



# Lessons Learned from Open Source Technology Development at Google

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HPA Tech Retreat 2017

# Open Source is an Engineering Methodology



[aomedia](#) / [aom](#) / [master](#) / [./](#) / [aom](#) / **aom\_codec.h**

blob: 1d301d16b2cacf6a9d89220ac4273434f01f3627 [\[file\]](#) [\[log\]](#) [\[blame\]](#)

```
38  ~/  
39  #ifndef AOM_AOM_CODEC_H_  
40  #define AOM_AOM_CODEC_H_  
41  
42  #ifdef __cplusplus  
43  extern "C" {  
44  #endif  
45  
46  #include "./aom_integer.h"  
47  #include "./aom_image.h"  
48  
49  /*!\brief Decorator indicating a function is deprecated */  
50  #ifndef DEPRECATED  
51  #if defined( GNUC ) &&  GNUC
```

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blob: 1d301d16b2cacf6a9d89220ac4273434f01f3627 [\[file\]](#) [\[log\]](#) [\[blame\]](#)

```
38  */
39  #ifndef AOM_AOM_CODEC_H_
40  #define AOM_AOM_CODEC_H_
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42  #ifdef __cplusplus
43  extern "C" {
44  #endif
45
46  #include "./aom_integer.h"
47  #include "./aom_image.h"
48
49  /*!\brief Decorator indicating a function is deprecated */
50  #ifndef DEPRECATED
51  #if defined( __GNUC__ ) &&  __GNUC__ >= 4
```

Publicly available at [https://aomedia.googlesource.com/aom/+master/aom/aom\\_codec.h](https://aomedia.googlesource.com/aom/+/master/aom/aom_codec.h)

Google contributions to open codecs

web▶m

VP8

VP9

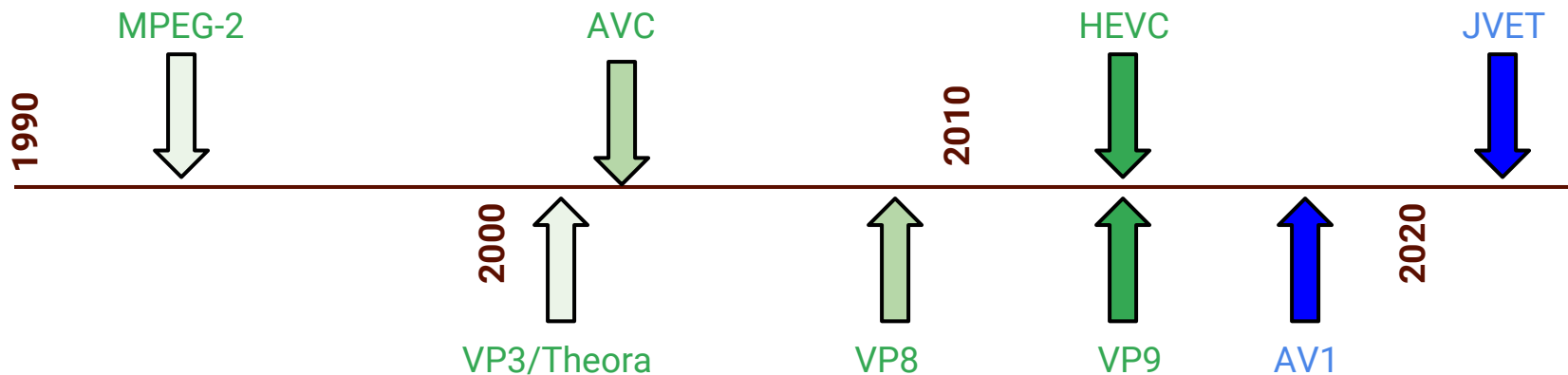


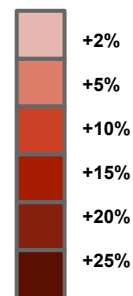
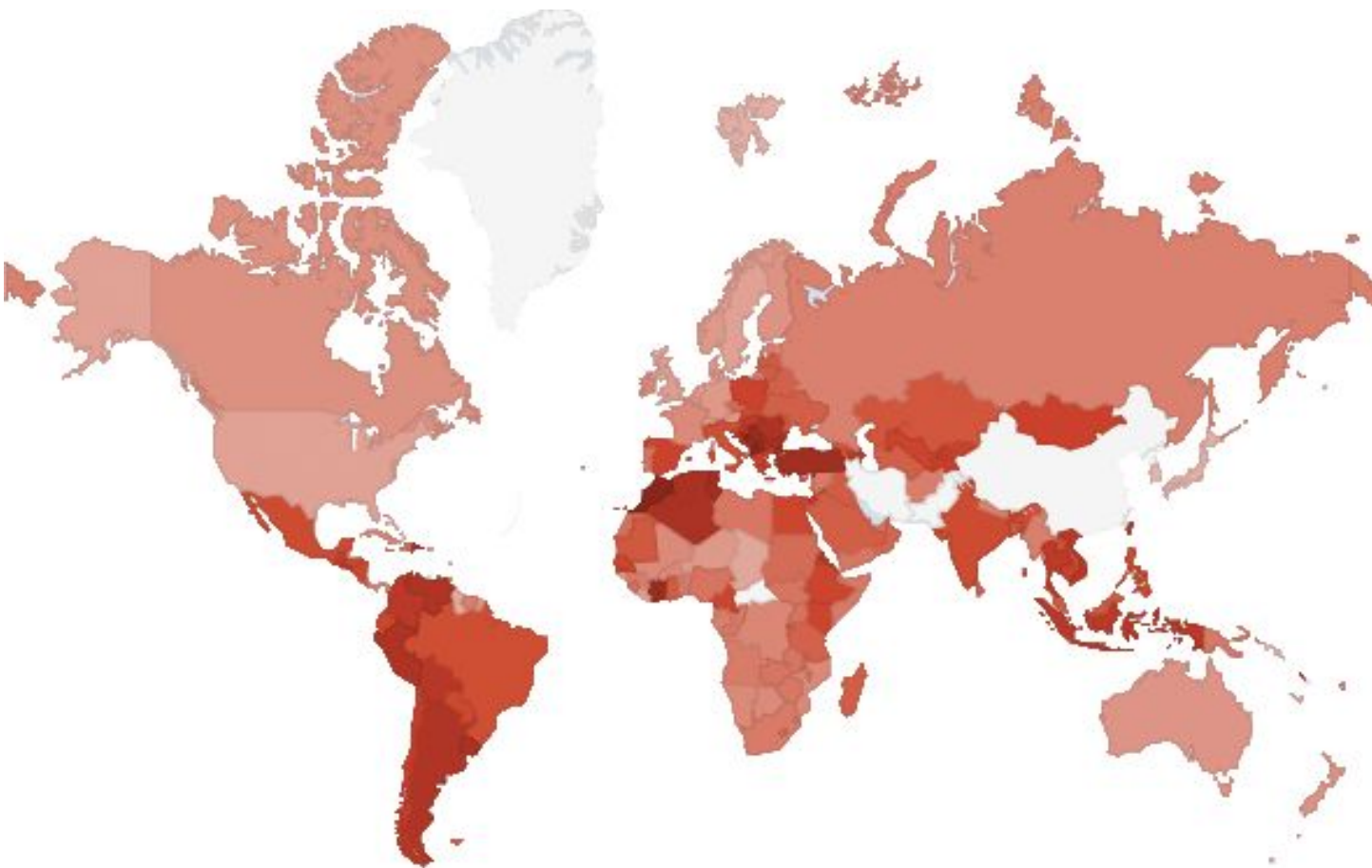
web📷p

  
*opus*



# Pace of Development: MPEG vs. WebM





YT VP9 watch time  
gains vs. H.264

**Demystify**

**Share**

**Spark**















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# Chrome's goals for media technologies

Technical excellence

Secure

Speedy “build, launch, adopt” cycle

Clear implementation

Transparent

Diverse contributors

# Google's goals for standards

Technical excellence

Secure

Speedy “build, launch, adopt” cycle

Clear implementation

Transparent

Diverse contributors

***This list should be universal for any standard, open or not***

**Test while you build  
(with community)**

# Google's goals for standards

Technical excellence

Secure

Speedy “build, launch, adopt” cycle

Clear implementation

Transparent

Diverse contributors

Code can be implemented and tested by external parties, well before the bitstream is frozen

Bugs are filed publicly during development



# Google's goals for standards

Technical excellence

Secure

Speedy “build, launch, adopt” cycle

Clear implementation

Transparent

Diverse contributors

Concurrent implementation  
catches ambiguities in the spec

Verification, testing, and  
integration tools develop  
alongside the standard (can  
also be open source)

# Google's goals for standards

Technical excellence

Secure

Speedy “build, launch, adopt” cycle

Clear implementation

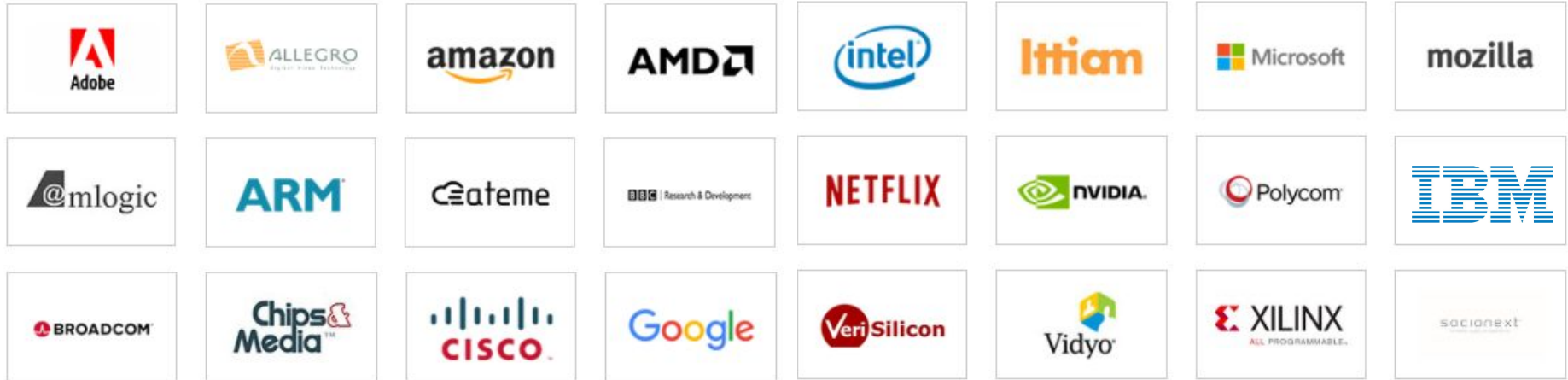
Transparent

Diverse contributors

Any uncertainty can be confirmed against the codebase and spec

Increase diversity by reducing barriers to entry.

# Tip 1: Take Opportunities to Grow Community



# Tip 2: Version Control is Your Friend



[For Developers >](#)

## Contributing Code

### Contents

- 1 Related resources
  - 1.1 Communicate
    - 1.1.1 Legal stuff
- 2 Create a local branch
- 3 Uploading a change for review
- 4 Initial git setup
  - 4.1 Code quality guidelines
  - 4.2 Writing change list descriptions
- 5 Code review
  - 5.1 Code reviews are covered in more detail on the [code review policies page](#).
    - 5.1.1 Finding a reviewer
    - 5.1.2 Requesting review
    - 5.1.3 The review process
    - 5.1.4 Approval
- 6 Running automated tests
- 7 Committing
- 8 Tips

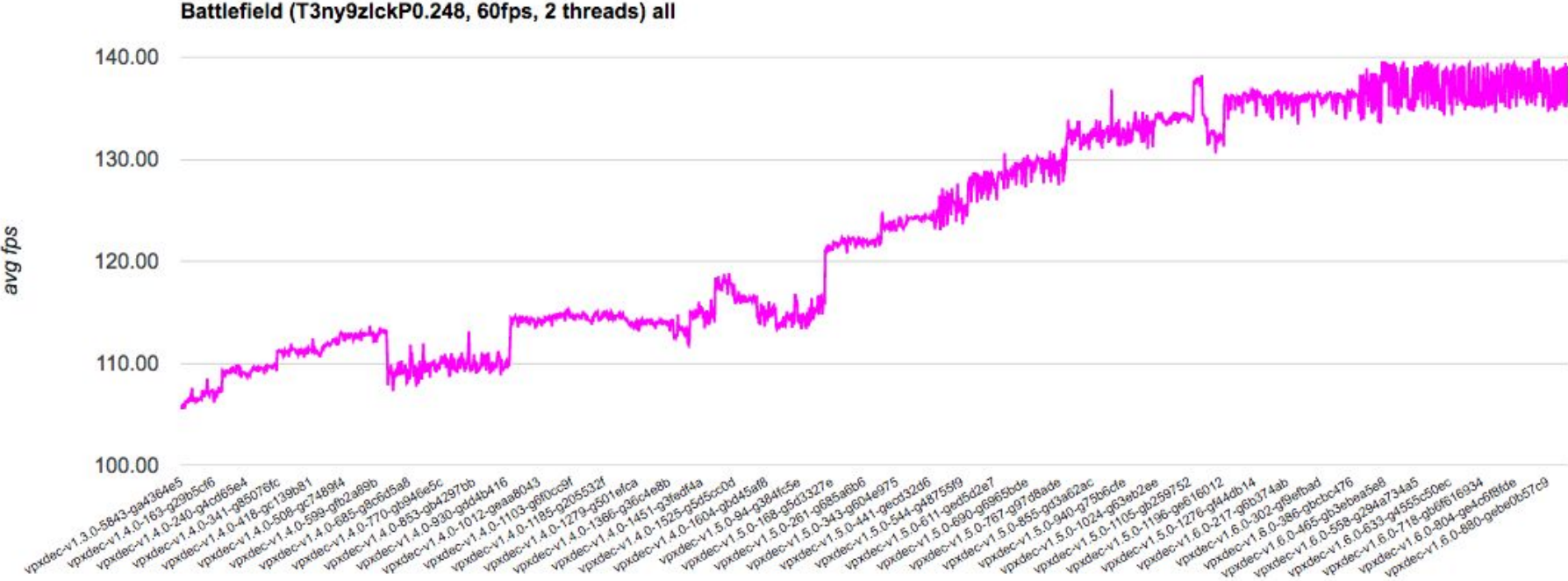
webproject / libwebp  
mirrored from <https://chromium.googlesource.com/webm/libwebp>

[Code](#) [Pull requests 0](#) [Projects 0](#) [Pulse](#) [Graphs](#)

**Releases** [Tags](#)

17 days ago	<b>v0.6.0</b> 50d1a84 zip tar.gz
21 days ago	<b>v0.6.0-rc3</b> 415f3ff zip tar.gz
23 days ago	<b>v0.6.0-rc2</b> 0ad3b4e zip tar.gz
on Dec 20, 2016	<b>v0.5.2</b> ece9684 zip tar.gz
on Dec 16, 2016	<b>v0.5.2-rc2</b> ece9684 zip tar.gz
on Jul 6, 2016	<b>v0.5.1</b> 3d97bb7 zip tar.gz
on Jun 28, 2016	<b>v0.5.1-rc5</b> c7e2d24 zip tar.gz

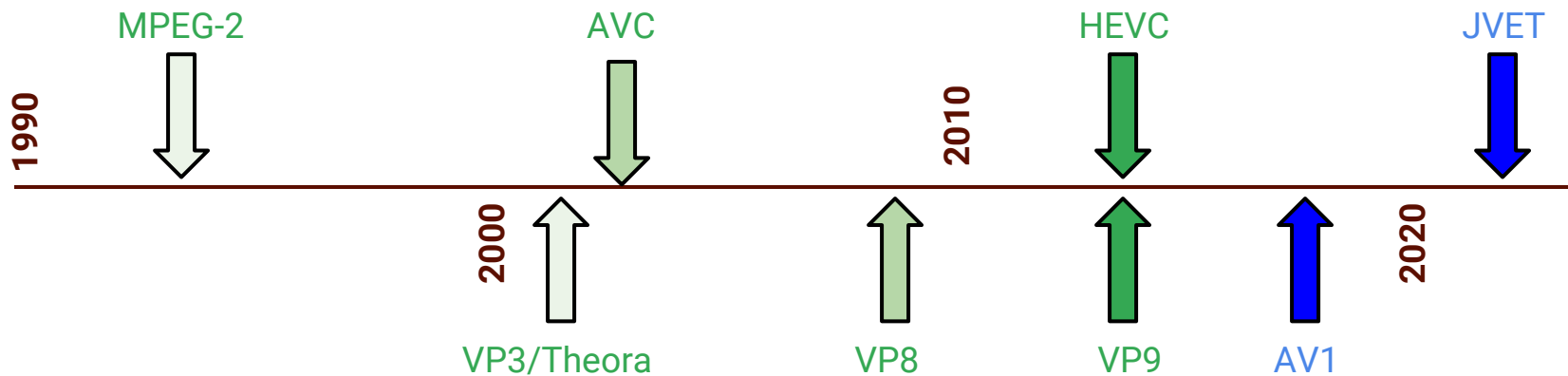
# Tip 2: Version Control is your Friend



## Tip 3: Make Modern Open Source Work For You



But wait...







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# Google's goals for standards

Technical excellence

Secure

Speedy “build, launch, adopt” cycle

Clear implementation

Transparent

Diverse contributors

No tech submissions are just “in it for the money”

Years saved on avoiding royalty discussions

Minimal negotiations required to share code and ideas

# Google's goals for standards

Technical excellence

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Speedy “build, launch, adopt” cycle

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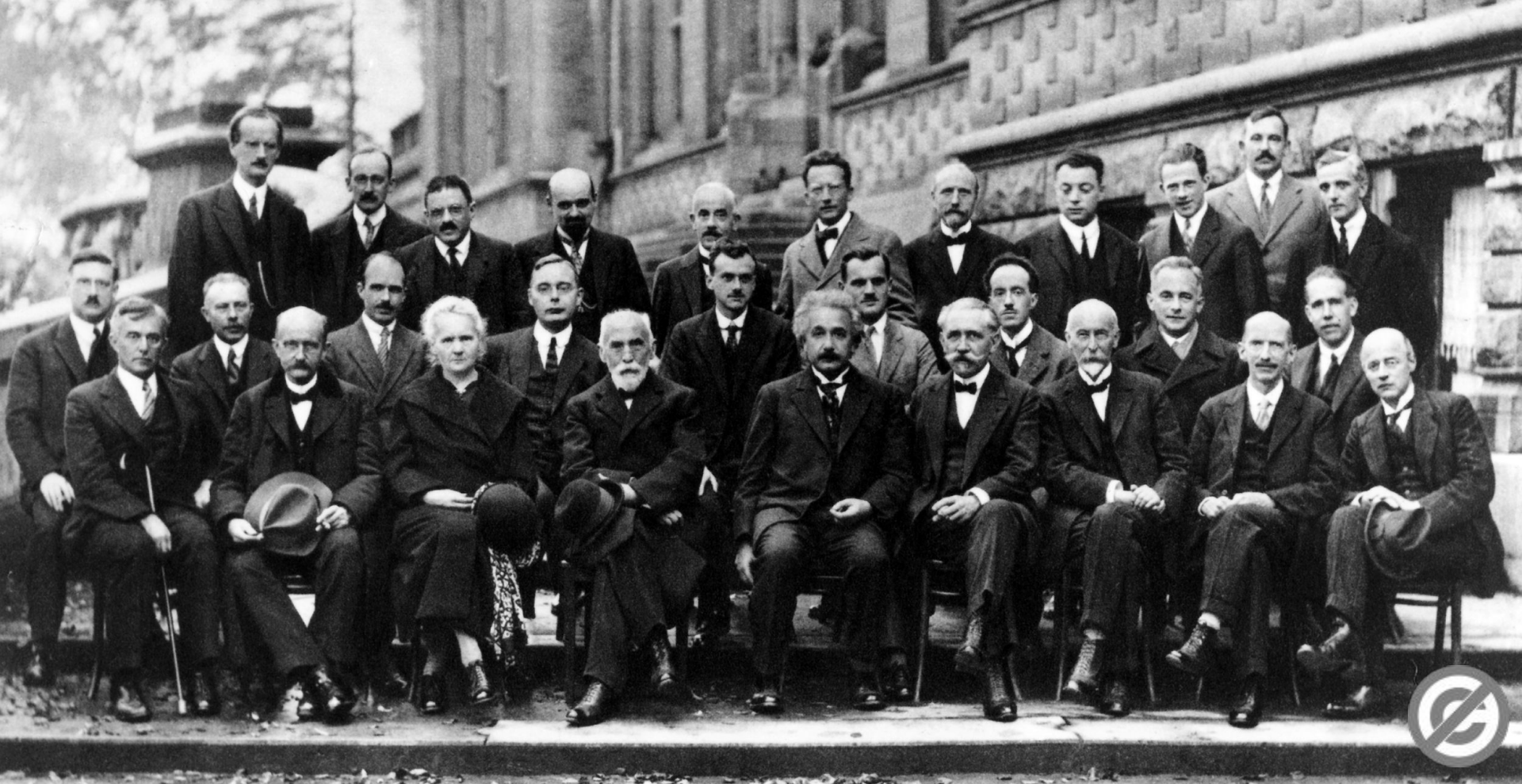
Diverse contributors

**Broad Adoption**

The internet is built to be free

YouTube & Netflix prove web media can be profitable without royalty-bearing tech

Requiring royalties means abdicating the web



# Learn More

AV1 Git Repository:

<https://aomedia.googlesource.com/aom>

AOM Contributors Guide:

<http://aomedia.org/contributor-guide>

AV1 Technical Overview Presentation:

<https://youtu.be/wi1BefrfTos?t=7070>

JW Player VP9 Case Study:

<https://www.twitch.tv/demuxed/v/94956361>