WebM and VP8

Demystifying Video Encoding

Who Are These Guys?

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Staff Software Engineer, Google

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Product Manager, Google

Things to Demystify...

- About WebM and VP8
  - What is WebM?
  - Why is WebM a great choice for developers?
- Encoding WebM in ffmpeg
  - Web VOD, realtime, mobile, etc.
- Using WebM in your apps
  - libvpx/libwebm/libvorbis
  - Live encode & upload to YouTube
- The Future - VP9
- Q & A

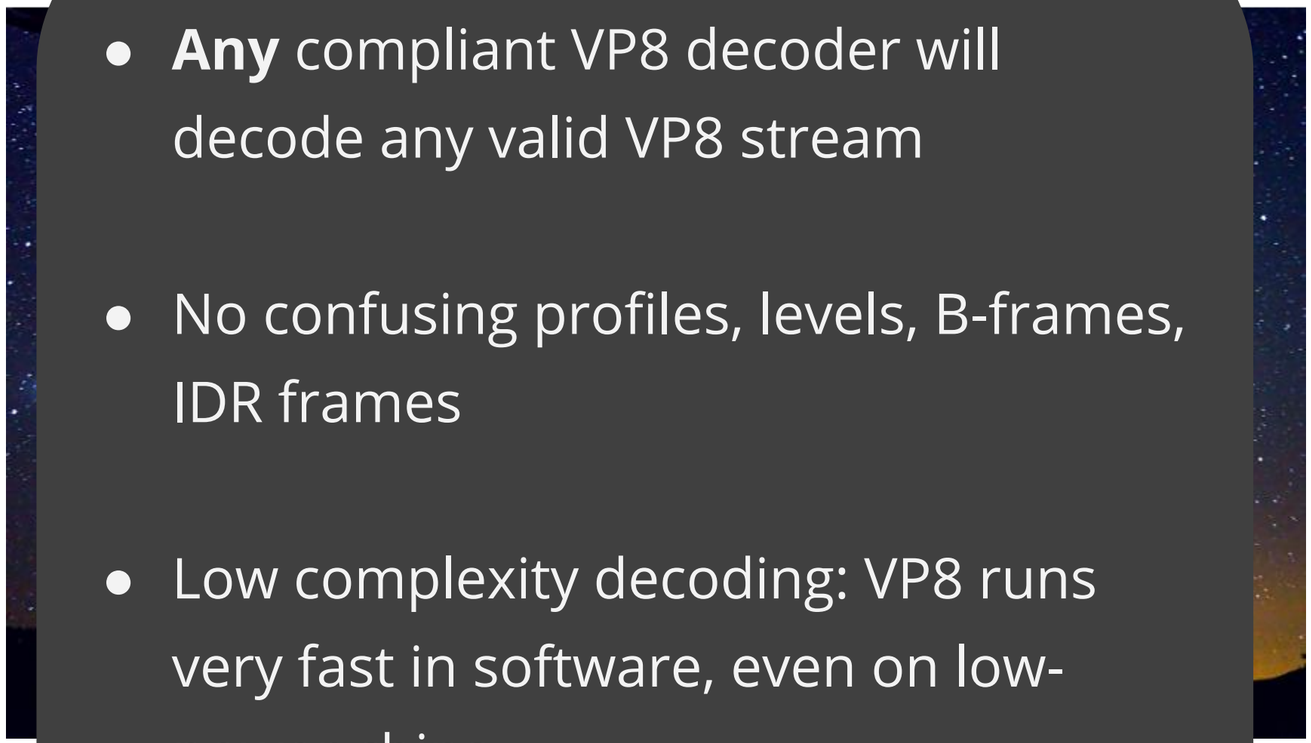
What is WebM?

High quality, open, royalty-free alternative for web video

- VP8 video
  - **VP9 coming soon!**
- Vorbis audio
  - **Opus audio coming soon!**
- Matroska-based container (.webm file extension)

Benefits of WebM for Developers

- Amazing video quality!
- Simplicity of design
- Native <video> support in ~60% of browsers worldwide!
- Rapidly growing support in mobile devices
  - As Android grows, WebM support grows
  - VP8 increasingly supported in hardware



- **Any** compliant VP8 decoder will decode any valid VP8 stream
- No confusing profiles, levels, B-frames, IDR frames
- Low complexity decoding: VP8 runs very fast in software, even on low-power chips

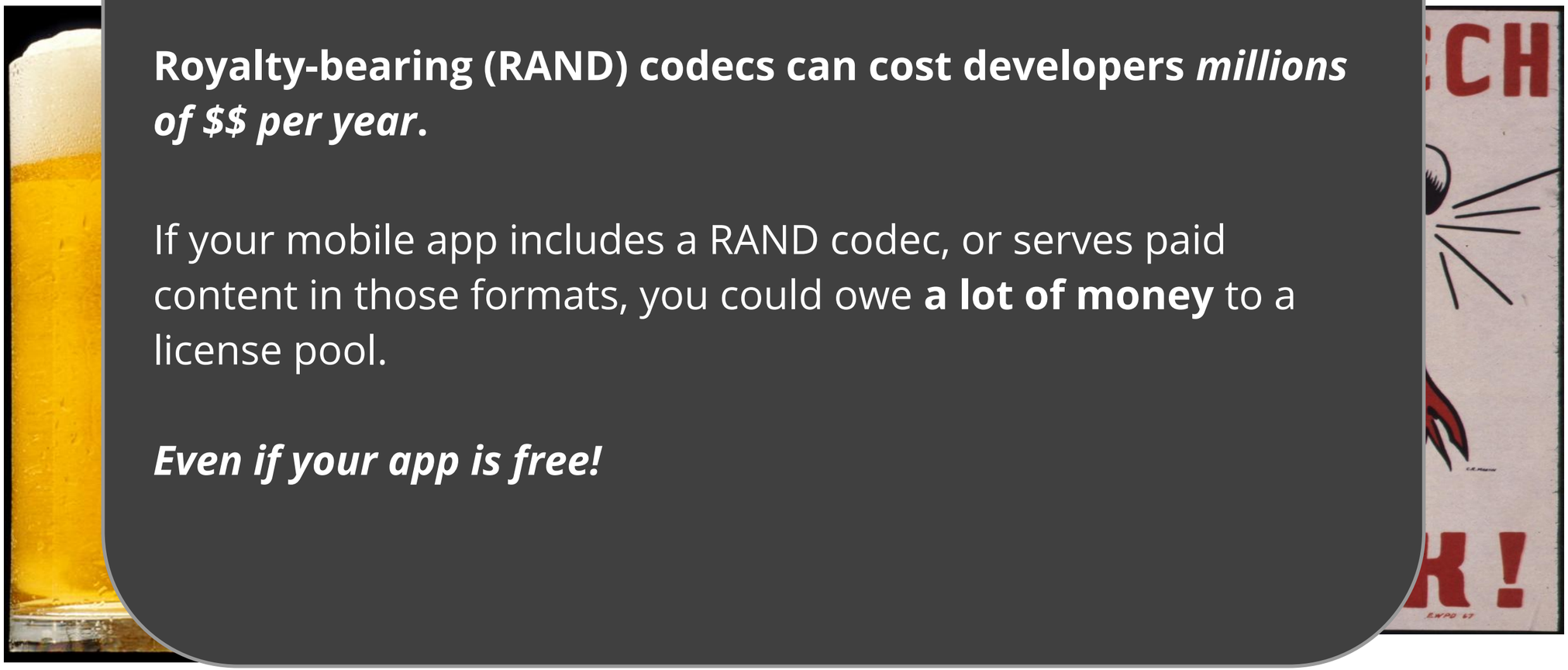
Timescapes still courtesy Southwest Light Ltd.; HD image CC BY-SA 2.0, flikr.com/phjellming
Desktop stats source: Statcounter, May 10, 2013; Mobile stats source: Strategy Analytics, April 23, 2013

Example: WebM on Nintendo Wii

- YouTube exclusively serves WebM (VP8) video to all Wii clients
- Made possible by to VP8's low decoding complexity

Perhaps most importantly…

WebM



Royalty-bearing (RAND) codecs can cost developers *millions of $$ per year*.

If your mobile app includes a RAND codec, or serves paid content in those formats, you could owe **a lot of money** to a license pool.

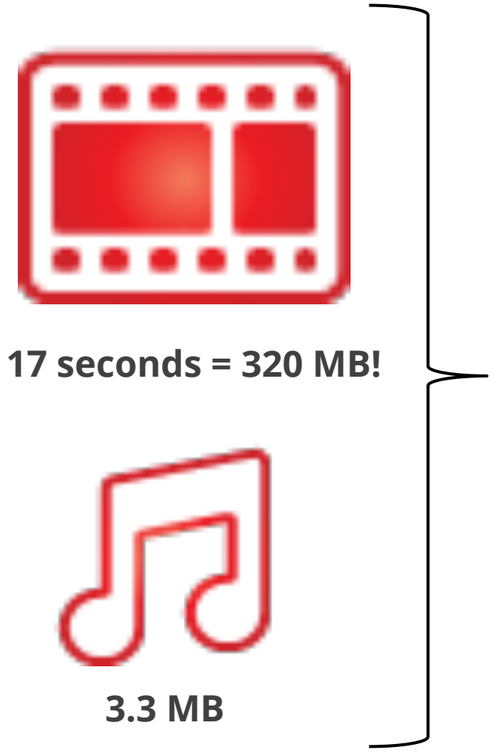
Even if your app is free!

Images: National Institute of Health; National Archives and Records Administration

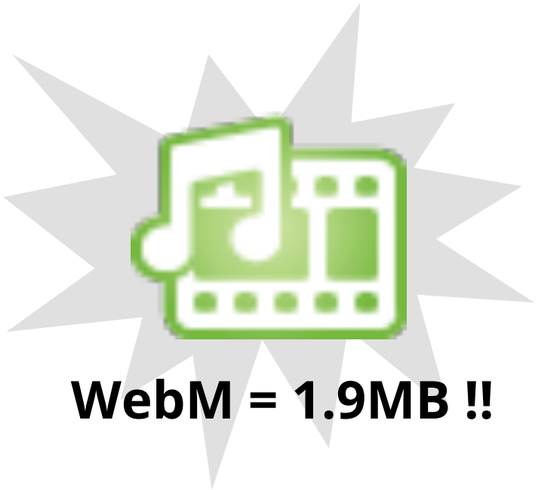
Next: Let's Make a WebM File!

What is Encoding/Compression?

Raw media streams are **HUGE...**



...WebM makes them **much** smaller **while** preserving quality.



Encoding use case examples

Web 480p ("good" quality)

bash

```
$ ffmpeg -i VIDEO_INPUT.Y4M -i AUDIO_INPUT.WAV -c:v libvpx -b:v 800k -quality
good -vf scale=-1:480 -c:a libvorbis W-480.WEBM
```

Encoding use case examples (Cont'd.)

Web 720p "best" quality, 2-pass

bash

```
$ ffmpeg -i VIDEO_INPUT.Y4M -c:v libvpx -b:v 1200k -c:a libvorbis -pass 1 W-720.
WEBM \

&& ffmpeg -y -i VIDEO_INPUT.Y4M -i AUDIO_INPUT.WAV -c:v libvpx -b:v 1200k -
quality best -vf scale=-1:720 -c:a libvorbis -pass 2 W-720.WEBM
```

Encoding use case examples (Cont'd.)

Fast encoding

bash

```
$ ffmpeg -i VIDEO_INPUT.Y4M -i AUDIO_INPUT.WAV -c:v libvpx -b:v 1000k -quality
realtime -vf scale=-1:480 -c:a libvorbis W-480.WEBM
```

Encoding use case examples (Cont'd.)

Mobile 3G

bash

```
$ ffmpeg -i VIDEO_INPUT.Y4M -i AUDIO_INPUT.WAV -c:v libvpx -b:v 112k -vf scale=-1:240 -c:a libvorbis -ar 16000 -b:a 32k M-3g.WEBM
```

Encoding use case examples (Cont'd)

For a more comprehensive list, see http://goo.gl/ijcYv

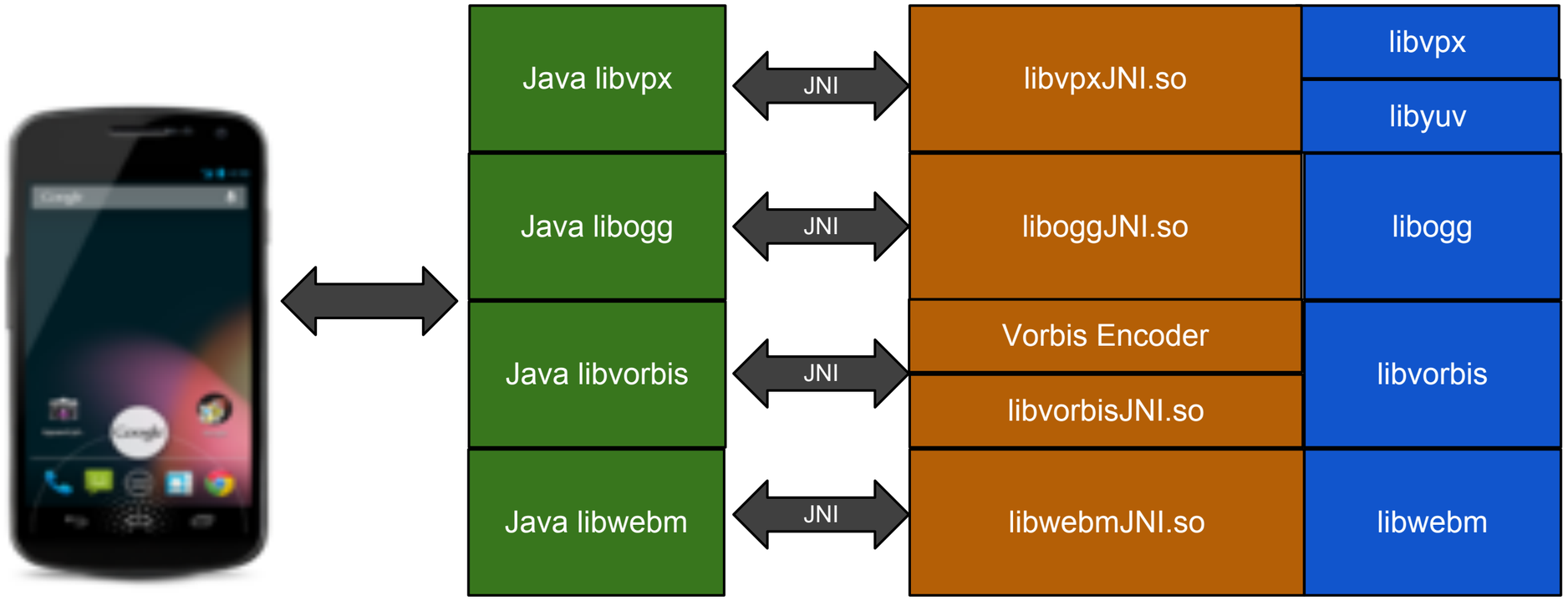
Also see this Google search: http://goo.gl/yZ8nR

ffmpeg source & binaries available at ffmpeg.org

Agenda - Using WebM in Your Apps

- WebM JNI bindings
- Demo using the bindings
- Look at encoding and muxing code
- Live encode & upload to YouTube demo using the bindings

WebM JNI Bindings



Next: Actual Code!

Initializing Encoders and Muxer

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mkvWriter.open(webmOutputName);
Segment muxerSegment = new Segment();
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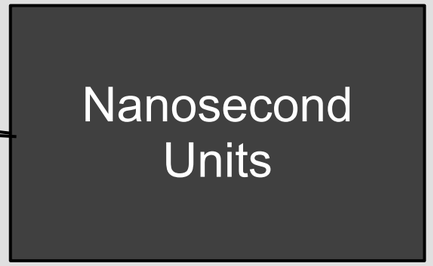

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Encoding and Writing Frames

java

```
while (encoding) {
  rawFrame = GetRawFrame();
  if (rawFrame == AUDIO) {
    vorbisEncoder.Encode(rawFrame);
    AudioFrame vorbisFrame = vorbisEncoder.ReadCompressedFrame();
    if (vorbisFrame != null)
      muxerSegment.addFrame(vorbisFrame.buffer, audioTrackNumber, vorbisFrame.pts, true);
  } else if (rawFrame == VIDEO) {
    ArrayList<VpxCodecCxPkt> vpxPkt = vpxEncoder.encodeFrame(
        rawFrame, LibVpxEnc.VPX_IMG_FMT_I420, timestamp, duration);
    for (int i = 0; i < vpxPkt.size(); i++) {
      VpxCodecCxPkt pkt = vpxPkt.get(i);
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YouTube Upload Demo!

Summary

- Where to Download WebM JNI Binding?
  - git clone http://git.chromium.org/webm/bindings.git
- Minimum SDK version 2.2 (Froyo)

- Have Questions?
  - Visit **webm.project.org**
  - Post on webm-discuss mailing list (**goo.gl/Ryfvd**)

- YouTube v3 API (**goo.gl/GBenN**)

Next: The Future

The future - VP9

- New open (free!) video codec
- Achieves ***same quality as VP8 and H.264*** using up to ***half the data***
- Rolling out in YouTube and Chrome in Q3 2013
- For more info, see I/O 2013 Session 258, "WebM and the new VP9 open video codec"

Special Thanks

- Xiph.org
- matroska.org
- WebM Project team
- Google
  - Fritz Koenig
  - Johann Koenig
  - Hangyu Kuang
  - Michael Szal
  - Jarek Wilkiewicz

Don't Forget to Rate Us!

Room 3

<Thank You!>

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jluther@google.com

Google
Developers