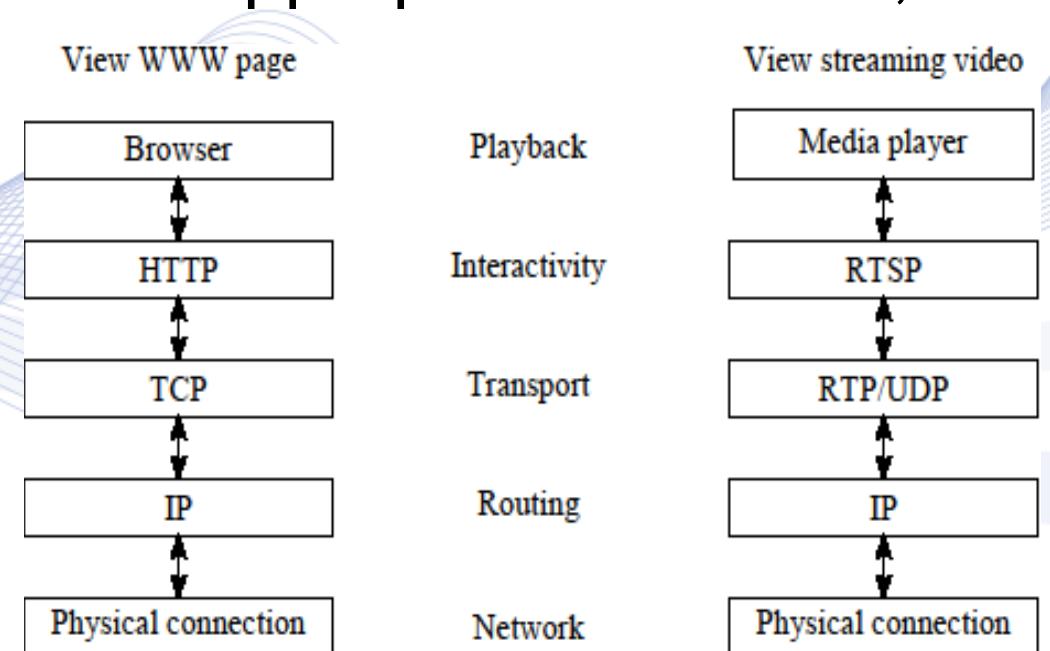
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Publishing & Hosting



Publishing is the process of making the streaming media available to the public.

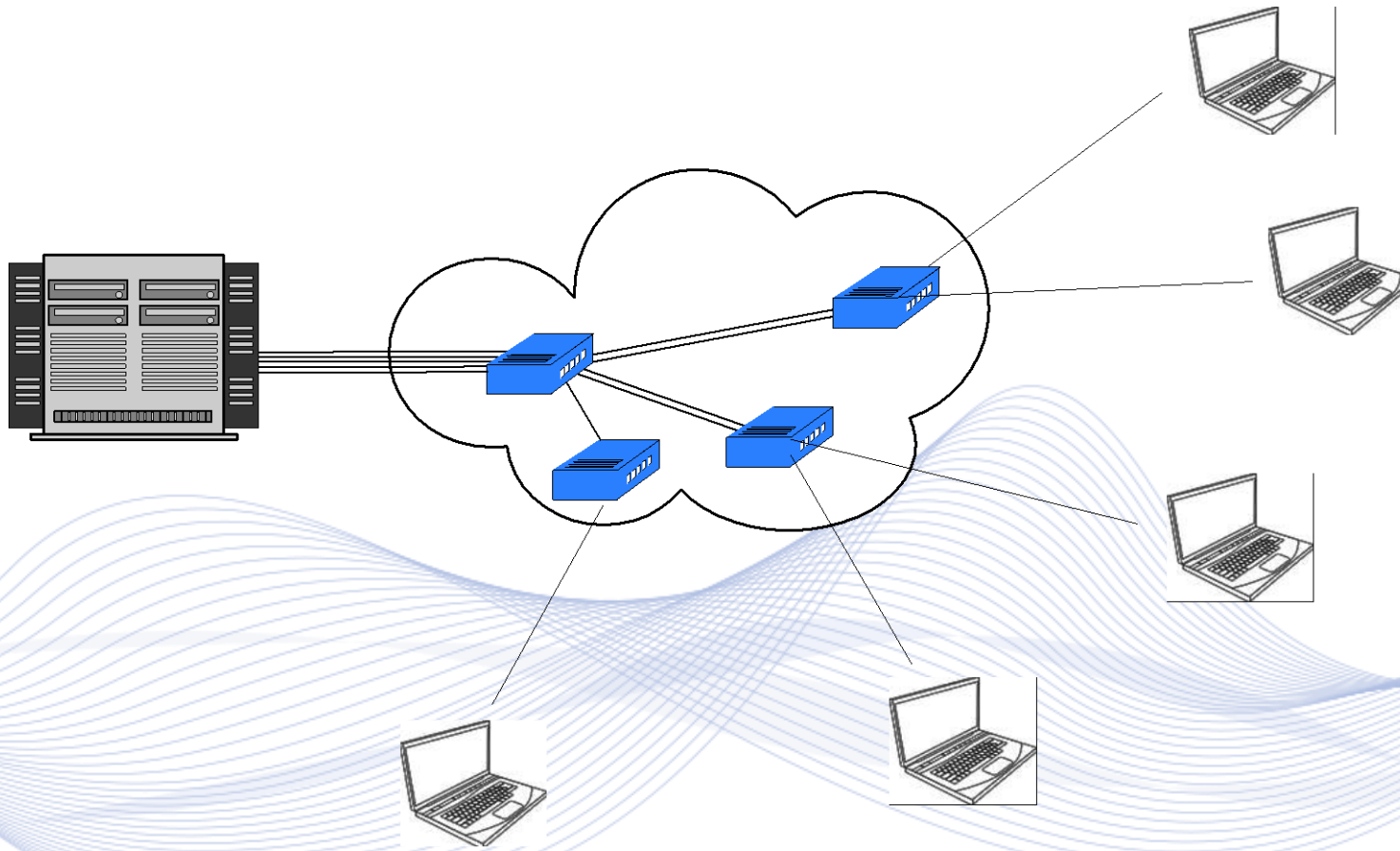
- Media files can be transferred via **HTTP** or other protocols.
- They can be played on a browser with appropriate software, or on a separate **media player**.



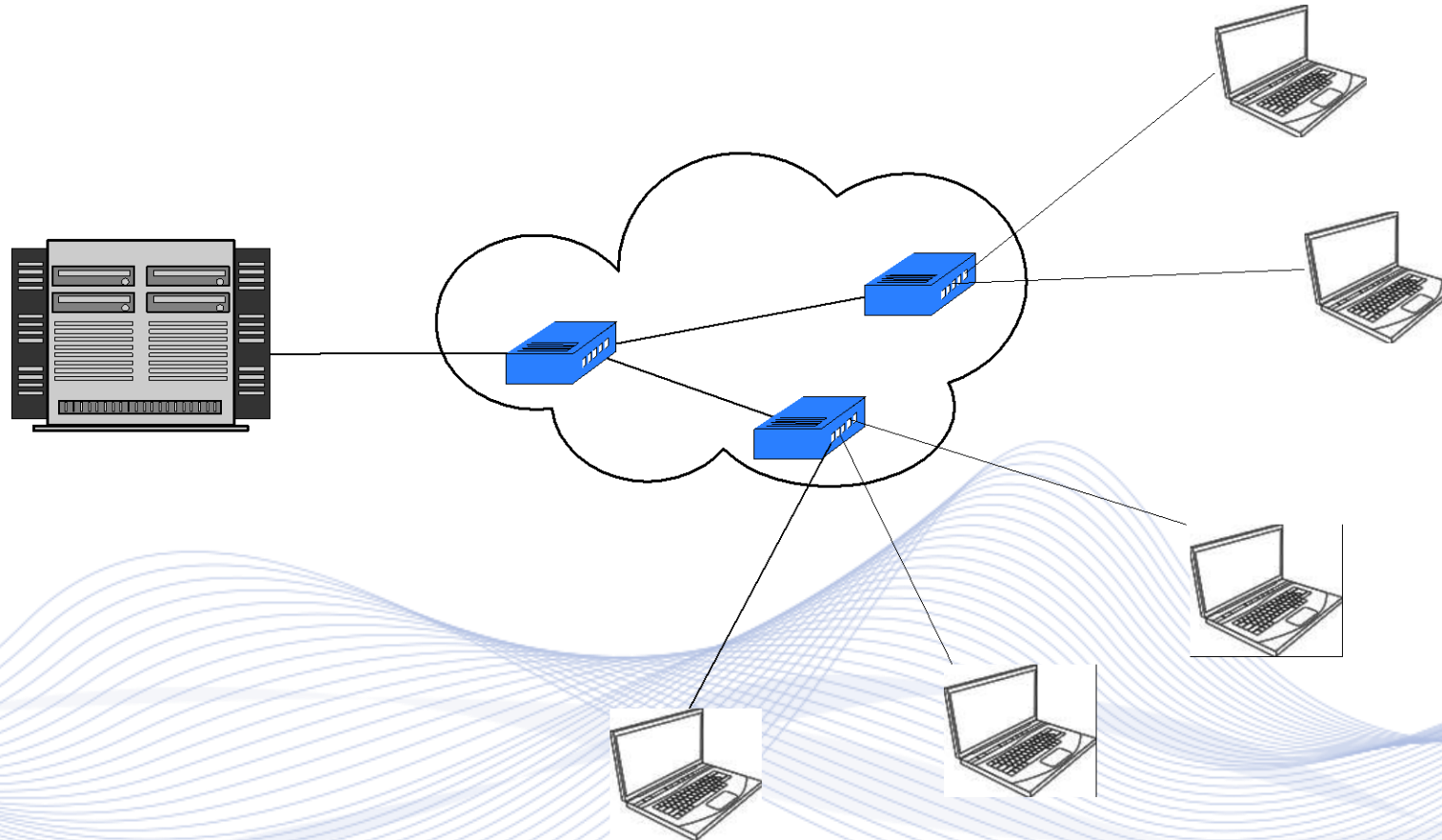
Streaming Media Communication

- ***Multicast.***
 - A single stream is transmitted over a network.
 - It is replicated in network nodes to reach multiple users.

Streaming Media Communication



Streaming Media Communication

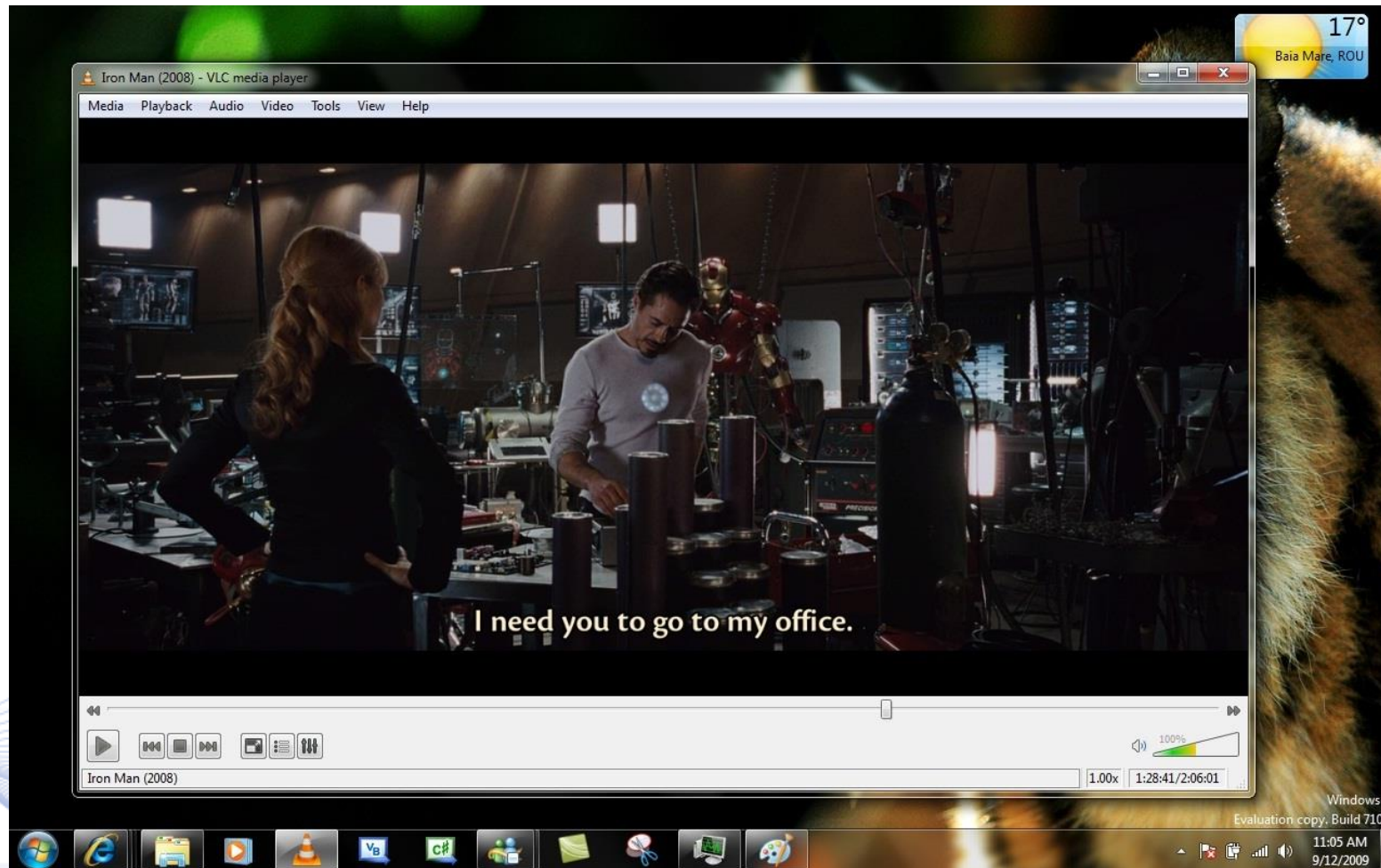


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VLC Media Player



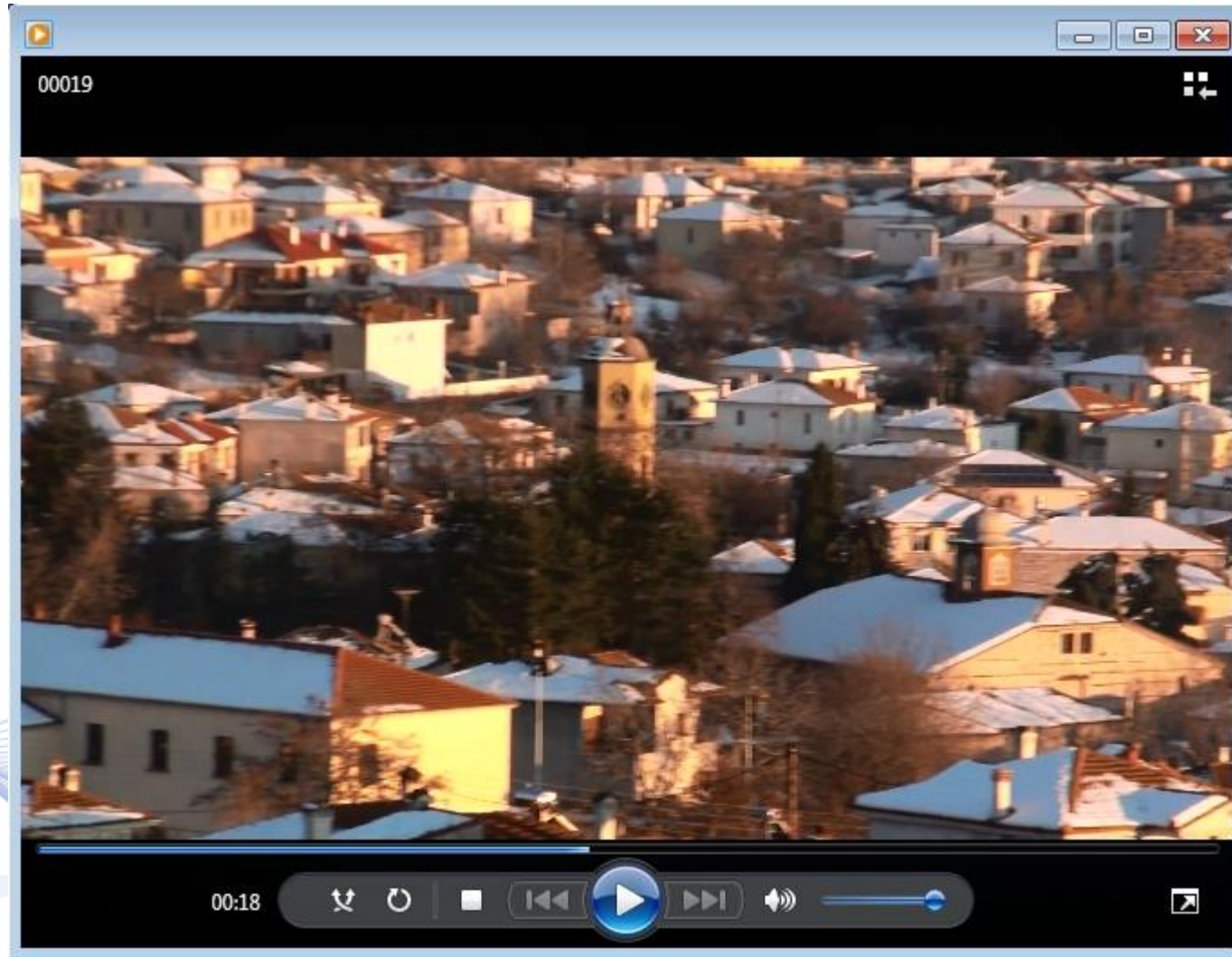
VLC Media Player [VLC].

Real Player



Real Player [RPL].

Windows Media Player (WMP)



QuickTime



- Developed by Apple.
- Newer versions available only for **Mac OS**.
- Older unsupported versions for other operating systems.
- Can handle video, audio, animations and panoramic images.
- Allows trimming and splitting content to parts.
- QuickTime video compression format was the basis of MPEG-4 video compression standard.

QuickTime



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Videoconferencing



Videoconferencing is a two-way audiovisual communication between two or more sites/users.

- Created in the 30s for analog videos.
- Digital videoconferencing begun in the 80s.
- Moderate initial success, used mainly to reduce travel costs.
- ***Videoconferencing over IP*** and powerful compression tools like the H.323 standard lead to the modern day prevalence.
- Since 2020, it is an indispensable tool for ***teleworking***.

Skype



- Available for both computers and cellphones for free.
- Calls can be made over the Internet, mobile and fixed telephone networks.
- Videoconferences of up to 50 people.
- Has messages, live subtitles and screen sharing.
- Calls to non Skype users' telephone is charged.

Microsoft Teams



- A unified communication and collaboration platform.
- Contains all the features of Skype for Business.
- Has improvements like a shared storage space.
- Comes with free and paid packages.

Google Meet



- Previously known as Hangouts Meet.
- Provided either for free or included in G Suite.
- Available for most operating systems.
- Can be accessed through a web browser or an app.
- Meetings of up to 250 people.
- Same security as the rest of Google services.
- Compatible with SIP and H.323 standards.

Zoom



- Developed by ***Zoom Video Communications.***
- Available for both computers and cellphones.
- Comes with a limited free and paid business or education packages.
- Allows HD videoconferences and multiple shared screens.
- Extensive use of calendars for scheduling meetings and organizing the chat.
- Provides high quality and toll based audio for global cross platform meetings.

Discord



- Free videoconferencing application.
- Available as an app for computers and cellphones.
- Or it can be opened on a web browser.
- Users communicate through private servers and are able to:
 - Put verification levels on their servers.
 - Select who can message and send them friend requests.
 - Choose who can join their servers.

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Multimedia Frameworks



- Used by/for media players, not media players by themselves.
- Can be used to create media players, audio editors, etc.
- Easy to add support for new file formats.

GStreamer



- A development framework for creating applications.
- Written in C.
- Pipeline Based.
- Uses and combines many different plugins.
- Mainly targeting ***Linux*** systems.
- Used as backend in many applications.

GStreamer



gstreamer tools

gst-inspect
gst-launch
gst-editor

media player

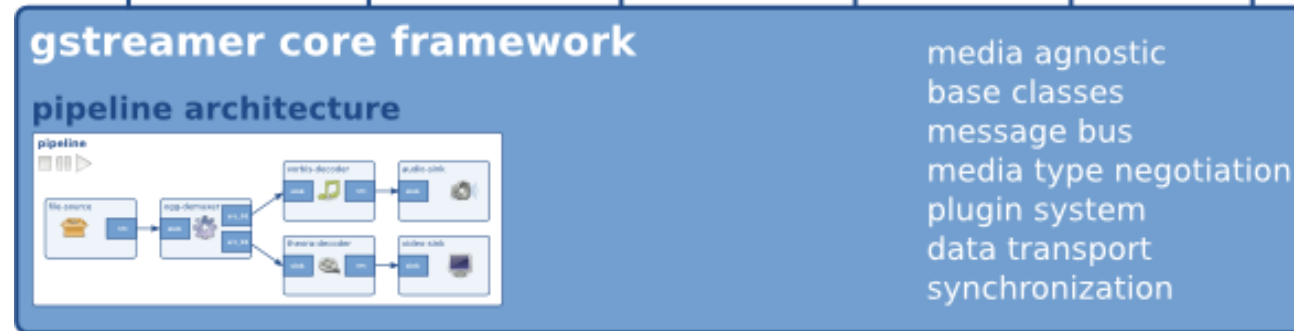
VoIP & video
conferencing

multimedia applications

streaming
server

video editor

(...)



protocols
- file:
- http:
- rtsp:
- ...

sources
- alsa
- v4l2
- tcp/udp
- ...

formats
- avi
- mp4
- ogg
- ...

codecs
- mp3
- mpeg4
- vorbis
- ...

filters
- converters
- mixers
- effects
- ...

sinks
- alsa
- xvideo
- tcp/udp
- ...

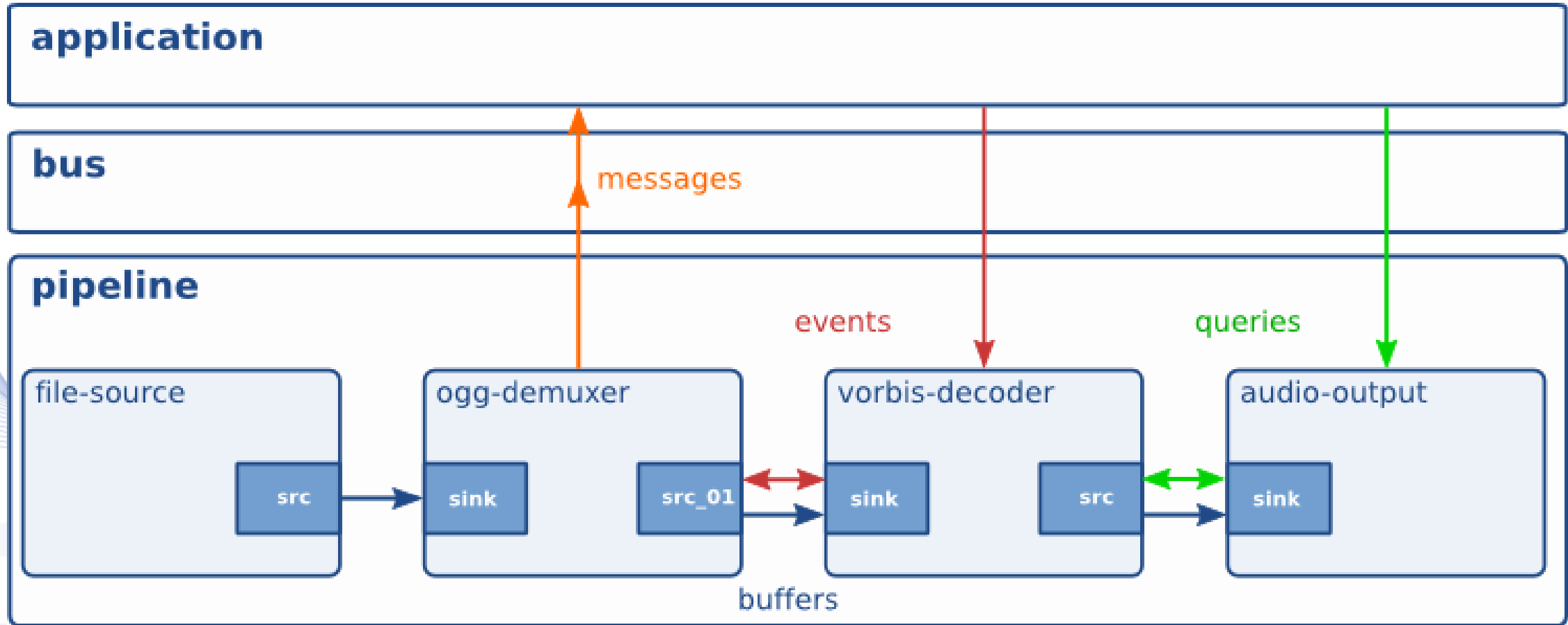
**3rd party
plugins**

gstreamer plugins

gstreamer includes over 250 plugins

Gstreamer plugin architecture [GSP].

Gstreamer Communication



Application-Pipeline communication [APC].

HTML5



HTML5 is a *markup language*.

- It is the fifth version of HTML, released in 2014.
- Previous versions were released throughout the 90s.
- Alongside Javascript and CSS is the basis of the Internet.
- Introduced the *video* tag.
- Used by famous companies (Youtube, Netflix, etc.).

HTML5 Video Tag



- Allows the ***video playback*** of supported video formats.
- No need for third party plugins.
- Can specify the video dimensions.
- Allows the use of existing controls or the creation of new ones.
- Has options for ***preloading*** and ***autoplay***.
- Multiple files of different formats and links can be embedded.
- The browser checks and plays the first it can.

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Mobile TV



- The wide use of smartphones has renewed interest on multimedia broadcasting technologies.
- Many standards and formats exist.
- Two of the more famous ones:
 - ***DVB-H, DVB-NGH*** (EU)
 - ***ATSC-M/H*** (USA).

Digital Video Broadcasting – Next Generation Handheld

(DVB-NGH) is a handheld evolution of DVB-T2lite.

- Standardization finished in 2012.
- First to incorporate MIMO antenna schemes.
- Supports ***MPEG TS*** and ***IP*** transport protocols.
- Improved bandwidth utilization efficiency.
- Allows inserting and providing local content.
- No need for terrestrial network in ***S*** and ***L bands***.

ATSC-M/H

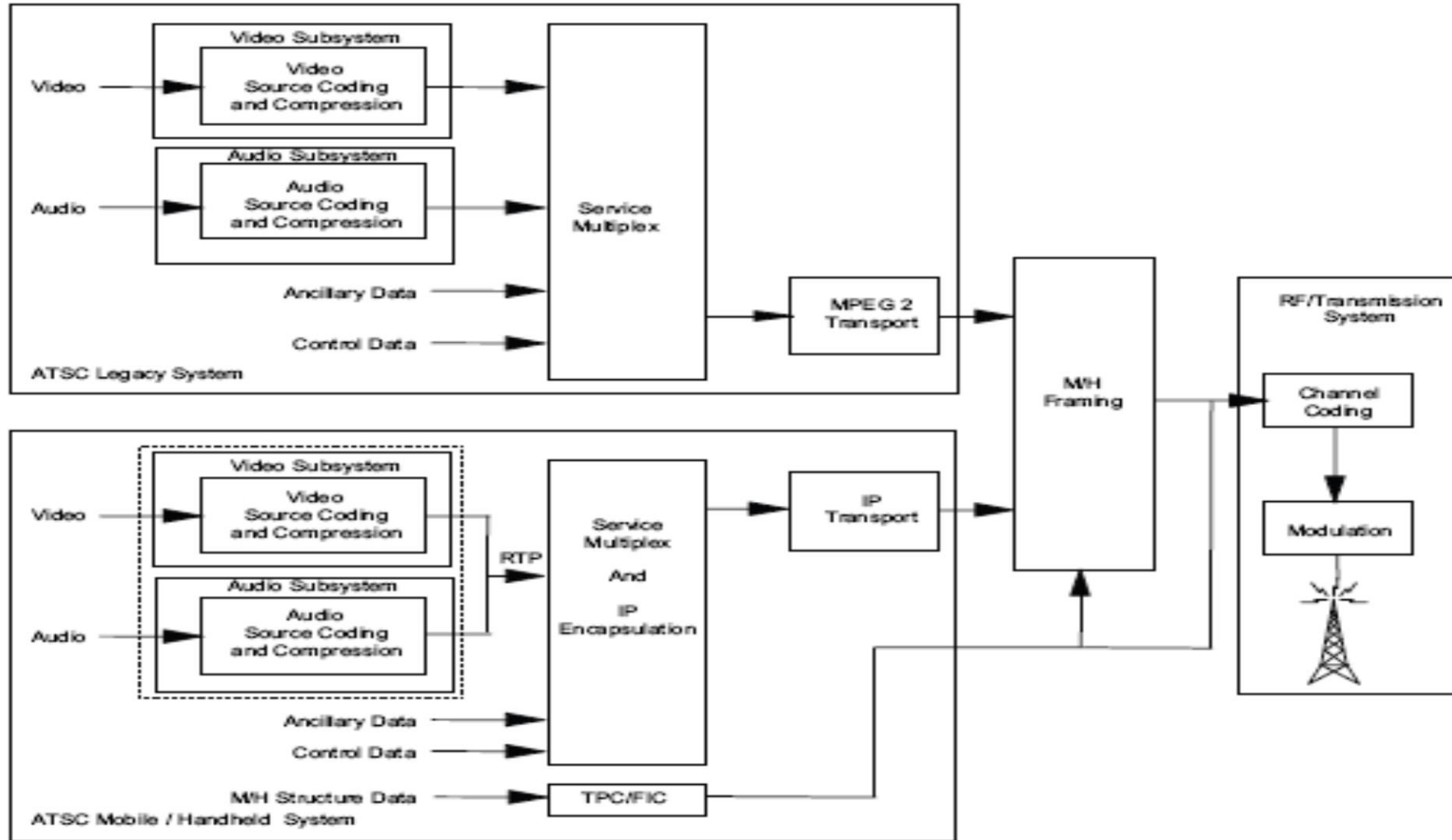


Advanced Television Systems Committee –

Mobile/Handheld (ATSC-M/H) performs stream delivery over IP transport.

- Has energy saving receivers.
- Can be decoded under high Doppler rate conditions.
- Provides information about the services that are available.

ATSC-M/H



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Q & A

Thank you very much for your attention!

**More material in
<http://icarus.csd.auth.gr/cvml-web-lecture-series/>**

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