Music & the Internet
MUMT301

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Plan

- <u>Syllabus review</u>
- Review of the last class
  - Sound file formats
    - ✳ Structured audio
    - ✳ Recorded sound
      - ✦ Uncompressed formats
      - ✦ Compressed formats
        - ❖ Lossless compression
        - ❖ Lossy compression
          - ❖ <u>MPEG-1 Layer 3</u>
- Assignment #4 compression methods
- Music distribution
- Assignment #5

Assignment 4 (compression comparison)

- https://mumt301.github.io

- ffprobe

- Volodymyr Trunov's

Recorded music history

- Several inventions have driven the way we consume music
    - 1850s: 1st recording device, the **phonoautograph** (Léon Scott de Martinville)
    - 1877: Thomas Alba Edison heard his voice in his **phonograph** (a.k.a. "talking machine") Invited to the White House!
    - 1880s: the **gramophone** (Emile Berliner)
    - 1906: Victrola introduced by RCA (mechanical record player)
    - 1920s: electric record player (78RPM)
    - WWII: vinyl records and audio tapes
    - 1958: stereo and cassette tapes
    - 1970s: digital recording
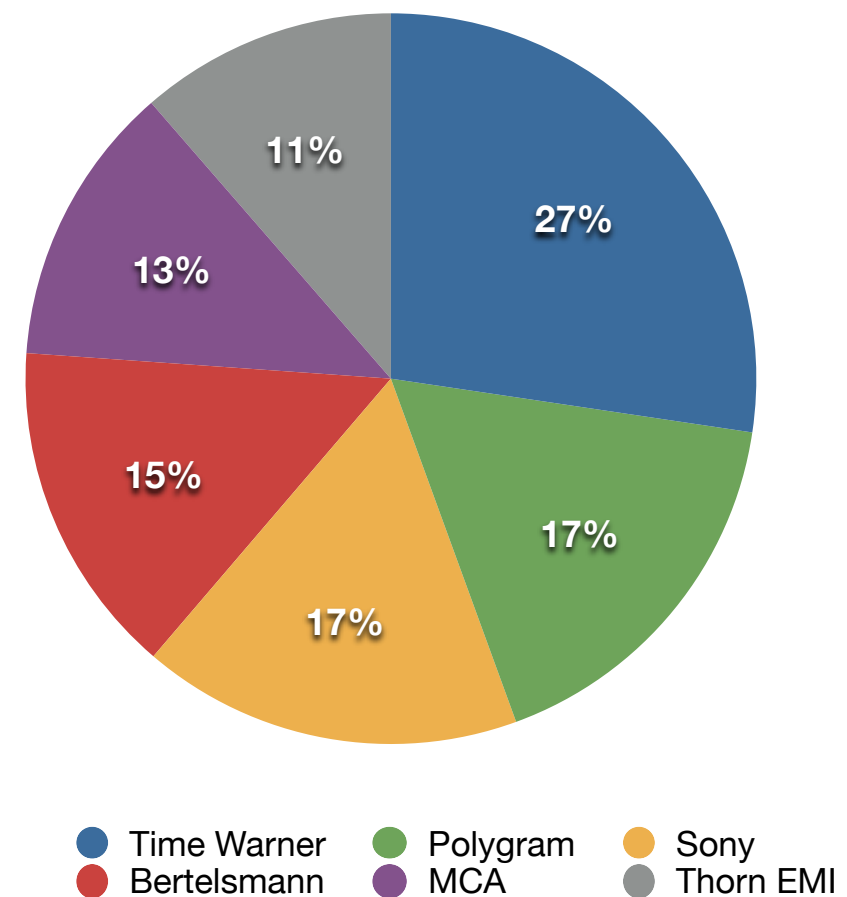   - 1983: CDs
    - 1992: MP3 (ISO standard)

Music distribution history

- Technological inventions have also shaped the way music is distributed
- 1909: 3 companies controlled market of music distribution (oligopoly!)
  - Edison (the inventor of the phonograph)
  - Columbia
  - Victor
- 1929: Edison broke, Decca rose
- 1955: RnR brought competition, oligopoly faded out (40% increase in sales)
- 1960s: **albums began to replace singles**
  - 42 labels had at least one charted album
  - Top 6 companies controlled less than 50% market
- 1970s: Top five labels controlled a third of album charts (oligopoly started to return)

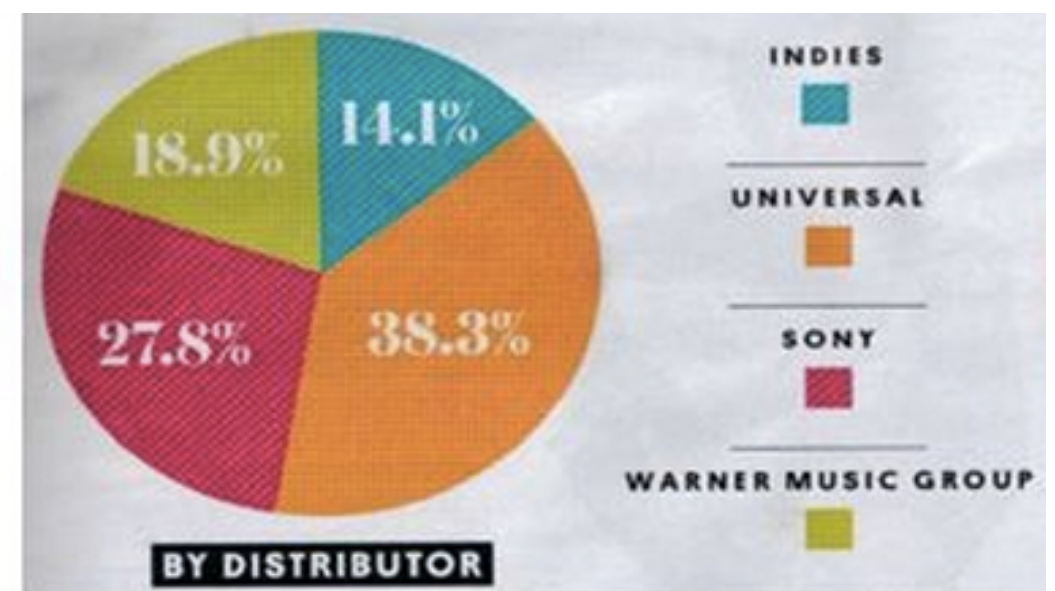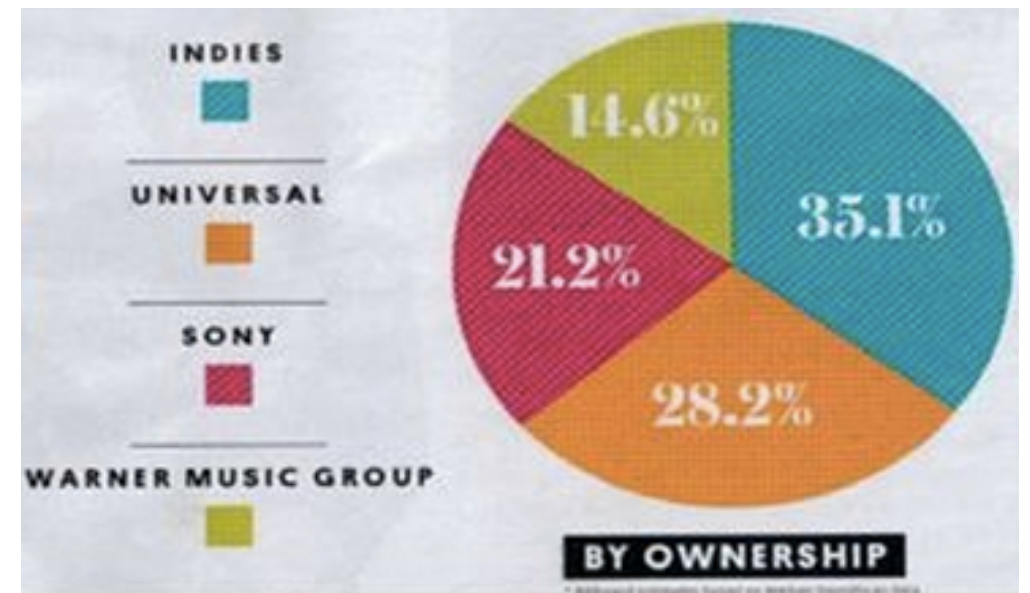# Music distribution history

- 1995: Six Major labels
  - Time Warner (Atlantic, Elektra)
  - Polygram (A&M, Mercury)
  - Sony (Columbia, Epic)
  - Bertelsmann (Arista, BMG)
  - MCA (Geffen, GRP)
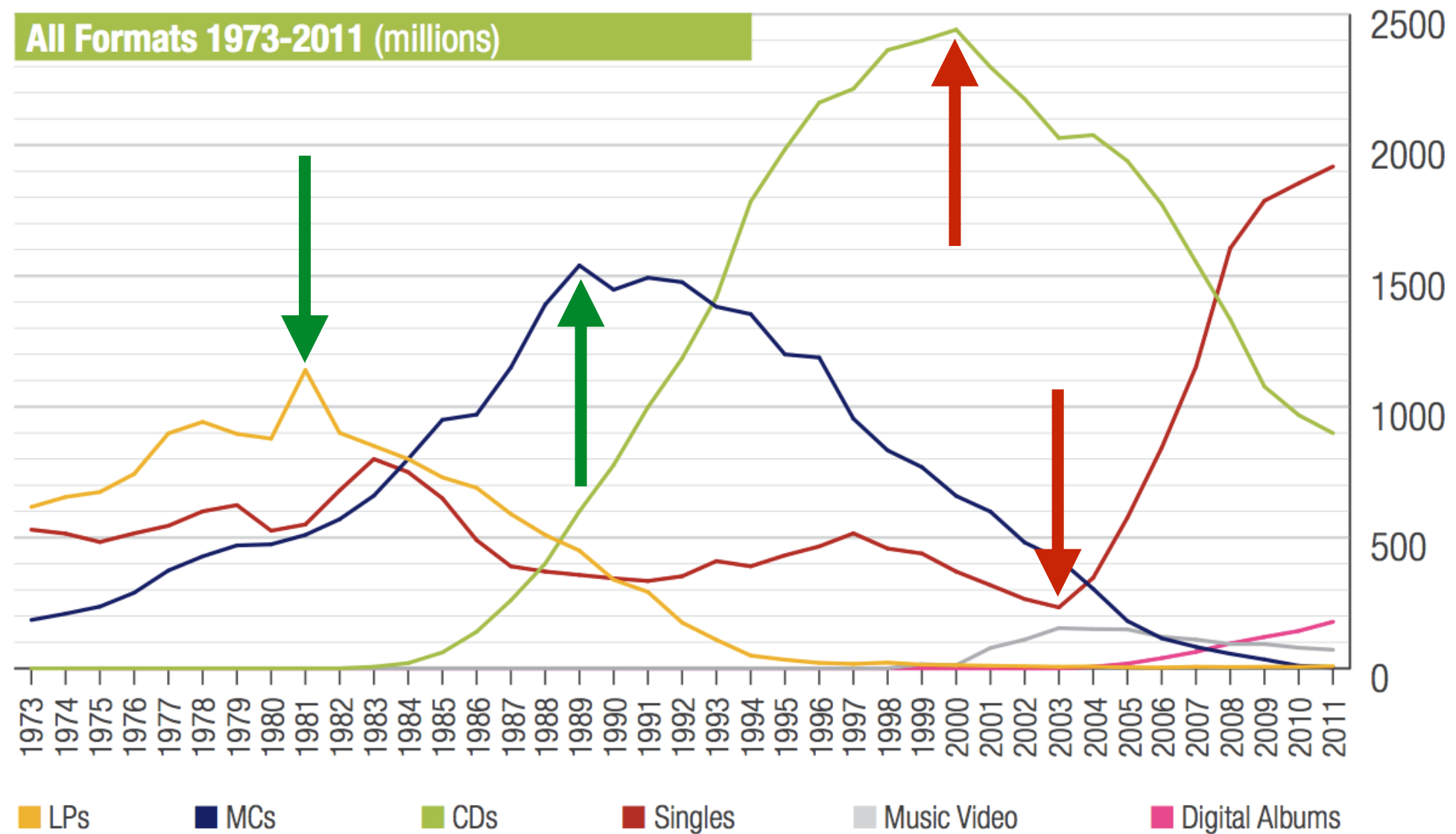 - Thorn EMI (Capitol, Virgin)

Music Industry Sales, 1995

Pie chart:
- Time Warner: 27%
- Polygram: 17%
- Sony: 17%
- Bertelsmann: 15%
- MCA: 13%
- Thorn EMI: 11%

Legend: Time Warner, Polygram, Sony, Bertelsmann, MCA, Thorn EMI

Music distribution history

- ... but in
  - 1998 Universal & Polygram merge
  - 2004 Sony & BMG merge
  - 2013 WMG and EMI merge

Taken from http://a2im.org/tag/nielsen-soundscan/

Global music sales by format

All Formats 1973-2011 (millions)

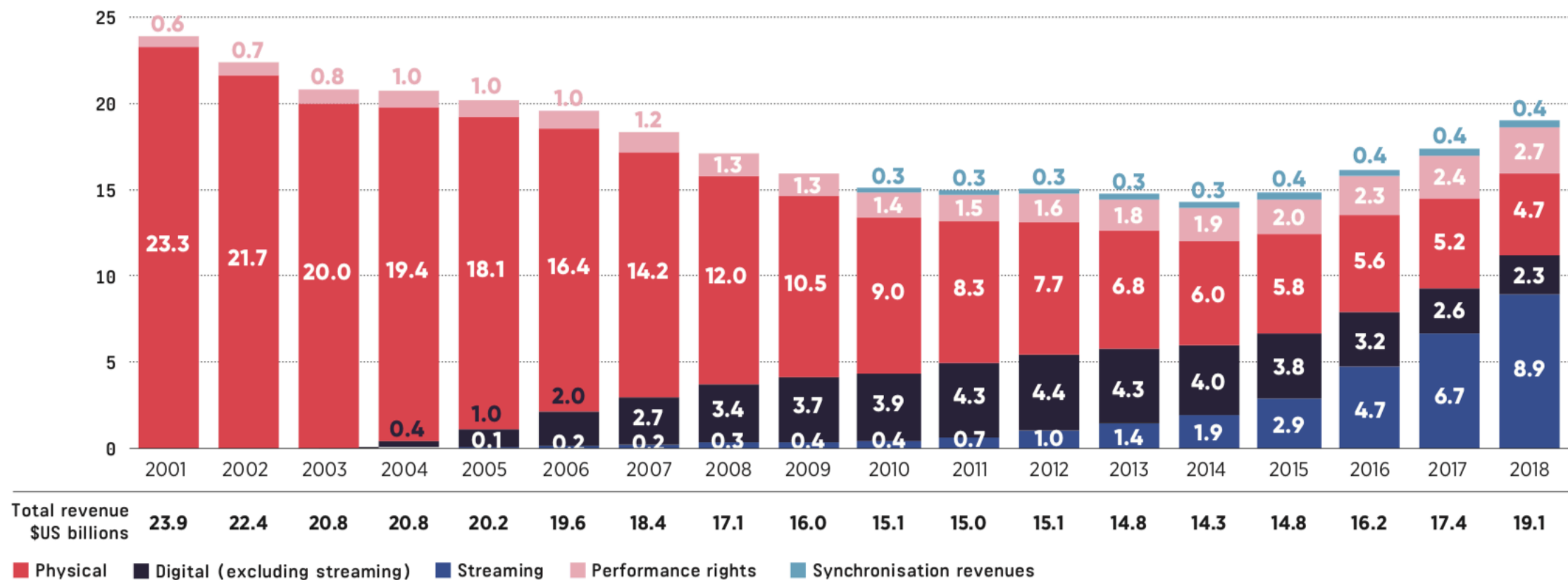Legend: LPs · MCs · CDs · Singles · Music Video · Digital Albums

Taken from Record Industry in Numbers 2011 (IFPI)

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Global recorded music revenues

Global Recorded Music Industry Revenues 2001–2018 (US$ Billions)

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Total revenue $US billions	23.9	22.4	20.8	20.8	20.2	19.6	18.4	17.1	16.0	15.1	15.0	15.1	14.8	14.3	14.8	16.2	17.4	19.1

■ Physical ■ Digital (excluding streaming) ■ Streaming ■ Performance rights ■ Synchronisation revenues

Taken from Global Music Report 2019: State of the Music Industry

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Global recorded music revenues

Global Recorded Music Revenues by Segment 2018
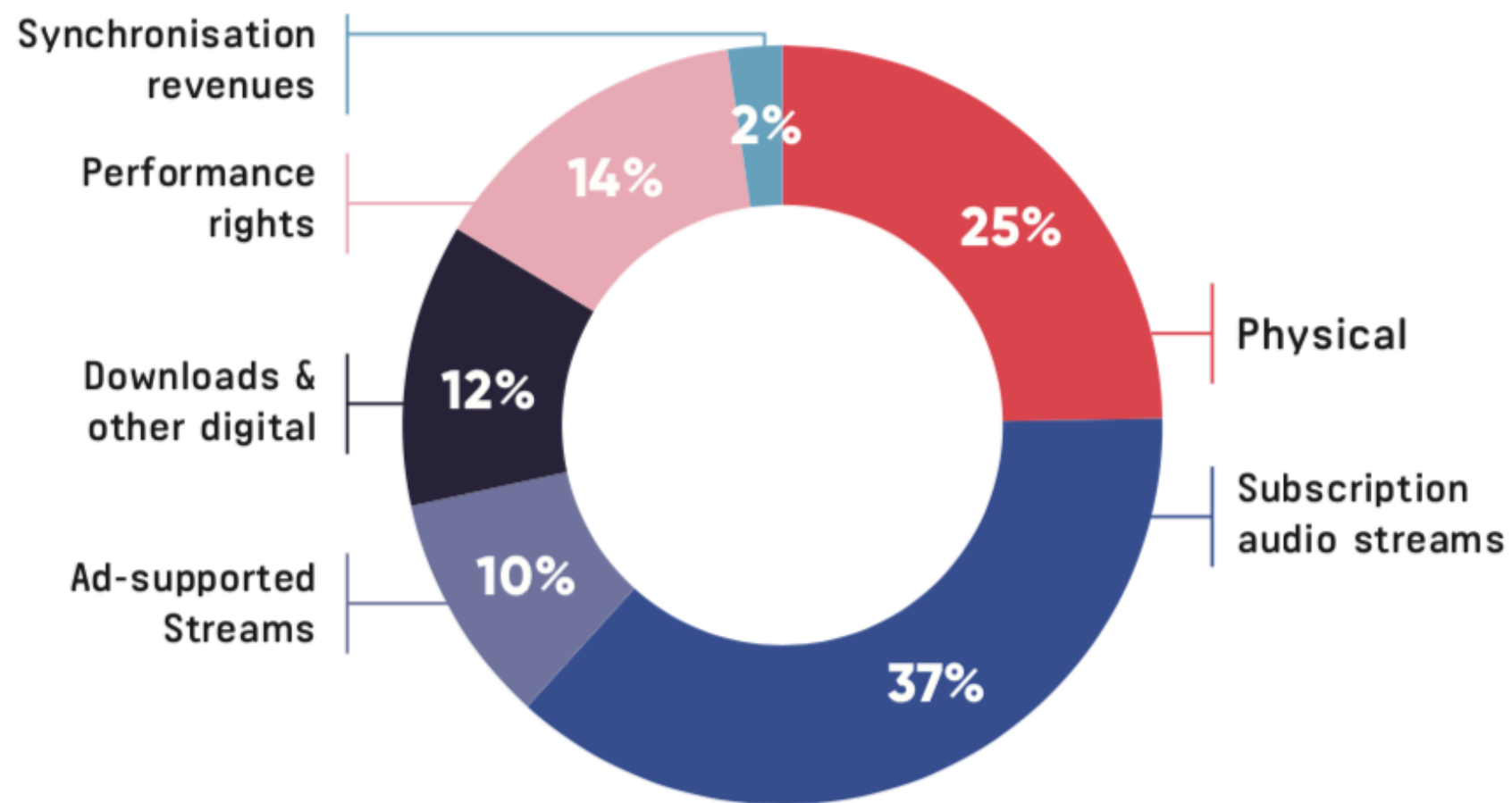
- Synchronisation revenues — 2%
- Performance rights — 14%
- Downloads & other digital — 12%
- Ad-supported Streams — 10%
- Physical — 25%
- Subscription audio streams — 37%

Taken from Global Music Report 2019: State of the Music Industry

Music industry

Music industry of physical goods

P2P & piracy

Music industry of digital goods

2014

Peer to peer (P2P)

(a) Client-server (b) Peer-to-peer (c) Peer-assisted
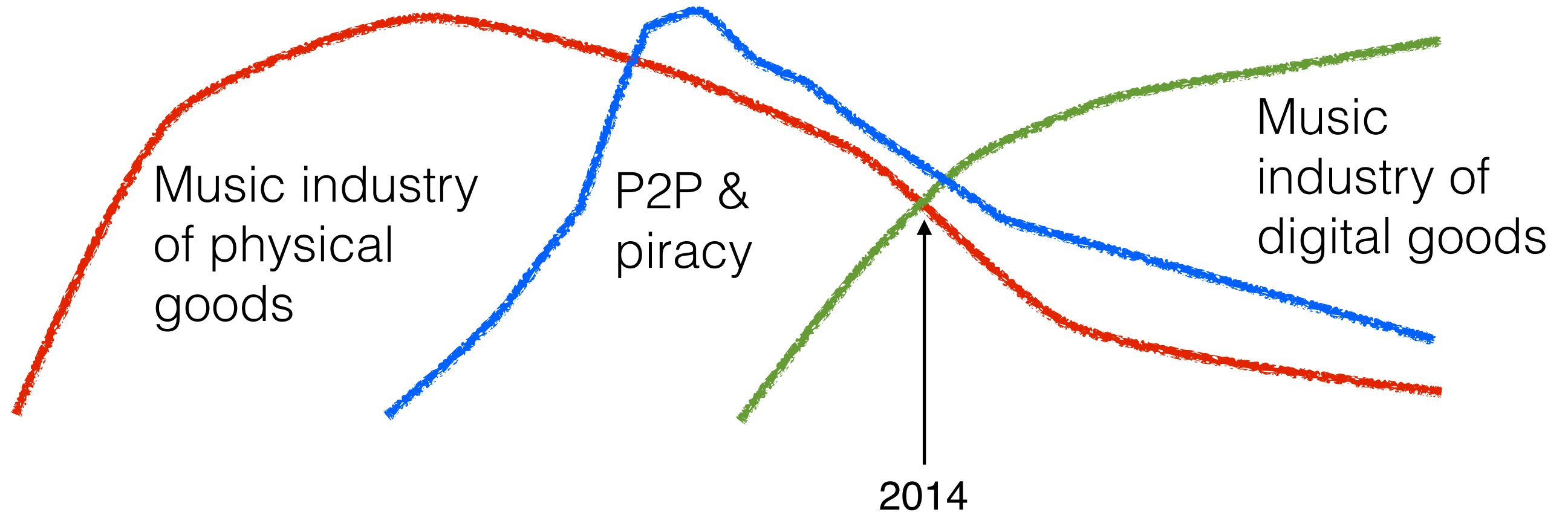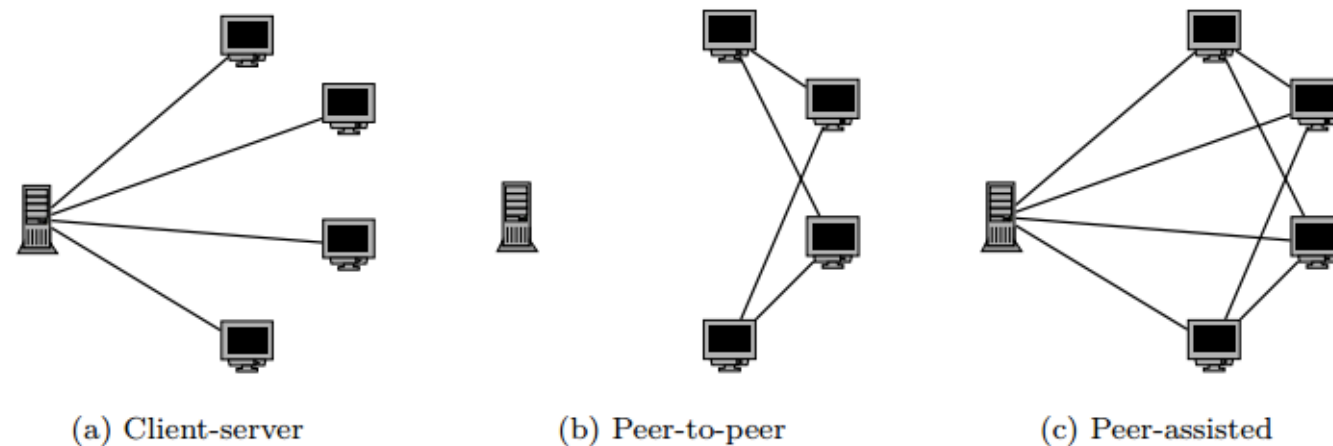
Figure 1.1: Three types of protocols.

Taken from Kreitz, G. 2011. Aspects of Secure and Efficient
Streaming and Collaboration. PhD Thesis. KTH Computer Science and Communication.

- By the end of the 90s, the P2P protocol irrupted, **allowing users to share files between their own computers** through a network
- In P2P, the **clients talk directly to each other** to accomplish a task
- It is also common a server remains in the picture providing some functionality such as helping to peers to find each other
- Easily **scalable to large number of users**: each client helps in serving other clients
- The **content is sent from peers**, and so data is not always available

P2P music services

- **Napster** (Shawn Fanning)
  - P2P file sharing Internet service that **emphasized audio file sharing**, typically encoded in **MP3**
  - **active** between June 1999–July 2001 (only **2 years**!!!)
  - peaked 80M users
  - Radiohead's *Kid A* leaked three months before its release, but went number one in the first week
    - Way before Radiohead was big in the US
    - P2P good promotional tool?
    - **Fear of the music industry!**
  - ceased working by legal **difficulties over copyright infringement** (public letters by Metallica and Dr. Dre first, then sued by RIAA and those artists)
  - Napster was acquired and turned into an online store, and then into a music streaming service (http://napster.com) "Downloaded" documentary teaser

P2P music services

P2P music services

P2P music services

	File Size	User	Status	Speed	Progress	Rate	Time Left
	1,247,232 of 3,768,142	Fantaghiro	Downloading...	Cable	33%	20.12 k/s	00:02:05
	3,461,120 of 4,583,980	ami9	Downloading...	Unknown	76%	55.82 k/s	00:00:20
	5,472,254	onefoo	Getting Info...				
	1,458,176	tmitchellpm	Getting Info...				
	2,287,616	SpencerCofC	File Complete!				
	1,275,904	j4k3	Getting Info...				
	1,458,176 of 6,352,447	buffy123456...	Downloading...	Unknown	22%	23.52 k/s	00:03:28
	11,272,192	Machine79	Getting Info...				
	6,966,322	_chocula_	Getting Info...				
...i Concert, Disc 2 - 09...	2,182,250	_chocula_	Getting Info...				
	2,359,296 of 4,114,432	Lazeriron	Downloading...	Cable	57%	38.05 k/s	00:00:46

	File Size	User	Status	Speed	Progress	Rate	Time Left
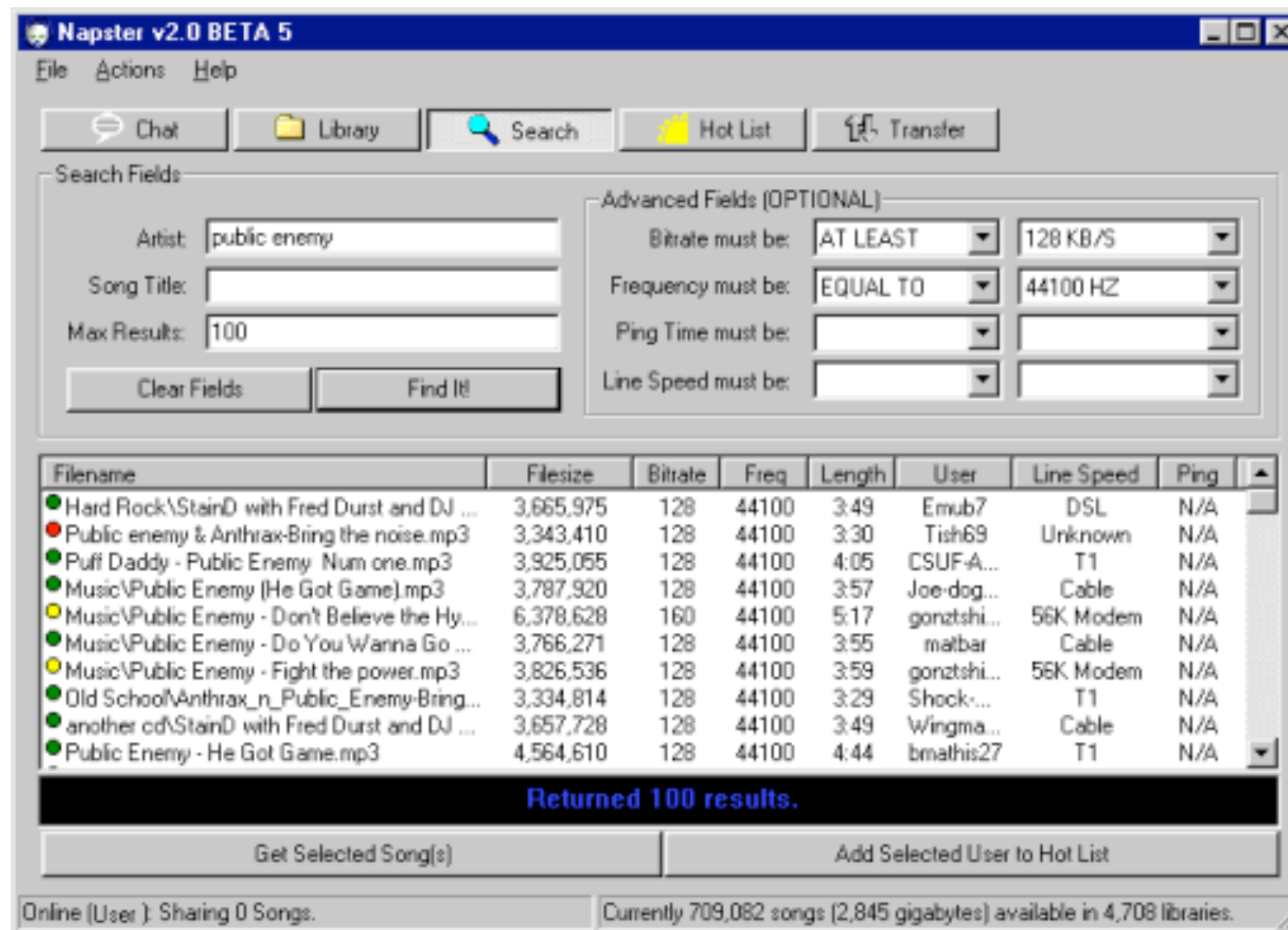
P2P music services

P2P music services

- **Audiogalaxy** (1998–2002)
  - web-based P2P!
  - gained ground from file sharers **abandoning Napster** in 2001
  - per-artist and per-genre **forums**
  - **songs shared to groups of users**
  - big community of people sharing music across a broad range of genres
  - AG0 (1999)
  - AG1 (2000)
  - AG2 (2004)

P2P music services

- **Soulseek**
  - made by Nir Arbel, **former Napster programmer**
  - started in 2000 as a file-share space of the IDM mailing list
  - "Download containing folder", "wishlists", rooms, and many other features
  - "Soulseek® **does not endorse nor condone the sharing of copyrighted materials**. You should only share and download files which you are legally allowed to, or have otherwise received permission to, share." (Soulseek homepage)
  - still working (!)
  - Some searches are blocked

Digital music distribution

- **Apple's iTunes Music Store** is credited with finally getting people to pay for digital music, unveiled in 2003
- Apple **signed deals** with EMI, Universal, Warner, SME, and BMG
- AAC format (originally128 kbit/s DRM files, and then 256 kbit/s DRM-free in 2009)
- Per-song pricing model: originally 99¢ per song (now free, 69¢, 99¢, or $1,29)
- As of 2014, there were more than 37M songs (with some notable holdouts at that moment: The Beatles, Led Zeppelin, Radiohead, …)

Apple Music Store (2003)

iTunes Store songs sold

Number of Songs Sold on the iTunes Store

Billionth Song	Days taken	Songs per day
1st	1033	968,054
2nd	322	3,105,590
3rd	203	4,926,108
4th	169	5,917,159
5th	157	6,369,426
6th	202	4,950,495
8th	197	5,076,142
10th	109	9,174,311
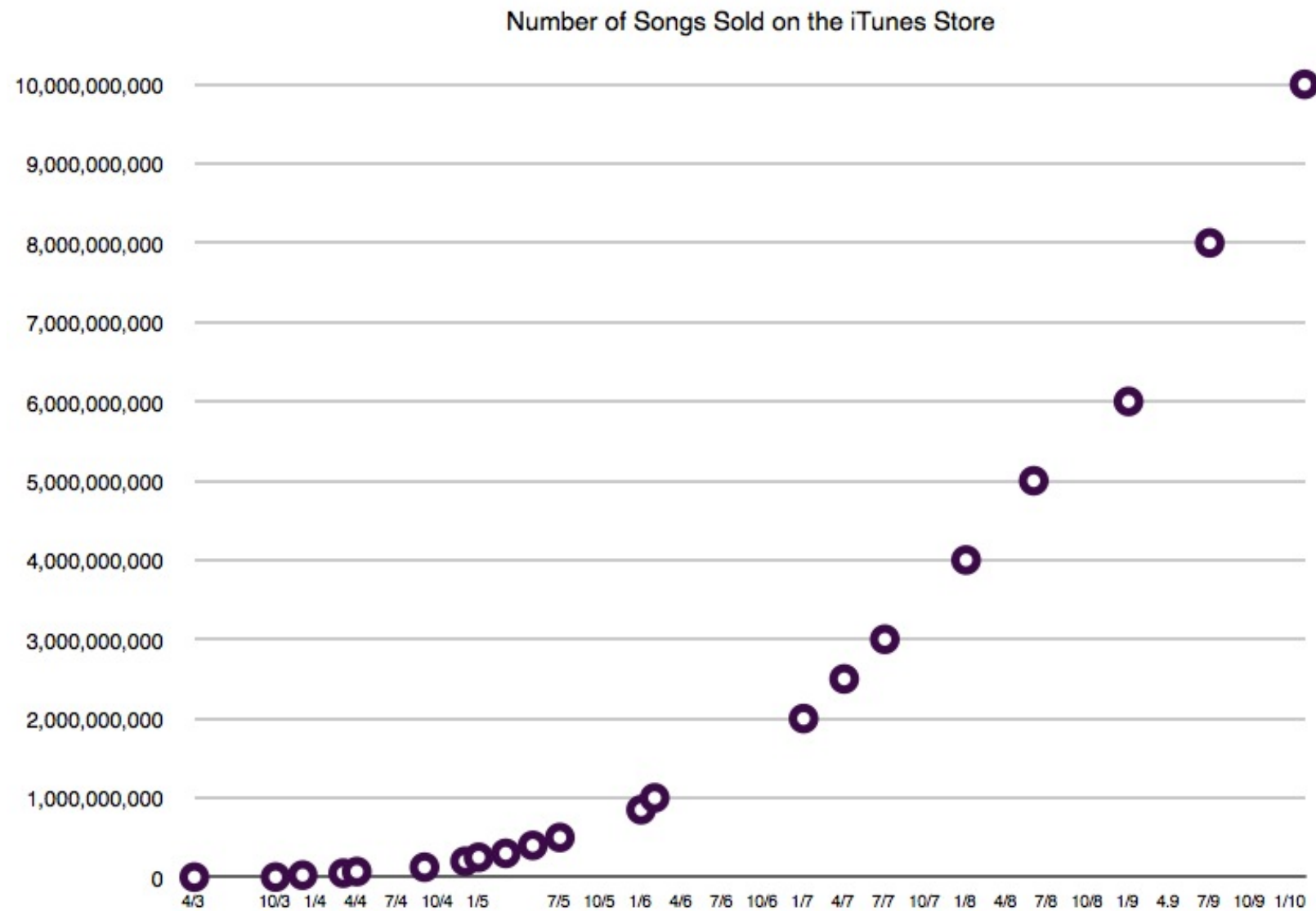
15th / Jun 2011

20th / Sep 2012

25th / Feb 2013

35th / May 2014

https://en.wikipedia.org/wiki/ITunes_Store

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Digital music distribution models

- **Music stores (buy to own)**
  - Physical media (LP, CD, DVD), are delivered
    - Amazon.com
    - Barnes & Noble
    - Books-a-Million (BAM!)
    - Borders (bankrupt 2011)
- **Music tracks are delivered online**
  - MP3 stores (MP3 downloads)
    - iTunes
    - Amazon MP
    - Google Play
- **Online record labels** (a.k.a. web labels, digital labels, MP3 labels, or download labels)
  - sells CDs directly
  - downloads via iTunes or other download services
  - distribute other labels' releases
  - armadamusic.com
  - beatport.com
  - Free, independent music net labels list

Digital music distribution models

- **Music locker (cloud based)**
  - Amazon Drive (Cloud Drive)
    - free for 5GB or up to 250 songs
    - free for Amazon-bought music
    - up to 10 devices
    - max: 250k songs (US only)
    - Also Cloud player
  - Google Music (up to 20k songs per personal music collection)
  - Apple's iTunes Match

- **Music streaming via subscription**
  - Pandora
  - Spotify
  - Rdio
  - Songza
  - Deezer
  - Google Music
  - Apple Music
  - Last.fm
  - Soundcloud
  - slacker.com
  - Microsoft Groove
  - Playstation Music
  - Tidal
  - Amazon Music Unlimited
  - and many others …

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  - Apple's iTunes Match

- **Music streaming via subscription**
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  - Spotify
  - Rdio
  - Songza
  - Deezer
  - Google Music
  - Apple Music
  - Last.fm
  - Soundcloud
  - slacker.com
  - Microsoft Groove
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  - and many others …

Digital music distribution models

- **Music locker (cloud based)**
  - Google Play Music (up to 20k songs per personal music collection)
  - Apple's iTunes Match
  - Vox Music Cloud
  - Amazon Music Storage (R.I.P.)

- **Music streaming via subscription**
  - Pandora
  - Spotify
  - Rdio
  - Songza
  - Deezer
  - Google Play Music
  - Apple Music

  - Soundcloud
  - slacker.com
  - Microsoft Groove
  - Playstation Music
  - Tidal
  - Amazon Music Unlimited
  - and many others …

  - Xiami
  - QQ Music
  - Gaana
  - Saavn
  - Symfy
  - Spinlet

New approaches
  - 22tracks (RIP)
  - Resonate (check "learn")
  - Choon
  - Potentiam
  - Bitsong
  - Bronze

Digital music distribution across the globe

The musician's POV

- None of the digital music services will let you upload your music directly
- Artists need to be signed to a major (or big indie) record label
- Or use a **digital music distributor** to get in a digital music service
  - Tunecore
  - CDBaby
  - Mondotunes
  - JTV Digital
  - Zimbalam
  - ReverbNation
  - DittoMusic
  - Routenote
  - Distrokid
  - Soundrop

Digital Distributors Comparison

ARI'S TAKE	cdbaby	DISTROKID	DI++O	LOUDR	MONDOTUNES	REVERBNATION	tunecore	SYMPHONIC
# OF OUTLETS	90+	90+	200+	7	200+	90+	90+	200+
COMMISSION	9%	0%	0%	15% originals 30% covers	10%	0%	0%	0%
SIGN UP FEE	single = $9.95 album = $49	unlimited songs $19.99	single = $9 EP = $20 album = $35	unlimited songs $0	unlimited songs $39.99	single = $9.95 album = $19.95	single = $9.99 album = $29.99	$25 + (one time) < 5 songs = $10.99 < 10 songs = $19.99 < 15 songs = $29.99 16 + songs = $39.99
YEARLY FEE	$0	unlimited songs $19.99	single = $8 EP = $20 album = $25	unlimited songs $0	unlimited songs $39.99	single = $9.95 album = $49.95	single = $9.99 album = $49.99	$0
ADDING STORES	free	free	free	free	free	free	$1.98 per store	free
ITUNES WORLDWIDE? (100+ COUNTRIES)	yes	yes	yes	yes	yes	yes	yes	yes
SPEED TO ITUNES (weekdays)	1-2 days	1-2 days	varies	within a week	up to 30 days	1-3 days	1-3 days	weekly
TAKEDOWN COST	$0	$0	$0	$0	$0	$0	$0	$0
ITUNES PRE-ORDER	free	N/A	$41.25	free	$25	N/A	$100	free
YOUTUBE MONETIZATION (commission)	30%	20% $4.95/yr	0% $79 sign up fee	N/A	20% via AdRev	N/A	10-20%	30%
ITUNES DIGITAL BOOKLET	N/A	N/A	N/A	yes	$25	no	$20	yes
PANDORA SUBMISSION	no	no	no	no	no	no	no	yes
CUSTOM LABEL NAME	free	$16/yr for 2 artists $60/yr 5+ artists	$41.25 (one time)	free	$39.99 one time +$99/yr for 5+ artists	free	free	write in and ask
ISRC CODES	free	free	free	free	free	free	free	free
UPC CODES	$5 single $20 album	free	free	free	free	free	free	free
GET CODES BEFORE UPLOAD	no	yes	yes	no	no	no	yes	yes
SOUNDSCAN REGISTRATION	no	no	$66-132	no	yes	no	no	no
OPT OUT OF STORES	yes	yes	yes	yes	yes	no	yes	yes
PAYMENT	weekly	immediate	immediate	monthly	monthly	monthly	monthly	quarterly
PAYMENT THRESHOLD	$10	$0	$25	$10	$25	$5	$0	$50

http://aristake.com/?post=92

Digital Distributors Comparison

- However, this changes every year (and it's getting complicated …)
- Check the most recent comparison

The musician's POV, how much do I get?

- How much musicians are payed?
  - What the biggest actor in the market say: Spotify
- Mid-size record label study
- The musician's POV: Thom Yorke and Nigel Godrich
- Spotify replies …, and Godrich
- Other artists' numbers:
  - Galaxy 500
  - Minimum wage for artists
  - Major music streaming services comparison

BREAK

Javascript and HTML Document Object Model

- mumt301.github.io

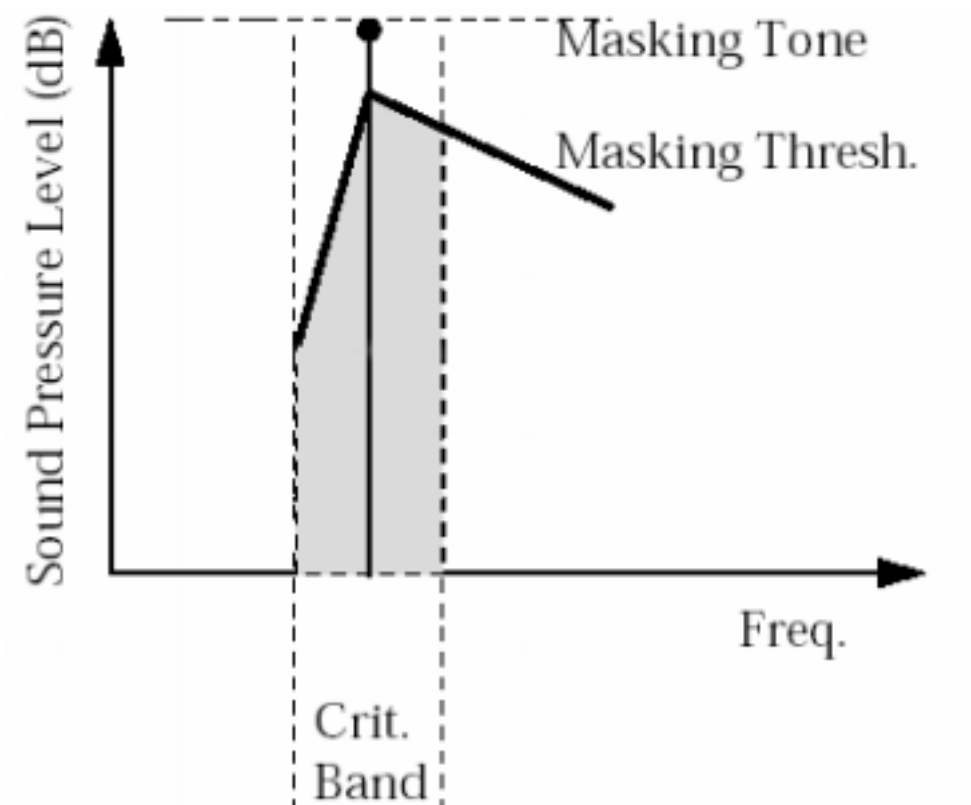# Assignment 5

- <u>On-demand digital music services presentation</u>
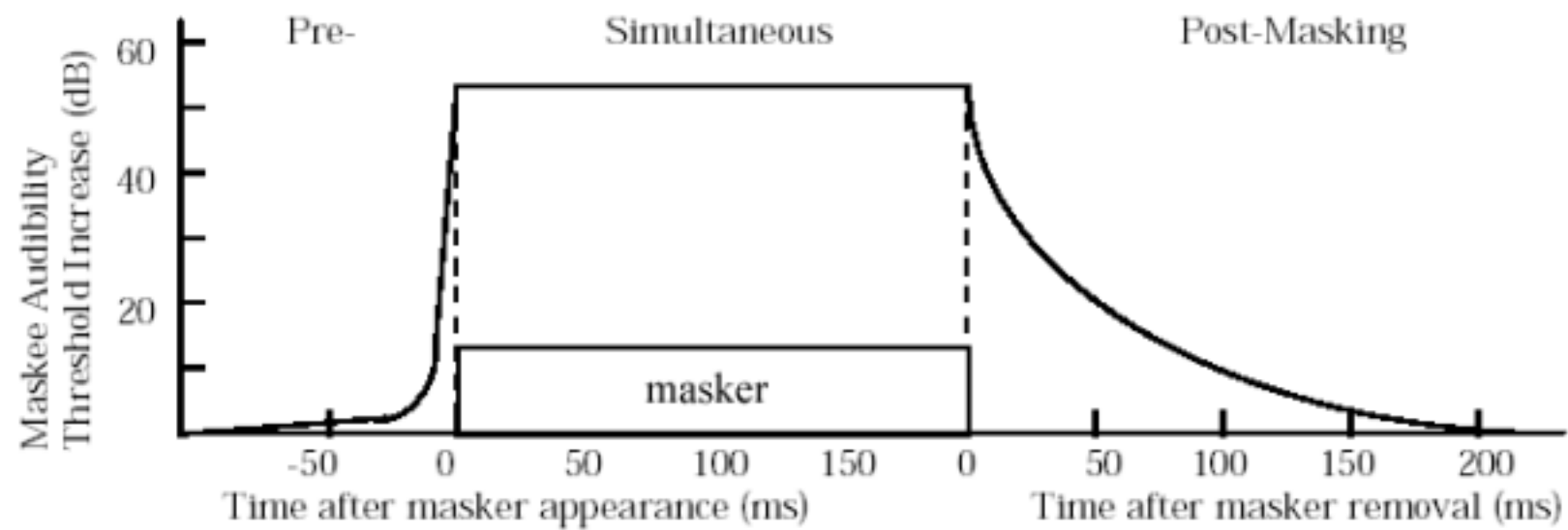
Figure 3.2: Simultaneous masking (Source [1])

*Figure 3.3: Temporal Masking (Source [1])*

Taken from Rassoi, R. 2002. <u>The theory behind MP3</u>.

- The MP3 specification defines **how the encoded/decoded bitstream should be structured/interpreted**

- The specification **does not exactly specify the steps of how to encode** an uncompressed stream to a coded bitstream

- The output of an encoder developed according to this specification will be **recognizable to any MP3 decoder**

- **Encoders can function quite differently** and still be compliant to the standard

- **It is up to the developer to decide how to implement certain parts** of the encoder
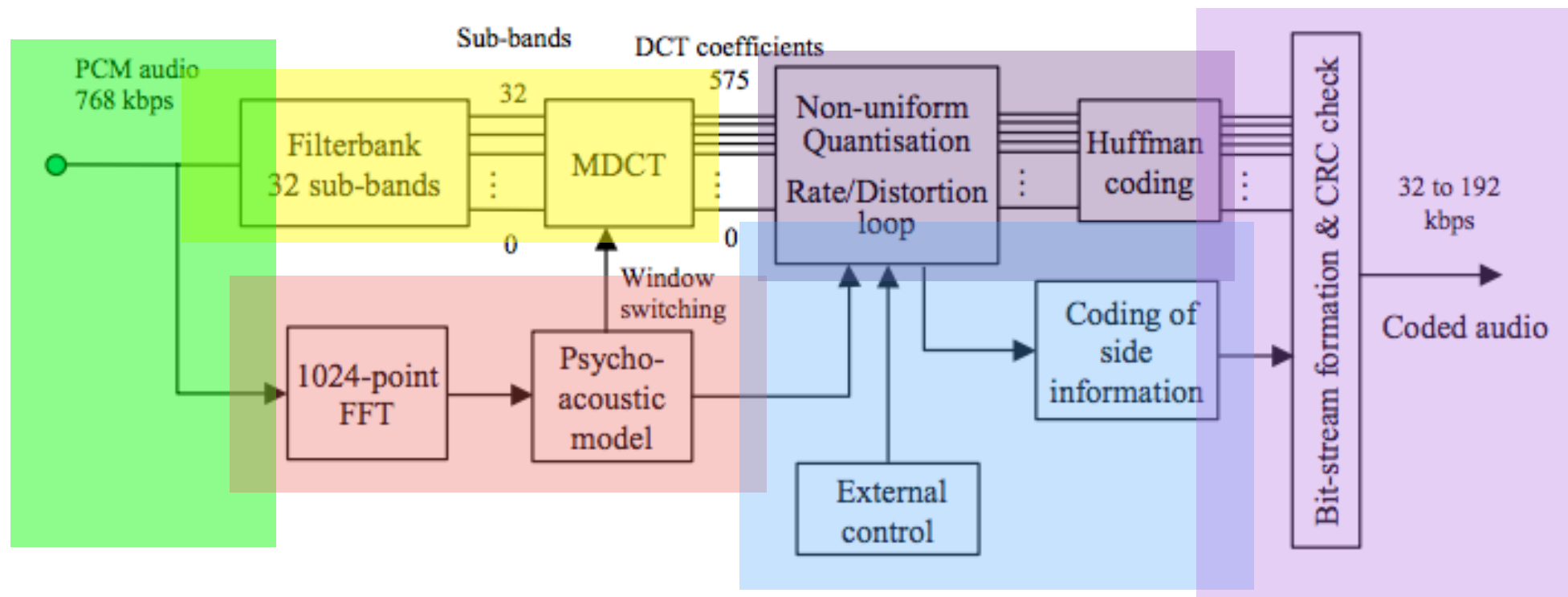
Taken from Brandeburg, K. 1999. MP3 and AAC explained. In Proceedings of the AES 17th International Conference on High Quality Audio Coding