

Companion to article 3.4 of Block 3 (Codec Evolution). Print on A4 or US Letter.

What it is - three names, one standard

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|-------------------------|--|
| ITU-T H.264 | Published by ITU-T Telecommunication Standardization Sector, May 2003 |
| ISO/IEC 14496-10 | MPEG-4 Part 10, published by ISO/IEC JTC 1/SC 29/WG 11, March 2003 |
| AVC | Advanced Video Coding - marketing-friendly name used by Apple and most vendors |
| Authors | Joint Video Team: G. Sullivan, T. Wiegand, A. Luthra (JVT formed Dec 2001) |

Profiles and levels - what to ship where

| Profile @ Level | Resolution / fps | Max bitrate | Where it ships |
|------------------------|----------------------|-------------|------------------------------------|
| Constr. Baseline @ 1.2 | Up to 352 x 288 @ 30 | 0.4 Mbps | WebRTC (RFC 7742 mandatory) |
| Baseline @ 3.0 | 720 x 480 @ 30 | 10 Mbps | Early mobile video, lossy networks |
| Main @ 3.1 | 1280 x 720 @ 30 | 14 Mbps | First-gen mobile HDTV |
| High @ 4.0 | 1920 x 1080 @ 30 | 25 Mbps | Broadcast HD, early VOD |
| High @ 4.1 | 1920 x 1080 @ 30 | 50 Mbps | Blu-ray, default 1080p VOD |
| High @ 4.2 | 1920 x 1080 @ 60 | 50 Mbps | 1080p60 streaming, gaming capture |
| High @ 5.1 | 4096 x 2304 @ 30 | 240 Mbps | 4K Blu-ray, pro cameras |
| High @ 5.2 | 4096 x 2160 @ 60 | 240 Mbps | 4K60 streaming |
| High 4:2:2 @ 5.1 | 1920 x 1080 @ 60 | 300 Mbps | Broadcast contribution, XDCAM |
| Hi444PP @ 5.1 | 4096 x 2304 @ 30 | 1200 Mbps | Studio mastering, lossless |

x264 presets - speed vs compression efficiency

| | |
|--------------------------------|---|
| ultrafast / superfast | Live ingest with extreme CPU budget. -30% efficiency vs medium. |
| veryfast / faster | Live encoding on commodity hardware. -15% efficiency vs medium. |
| fast / medium (default) | Sane default for live and ad-hoc encodes. |
| slow / slower | VOD encoding, multi-pass-grade quality. +5-10% efficiency. |
| veryslow / placebo | Reference quality. +1-2% over slower for 10x more CPU. |

FFmpeg recipes you will actually use

1080p VOD, High Profile, CRF 21:

```
ffmpeg -i in.mov -c:v libx264 -profile:v high -level 4.1 -preset slow -crf 21 \
  -pix_fmt yuv420p -c:a aac -b:a 128k -movflags +faststart out.mp4
```

Live 720p low-latency RTMP, Constrained Baseline:

```
ffmpeg -re -i live -c:v libx264 -profile:v baseline -level 3.1 \
  -preset veryfast -tune zerolatency -b:v 2500k -maxrate 2500k \
  -bufsize 5000k -g 60 -keyint_min 60 -f flv rtmp://ingest/stream-key
```

ABR ladder member, 540p, 1.5 Mbps:

```
ffmpeg -i in.mp4 -vf scale=960:540 -c:v libx264 -profile:v main -preset slow \
  -b:v 1500k -maxrate 1650k -bufsize 3000k -pix_fmt yuv420p out_540p.mp4
```

Patent calendar (2026)

- Pool administered by Via Licensing Alliance (Via LA) - MPEG LA merged into Via LA in April 2023.
- Streaming licence fees restructured in 2026: tiered, up to USD 4.5M/yr for largest new licensees.
- Last US patent in the pool (US 7,826,532) expires 29 November 2027.
- Free-to-end-user internet video has been royalty-waived since August 2010 (MPEG LA decision).
- AAC audio + DRM are licensed separately - clear those chains before declaring a product royalty-free.