

# The early MPEG years

## Personal Memories

Geoff Morrison  
Chief Devices Researcher, BT Innovate



# In the beginning (before MPEG)

- 1971 – I graduate in a world where there are no “digital” consumer items.
- I join British Post Office Research Department working on analogue video transmission.
- Colleagues are making digital video codecs
  - 140 Mbit/s PCM for broadcast
  - 6 or 8 Mbit/s DPCM for videophone
- Everything is hardware

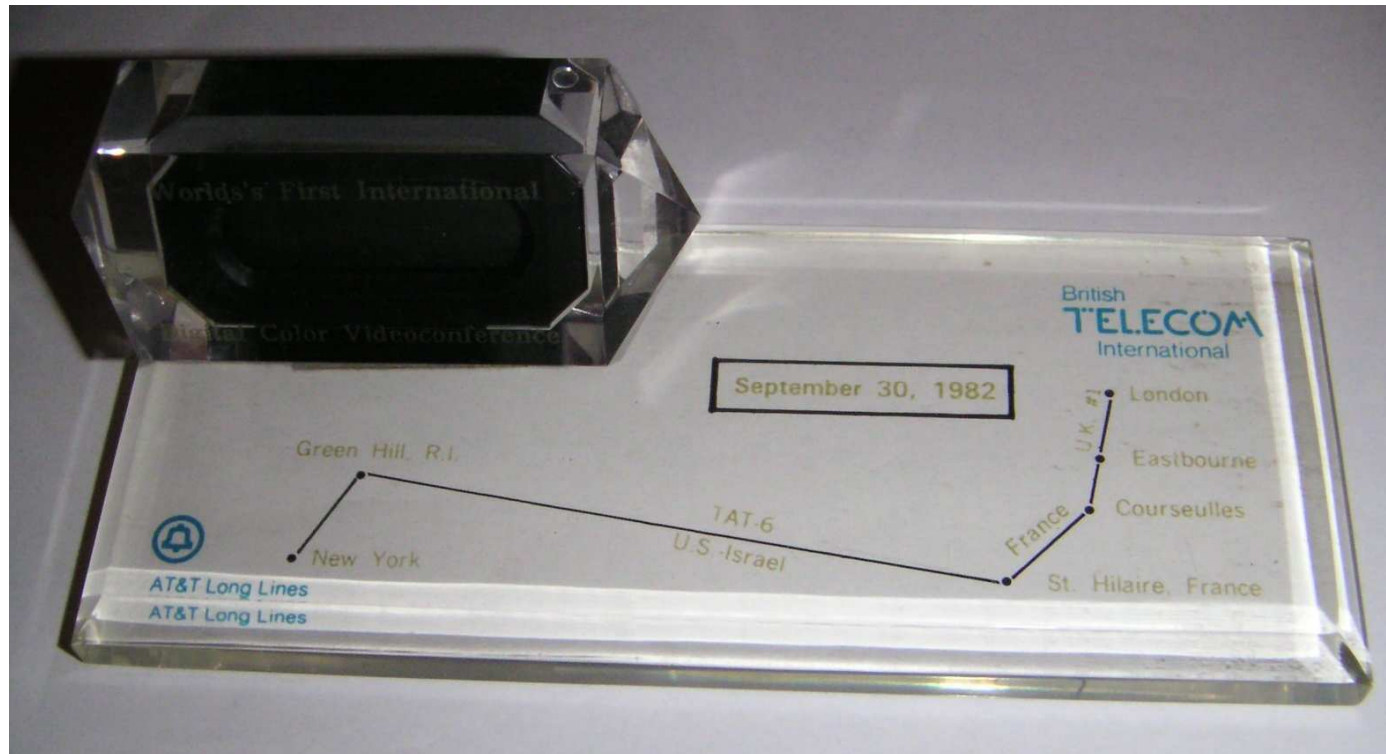


# 1975

- 1975. I am trying to make line standards converters (625 broadcast<>313 videophone) using Serial Analog Memories
- 1977. I make the digital versions of above for BPO version of COST211 codec (later standardised as CCITT Rec H.120.)
- 1980. Promoted to group leader and my soldering iron is switched off!



# 1983



- World's first international digital colour videoconference. 30 September 1982

# Japan 1985

- 1985. Spend 6 months at NTT Yokosuka Lab with Yasuda-san and Okubo-san.
  - Perform simulations investigating the feasibility of a single picture format for the newly started CCITT activity for nx384 kbit/s codec for videoconferencing and propose the parameters for CIF.
- I buy my first digital CE item.



# 1985 - 1988

- On return to BT I work full time on n x 384 kbit/s
  - I lead the group in BT making a real time hardware codec
  - I represent BT in the CCITT Expert's Group (“the Okubo group”)
  - I chair the COST 211 Hardware Subgroup



# LSI circa 1987



- Our 8 by 8 DCT used 16 of these ICs.  
(Encoder had 32 and decoder 16)

# 1988 – MPEG starts

- Yasuda-san and Chiariglione hatch MPEG
- Richard Nicol (my boss) participates in the first meeting and senses this will be important
  - He sends me to next(?) meeting near Torino airport
    - I meet Hidaka-san over breakfast



# MPEG-Video

- All the talk is about video compression
- Main target is 1.5 Mbit/s to fit CD-ROM
- Many people say:
  - “Silent movies are not very useful”



# MPEG-Audio

- Realisation that if audio and video are going to fit on disc that carried audio only, then audio compression is needed.
- MPEG-Audio group initiated.



# MPEG System

- Realisation that a specification is needed to combine and separate the coded audio and video bit streams.
- I write contribution “The need for more systems engineering in MPEG”
- MPEG System group begins work.



# MPEG-1 Competitive Phase

- Rules for MPEG-Video and MPEG-Audio competitions derived.
- 15 video compression proposals
- 4 audio compression proposals
- Evaluations at Kurihama meeting
- No competitive phase for System

# System

- Basic requirements were simple:
  - Multiplex streams together
  - Demultiplex streams apart
  - Synchronise the streams
    - Audio and video to be in lip-sync

# Telco muxes

- Multiplexing was predominantly a telco technology – many PCM telephony circuits on a digital trunk.
  - Regular, predetermined, bit or byte mux with inherent fixed delays gives implicit sync.
- CCITT also had a slightly more flexible variant, Rec. H.221.
  - I proposed, but it was deemed unsuitable.

# Origin of MPEG System Spec?

- Many papers published on MPEG video and audio compression
- Few (none?) on MPEG System
- I believe there was much good work done on timing models, buffer management, lock recovery



# Origin of MPEG System Spec?

- Concerned at lack of progress in the full MPEG System Group, Philips, IBM and BT met at Redhill UK.
- In 1 day, Jan van der Meer, John Morris, Sandy MacInnis, Mike Nilsson and Geoff Morrison agreed the basic design.
- This was proposed at the next MPEG meeting and adopted as the starting point for what was refined to become IS-11172 Part 1.



# MPEG-1 System Basics

- Synchronisation using time stamps
- Timing clock 90 kHz
- Packet mux with variable length packets
- Start codes identify payload media
- Start codes harmonised with video start codes to avoid emulation
  - no similar harmony with MPEG Audio!

# Advent of MPEG-2

- MPEG-2 ousted MPEG-1?  
(as MPEG-4 Part 10 later ousted Part 2?)
- Broadcasters had now “woken up” to compressed digital video for distribution
- Video group added interlace
- Audio group added multi-channel



# MPEG-2 System

- Original mux deemed to have shortcomings
  - not sufficiently robust to transmission errors
  - not able to mux multiple programs
  - timing not precise enough
- Transport Stream developed
  - fixed length packets ( $4 * (48-1)$ )
  - 27 MHz timing clock
- TS<>PS conversions possible
- Has stood the test of time



# Today



ISO/IEC JTC1/SC29 WG11



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# Truly consumer technology



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