

Video Coding IPR Issues

Developing China's standard for
HDTV and HD-DVD

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Agenda

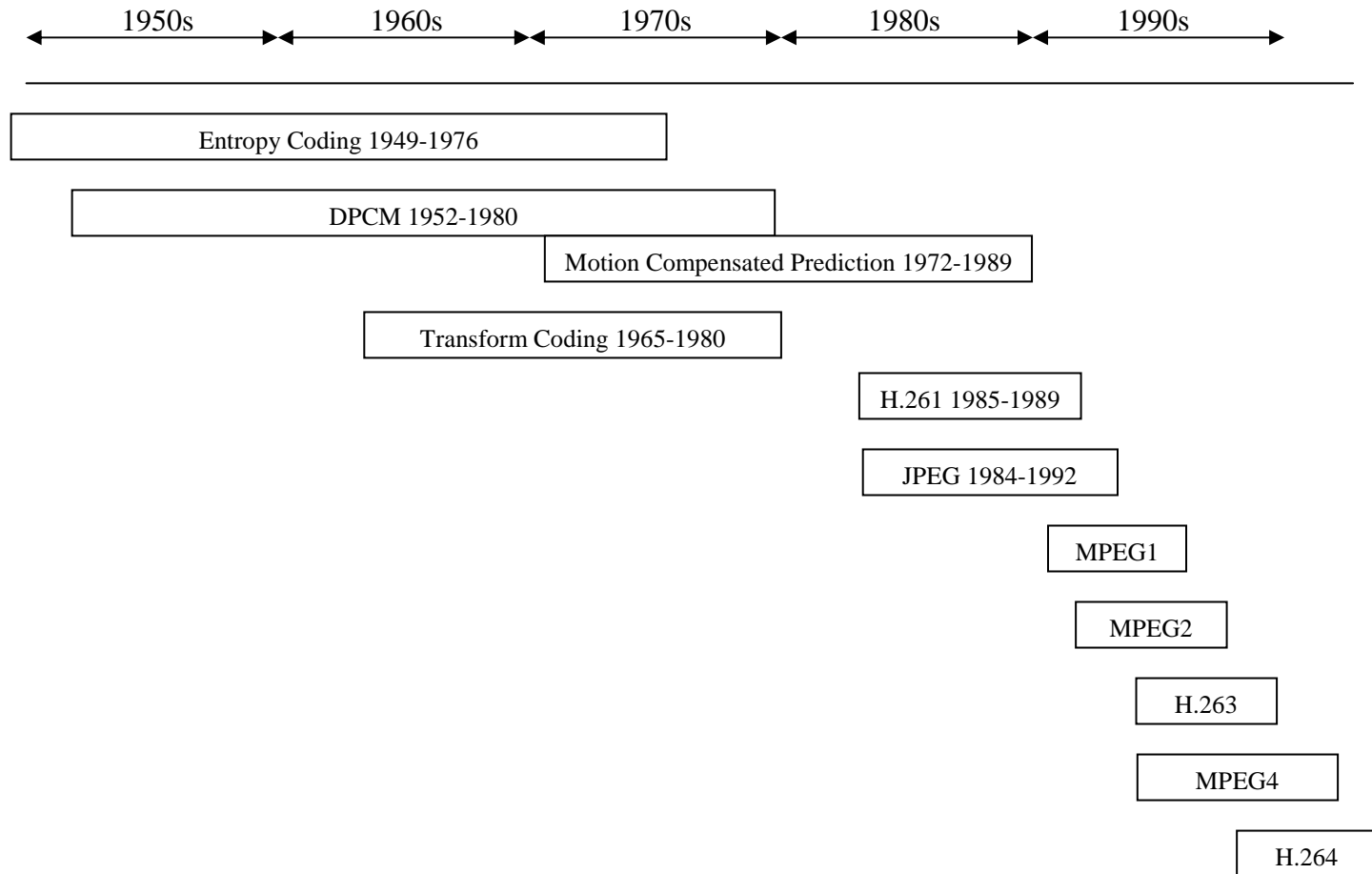
- Which technology is patented?
- What is the value of the patents?
- Licensing status today.
- How to minimize impact of patents.
- Progressive DTV Standard for China

History of Video Compression

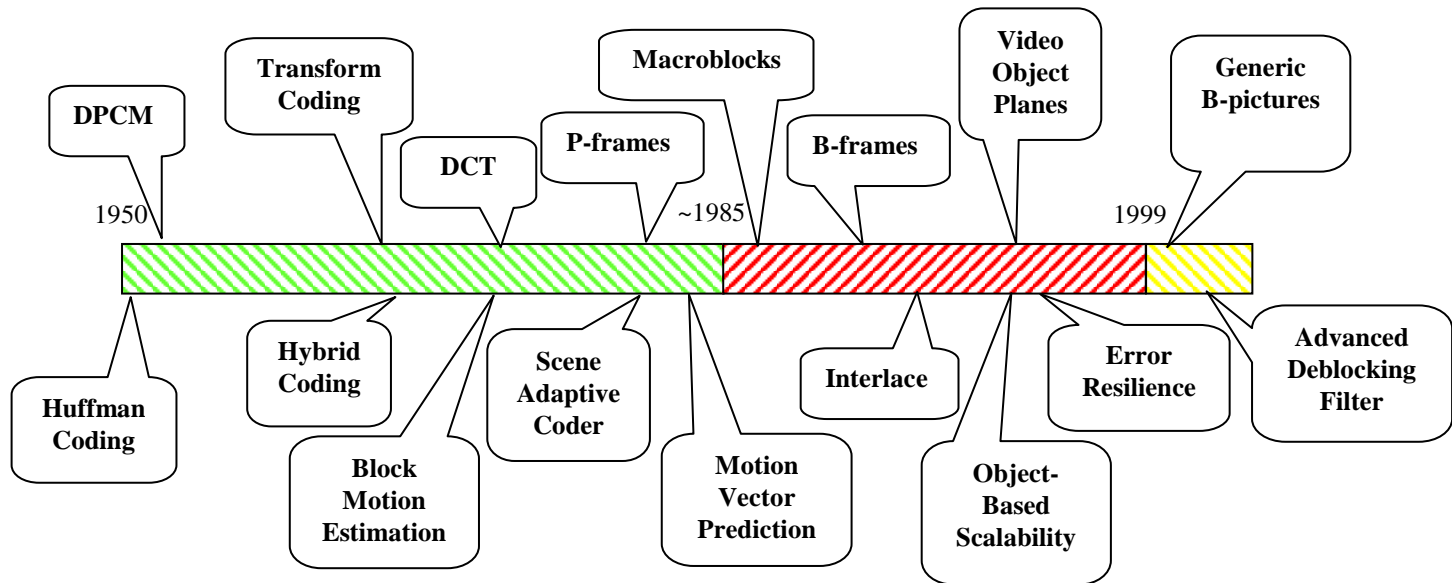
JVT-E066

- H.26x and MPEGx algorithms are built from a set of coding tools:
- Three main coding tools:
 - DCT coding to remove spatial redundancy
 - DPCM coding to remove temporal redundancy
 - Entropy coding to remove statistical redundancy
- Small coding tools:
 - Removal of residual redundancy
 - Coding of side information
 - Formatting the syntax of the coded bitstream
- Most of these tools were invented 20-30 years ago

Main Tools & Standards



Periods of IPR



C Reader, 2002

Periods of IPR

- **Up to 1985:**
 - Many coding tools were never patented.
 - Patents that were granted have largely expired.
 - The coding tools in this period contribute most of the basic performance.
 - Some important tools were invented that have not been used until very recently.

Periods of IPR

- **1985 to 1999:**
 - Many small coding tools were patented.
 - The small coding tools only provide small improvements in performance.
 - Interlaced coding tools were heavily patented.
 - B-frame coding tools were heavily patented.
 - Some tools from the early period were reinvented and patented.
 - These tools were too complex to implement originally and had been forgotten.
 - Some patents were filed without adequate prior art search and are not original.

Periods of IPR

- **After 1999:**
 - New tools have been invented
 - These offer significant performance
 - Most are offered royalty-free to the H.264 baseline algorithm (RFB).

Performance

- Most of the performance comes from tools that are free from IPR
- Alternatives exist for patented tools (except interlaced coding)
- Much of the performance comes from “smart encoding”
 - MPEG2 performance today is much higher than 10 years ago

Conclusion

- Most IP today is low value; alternatives exist
- Exceptions are interlaced coding tools and B-frames
- Recent improvements are included in H.264-RFB

Licensing Status

- Licensing terms for MPEG4-Visual have been rejected by most of the market
 - Too late
 - Too complex
 - Fees on content and service are unacceptable
 - Different fees for different applications and different delivery networks are unacceptable

Licensing Status

- Representatives of many companies from many industries around the World met to present their opinion of licensing for H.264 (Main and Extended profiles)
 - Very consistent opinions that the license must be fast, simple, inexpensive, consistent across applications and networks
 - Most people rejected content and service fees

Licensing Status

- Competition in coding algorithms!
 - Now there are proprietary alternatives
 - Performance is very high in tests despite not using patented coding tools
- Competition in licensing!
 - Via Licensing is competing with MPEGLA
- MPEGLA is meeting this week
 - Many feel this is their last chance to offer reasonable terms for MPEG4 and H.264

H.264 IPR Policy

- Main and Extended profiles must have “RAND” licensing (Reasonable And Non-Discriminatory)
- The royalty free baseline is in the Terms of Reference for JVT.
 - All proposals to JVT must include a Patent Disclosure Form.
 - Clause 2.2.1 of this form, says companies will license royalty free for the baseline if all other companies do so.

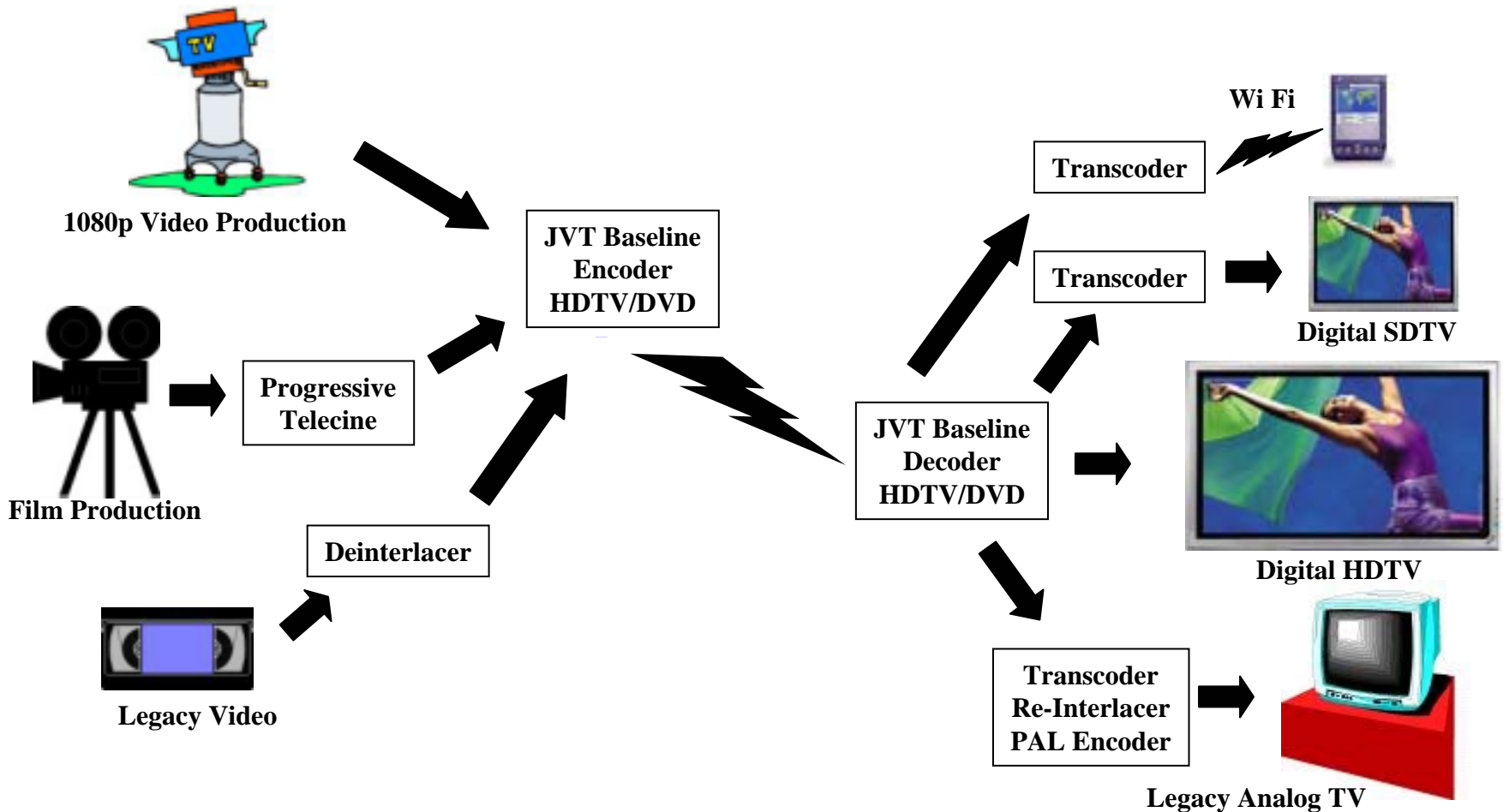
H.264 Status for RFB

- Most companies provided 2.2.1 statement
- No new technology without 2.2.1 is in baseline
- Interlace was removed from baseline
- One company joined the RFB to avoid removal after a redesign was submitted
- Technical and legal review has determined the RFB goal has been achieved

How to proceed?

- Base AVS video coding on H.264 Baseline
 - Royalty-free
 - Performance somewhat less than Main
- Enhance the performance with additional coding tools that are free from patents
 - Document the origin of these tools in detail as a defense against IPR claims
- Utilize smart encoding to achieve nearly optimum performance

Progressive TV/DVD Standard



Video Formats

- Decouple the formats for:
 - Production – make a fixed format
 - Distribution – H.264 coding with adaptive spatial and temporal resolution (video slices)
 - Display – make several options based on:
 - Cost
 - Network connection

Proposal – Progressive Standard

- Highest Quality – Lowest Bitrate encoding
 - HDTV at 8Mbits/s or less; SDTV at 1.5Mbits/s
 - Progressive displays can have Kell factor close to unity
- Decouple display from distribution
 - Advanced displays can have frame storage
 - Provide a range of resolutions at different prices like PC Monitors:
 - Wide versions of SVGA, XGA, SXGA, etc.
 - Down-sample, re-interlace and PAL-encode for legacy TVs in digital settop converter

Proposal – Progressive Standard

- Progressive Production:
 - Progressive telecine for film: highest quality, lowest noise
 - 1080p digital film cameras and 24p production is now becoming the new standard
 - 60p production needed for sports
 - CCD cameras, webcams, security cameras are all progressive (internally at least)
- Legacy interlaced video:
 - Motion-compensated de-interlacing is now available
 - Convert to progressive before encoding with JVT

Summary

- MPEG4/H.264-Main profile licensing situation is very uncertain:
 - Schedule? Cost? Terms?
- Close to optimum performance can be achieved without patented coding tools
 - H.264 Baseline + extensions
 - Progressive-scan format
- China can be the global leader:
 - Progressive HDTV superior to MPEG2
 - World's first standard for HD-DVD