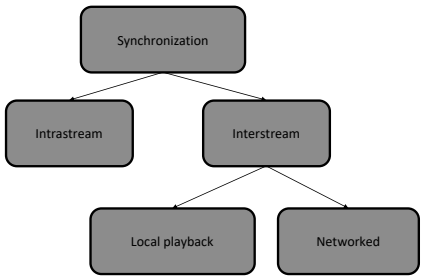
Maharaja Agrasen Institute of Technology
ETCS 211
Computer Graphics & Multimedia
UNIT 4

Intermedia Synchronization

Overview

Why we need to sync?
How close must we sync?
How to sync?
How to measure sync?
Applications

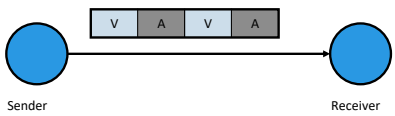


Problem

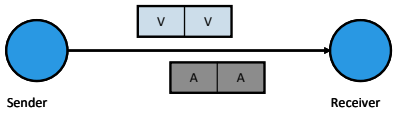
Ensure that audio/video **captured at the same instance** at the source, are **displayed at the same instance** at the receivers.

Why we need Synchronization?

Why not Pre-sync?

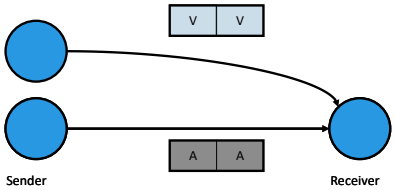


Seperating A/V Flows

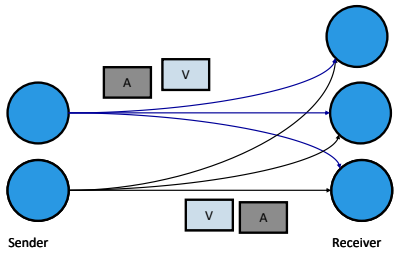


- Can receive audio without video
- Can prioritize audio over video

May Come from Different Sources



or Displayed at Different Sources



More Complications

Different decoding time for video and audio

Network delay and jitter

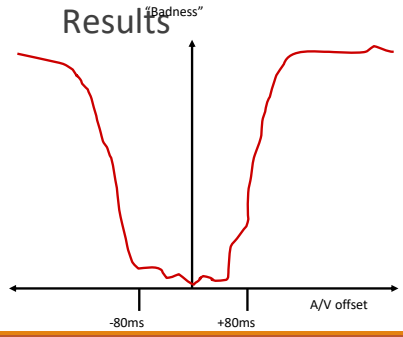
Different clocks

Bottom Line

Must synchronize at the receiver

Synchronization Requirements

Results



What matters

Video ahead of audio vs. audio ahead of video

Size of head

Occupancy

What does not matter

Language

Speaking or Singing

Speed

Hobby

Conclusion

-80ms to +80ms acceptable

-160ms to +240ms noticable but not annoying

- audio > video
+ video > audio

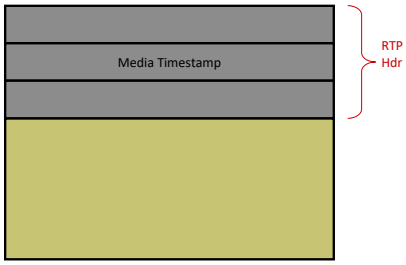
How to Synchronize?

Receiver needs

Exact time a sample is generated

Each packet needs a timestamp

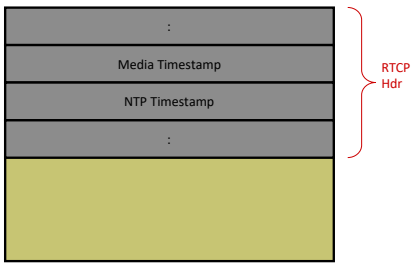
RTP Protocol



But..

Media timestamp has a random offset

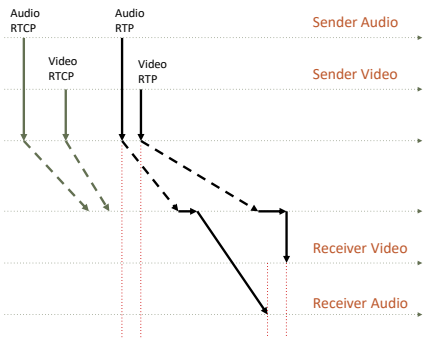
RTCP Protocol

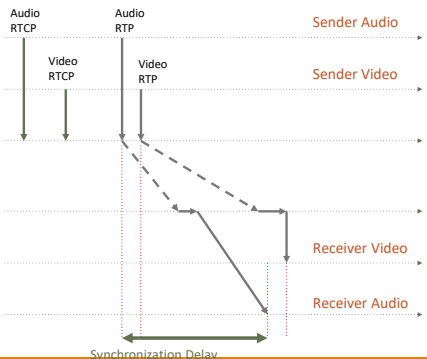


NTP

Network Time Protocol

Synchronize clock up to few milliseconds





Multiple Receivers

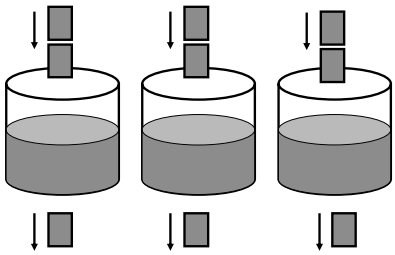
Everyone must have the same *synchronization delay*

How to set Sync Delay?

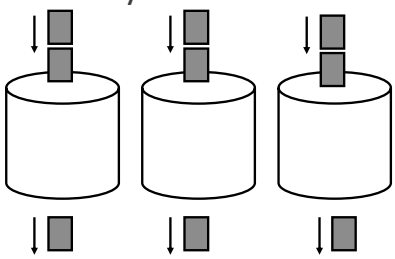
Receivers tell each other their network delay

Synchronization Delay =
max {Network Delays} + Buffer

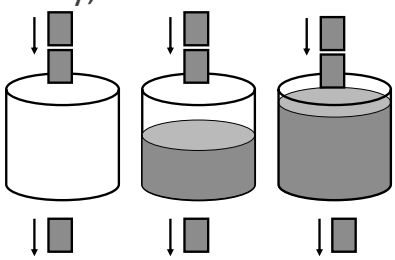
Buffer Control



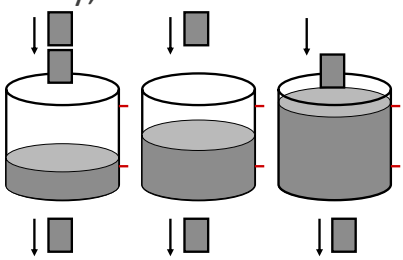
No Delay No Jitter



Delay, No Jitter



Delay, Jitter



If Buffer too Full/Empty

Send message “Play faster!” or “Play slower!” to other receivers

Must Synchronize!

Send message “Play faster **at time T**!” or “Play slower **at time T**!” to other receivers