Compression, convergence and conviviality: the contribution of new technologies to developments in radio from the 1980s

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the contribution of new technologies to developments in radio from the 1980s

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expanded version of presentation prepared for ICOHTEC 2017 http://www.icohtec.org/annual-meeting-2016.html
Old paradigm

- Broadcasting
- Limited bandwidth
- Listener response:
  - Letters
  - Phone-ins
- Other media
  - Print (*Radio Times*, *Listener* ...)

New paradigm

- Narrowcasting
- Flexible bandwidth
- Listener response:
  - Letters
  - Phone-ins
  - Email / texting
  - Social media (facebook, twitter, chat)
- Other media
  - Print (*BBC Magazines* ...)
  - Websites
  - Images
  - Videos
Discussion points

- Convergence of audio and video (including telephony)
- Role of standards
- Compression technologies
- Military & civil technologies
- Social aspects
  - Communication between audience, content developers and broadcasters
  - Conviviality
Standards

- MPEG suite
  - Moving picture experts group, established in 1988
  - Digital TV
  - mp3: MPEG-1/2 audio layer III
  - Digital analogue broadcasting
  - Now integral part of smart phones
- Advanced Audio Coding (AAC)
  - Default for YouTube, iPhone, etc
  - DAB+ (not forward compatible with MPEG DAB)
- Military / civil links
Military / civil links

- Coding
  - Development of CDMA
  - Uses pseudo-random codes instead of time- or frequency multiplexing
  - Military: security
  - Civil: noise resilience and bandwidth efficiency
- Hardware advances
- 3G: wireless telephony, Internet access, video calls and mobile TV technologies; IUT specification IMT-2000
- 4G: originally envisioned by DARPA; standardised 2008
  - Uses OFDMA rather than CDMA
  - IP-based
## Compression

<table>
<thead>
<tr>
<th>Format</th>
<th>Sampling Frequency</th>
<th>Quantization / Bit Rate</th>
<th>File Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>WAV</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>192 kHz</td>
<td>24 bits</td>
<td>329 MB</td>
<td></td>
</tr>
<tr>
<td>96 kHz</td>
<td>24 bits</td>
<td>164 MB</td>
<td></td>
</tr>
<tr>
<td>88.2 kHz</td>
<td>24 bits</td>
<td>151 MB</td>
<td></td>
</tr>
<tr>
<td>48 kHz</td>
<td>24 bits</td>
<td>82.4 MB</td>
<td></td>
</tr>
<tr>
<td>44.1 kHz</td>
<td>24 bits</td>
<td>75.7 MB</td>
<td></td>
</tr>
<tr>
<td>44.1 kHz</td>
<td>16 bits</td>
<td>50.4 MB</td>
<td></td>
</tr>
<tr>
<td>MP3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>44.1 kHz</td>
<td>320 kbps</td>
<td>11.4 MB</td>
<td></td>
</tr>
<tr>
<td>44.1 kHz</td>
<td>256 kbps</td>
<td>9.15 MB</td>
<td></td>
</tr>
<tr>
<td>44.1 kHz</td>
<td>192 kbps</td>
<td>6.86 MB</td>
<td></td>
</tr>
<tr>
<td>44.1 kHz</td>
<td>128 kbps</td>
<td>4.57 MB</td>
<td></td>
</tr>
<tr>
<td>44.1 kHz</td>
<td>92 kbps</td>
<td>3.43 MB</td>
<td></td>
</tr>
</tbody>
</table>
How is it done?

- Human hearing characteristics
- Frequency compression
- Temporal compression
- Enormous file size reductions
## Compression

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<td>329 MB, 164 MB, 151 MB, 82.4 MB</td>
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<tr>
<td></td>
<td>44.1 kHz</td>
<td>16 bits</td>
<td>50.4 MB</td>
</tr>
<tr>
<td>MP3</td>
<td>44.1 kHz, 44.1 kHz, 44.1 kHz, 44.1 kHz</td>
<td>320 kbps, 256 kbps, 192 kbps, 128 kbps</td>
<td>11.4 MB, 9.15 MB, 6.86 MB, 4.57 MB</td>
</tr>
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<td></td>
<td></td>
<td>92 kbps</td>
<td>3.43 MB</td>
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</tbody>
</table>
Digitisation

analogue – transmit a continuous replica of original

digital – transmit a series of numbers (sampling rate depends on frequencies)
Hearing threshold
Frequency masking
Temporal masking
Mp3: a cultural artifact?

- technological artifacts ‘embody specific forms of power and authority’ (Winner, 1986)
- mp3 an attempt to solve the problem of exchangeable formats across segments of the media industry
- may require particular social and cultural systems of both intellectual property and listening
- ‘works for’ and is ‘worked on’ by a host of people, ideologies, technologies and other social and material (Sterne, 2002)
- ownership – like digital images – rather than simply consuming!
Convergence

- In place of the old system is a new one, which has been called "convergence culture."
- Encompassing the hybridization of technologies and the collaboration of corporations on one hand, convergence also highlights the penetration of the audience itself into the spheres of production, promotion, and distribution.
- Many academics, commentators, and fans themselves see convergence culture as an ultimate victory ...
- But is it just free labour?
Conviviality and on/off-line (examples from BBC, but common to many broadcasters)

- Podcasts
- Videos
- Streaming and downloads
- Message boards
- Twitter
- Facebook

Some reasons
- Commonality of technologies
  - Web
  - MPEG / mp3 / DAB
  - MPEG video / DTV
- User knowledge
- Transferable user skills
Available now & Coming soon

Podcasts

The Archers
Contemporary drama in a rural setting
BBC RADIO 4

The Archers Omnibus
The week's events in Ambridge
BBC RADIO 4
Video

Roald Dahl: Going Solo

How to tell a story
Start with a hook and include a twist. Watch Josie Long’s guide to great storytelling.
Highlights

BBC Proms 2016: Cello
See the cello in a new light as Sol Gabetta performs Elgar’s Cello Concerto.

Composer of the Week: Mozart
Donald Macleod explores Mozart’s childhood, spent as much away from Salzburg as at home.

Haley’s La Juive
Roberto Alagna stars in the critically acclaimed production from Bavarian State Opera.

Bartók: Music for Children no 26-29
# Message boards

<table>
<thead>
<tr>
<th>Discussion</th>
<th>Replies</th>
<th>Started by</th>
<th>Latest reply</th>
</tr>
</thead>
<tbody>
<tr>
<td>Points of View Message Boards</td>
<td>972</td>
<td>Simon Miller</td>
<td>4 Weeks Ago</td>
</tr>
<tr>
<td>Hello everyone, my name’s Simon, and I’m the Series Producer of ...</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alternative message boards</td>
<td>3</td>
<td>Simon Miller</td>
<td>4 Weeks Ago</td>
</tr>
<tr>
<td>Prior to the closure of the Points of View message boards, some ...</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>What’s the music please?</td>
<td>3330</td>
<td>Peta</td>
<td>4 Weeks Ago</td>
</tr>
<tr>
<td>Trying to identify music from a programme? Post your query here ...</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Background music in BBC TV</td>
<td>3241</td>
<td>Peter</td>
<td>4 Weeks Ago</td>
</tr>
<tr>
<td>Hi all, this is a new thread for your comments on music used in ...</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
BBC
@BBC

Our mission is to enrich your life and to inform, educate and entertain you, wherever you are.

📍 TV. Radio. Online
🔗 bbc.co.uk
Joined January 2009

📸 936 Photos and videos

Tweets
Tweets & replies
Media

BBC Archive @BBCArchive - 2h
#OTD 2013: On her 16th birthday, Malala Yousafzai addressed the UN, campaigning for free education for every child

"One child, one teacher, one book and one pen can change the world"
Theresa May will be the new Prime Minister replacing David Cameron as Tory leader. Adam Fleming from BBC Daily Politics & Sunday Politics is answering your questions. What do you want to know? #FacebookLive
Conclusion

- Audio compression based on psychoacoustic models has led to enormous file compression
- Storage requirements and transmission rates improved
- Time is shifted (catch-up audio and video)
- Social change
  - Social media
  - Citizen journalism / AV production
  - Conviviality and convergence