AV1 for RTC Use Cases Across Meta Family of Apps

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∞ Meta

Video @ Real-time Communication Products
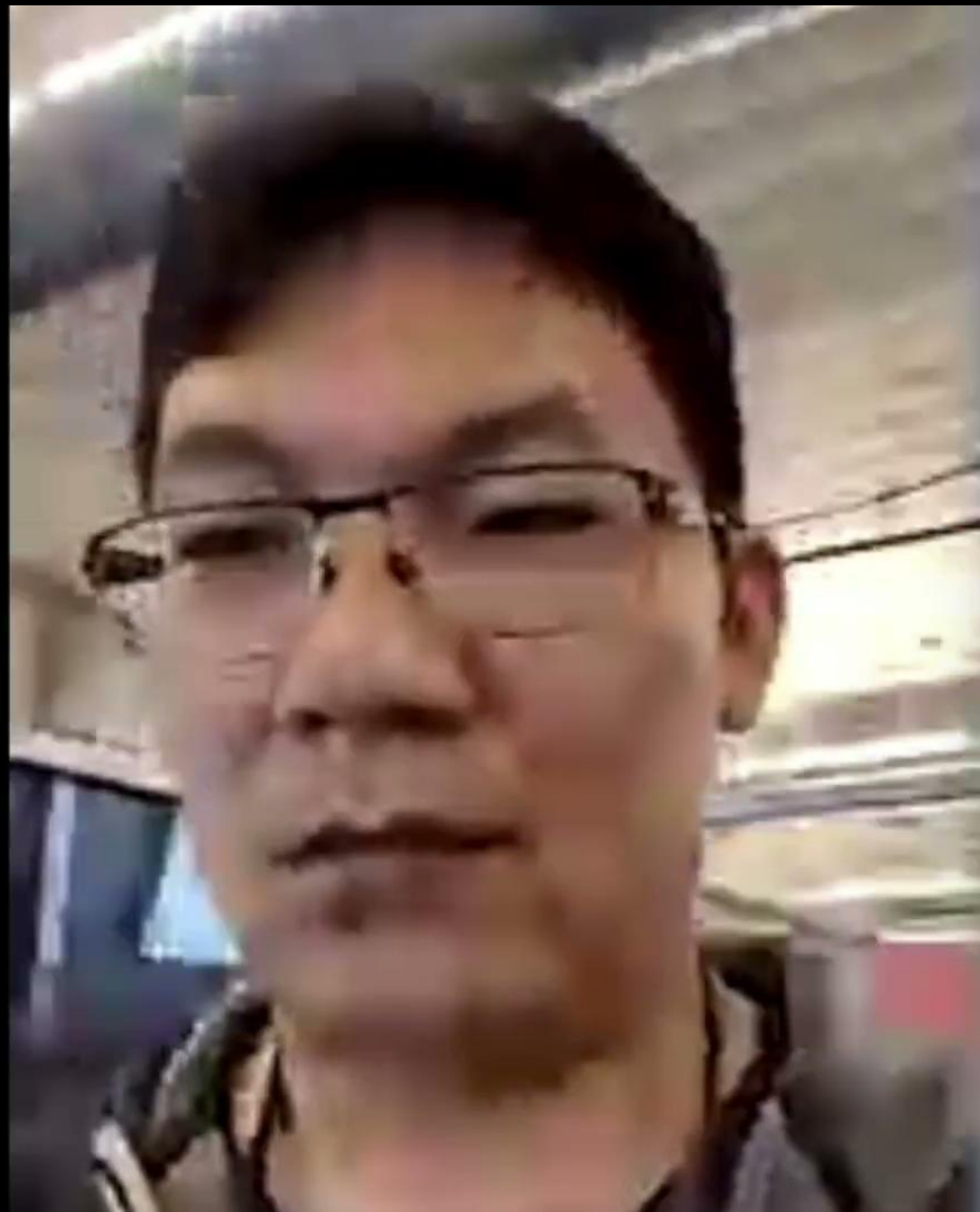
High quality video

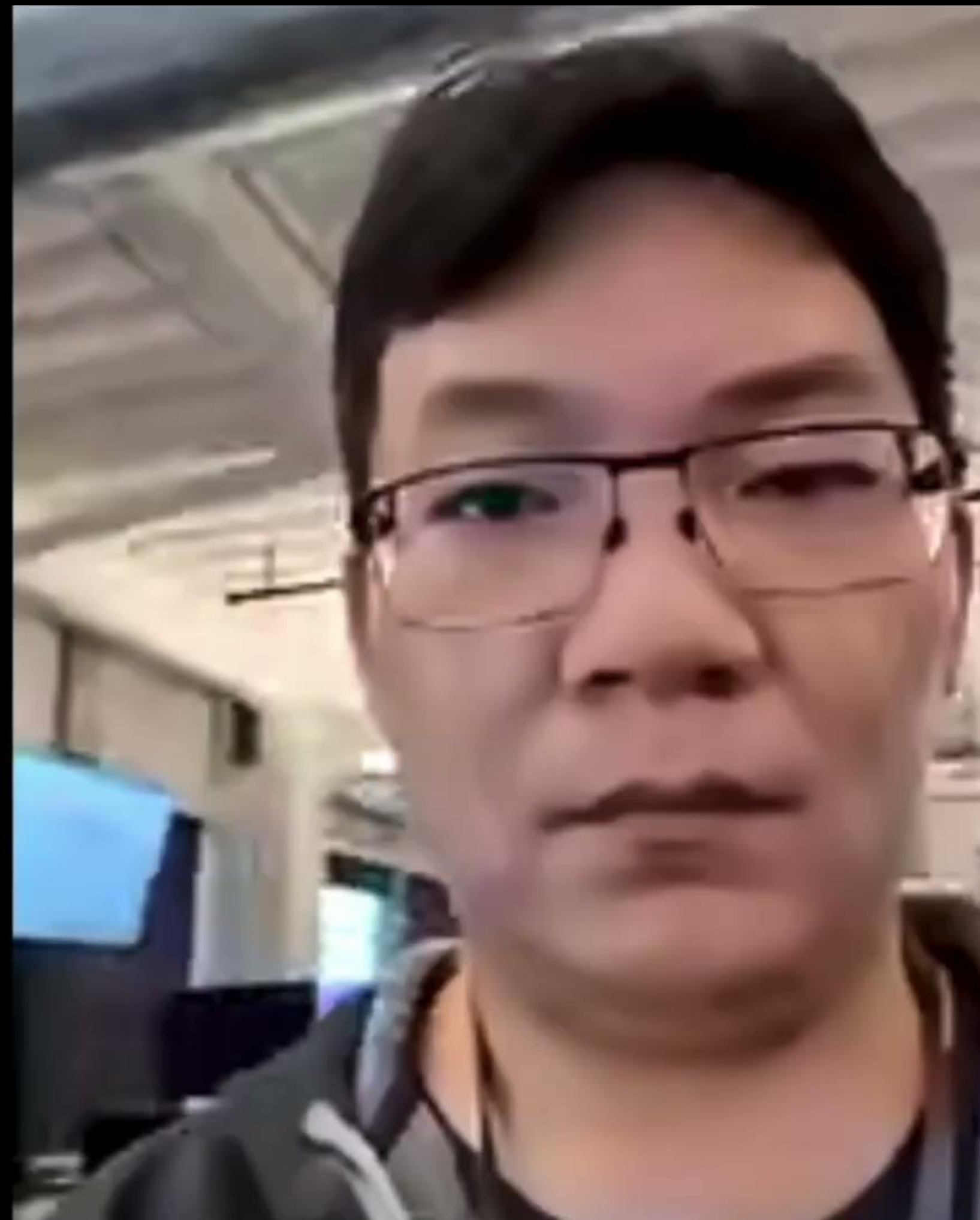**Low latency and freeze**

Low power consumption

AV1 P2P Call on Messenger

H264/AVC @100k

AV1 @100k

AV1 P2P Call on Messenger

H264/AVC @50k

AV1 @50k

Agenda

Launch AV1 on Large Scale RTC Apps

Challenges and Solutions
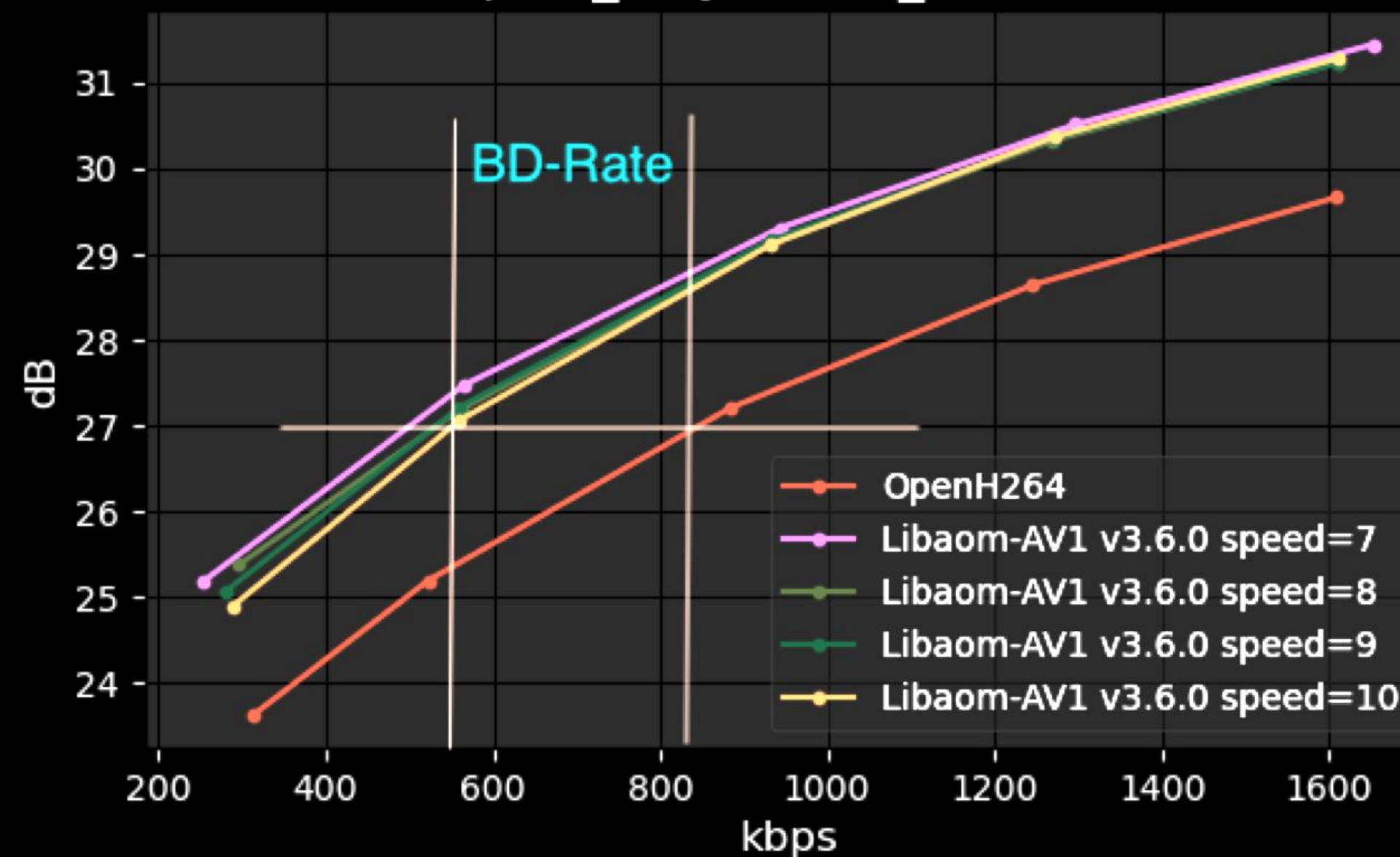
Conclusion / Takeaways

Launch AV1 on Large Scale RTC Apps
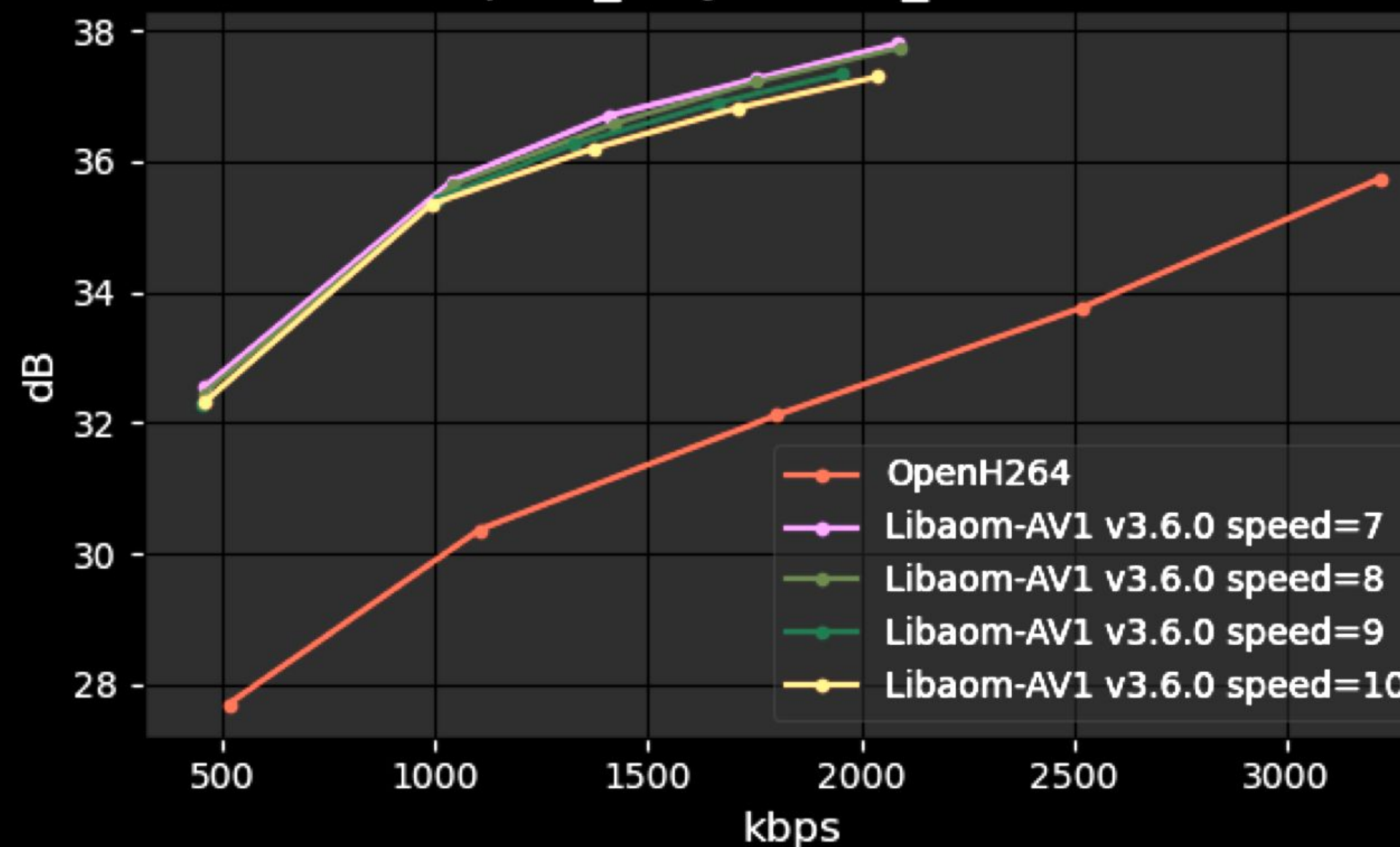
Quantitative Improvements

BD-Rate wins
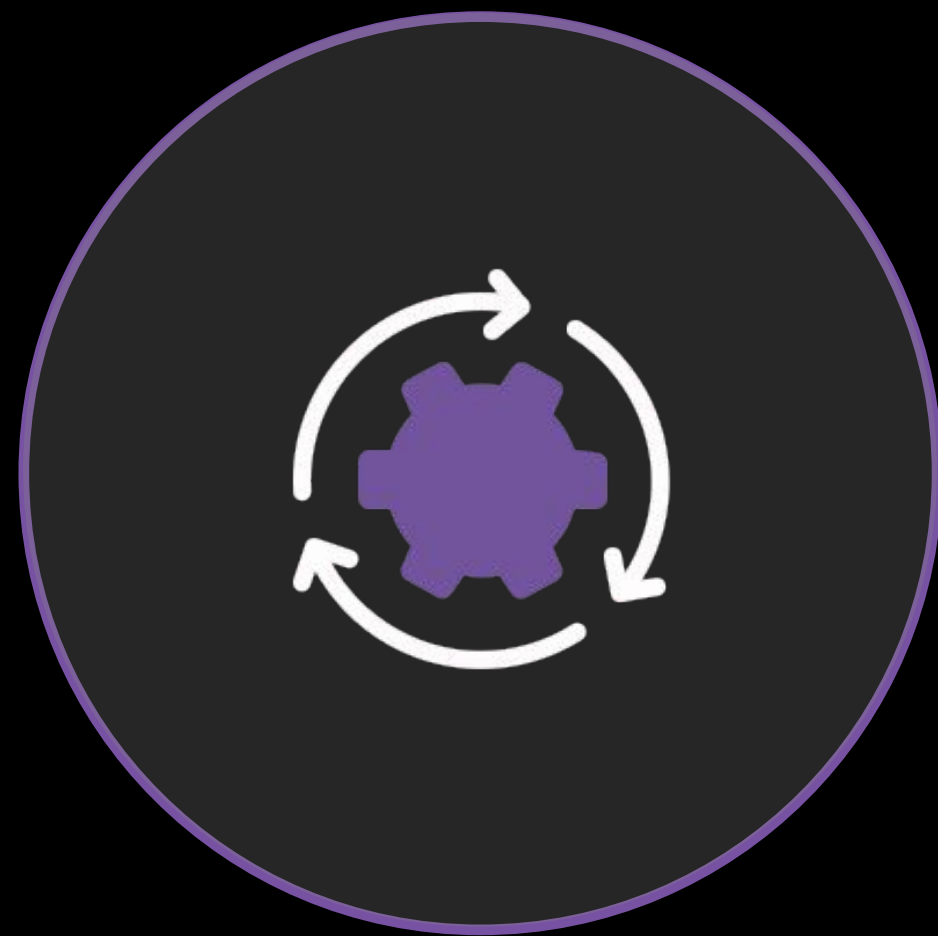
User feedback wins

rtc_WalkingInStreet_720x1280-15.yuv
psnr_a by actual_bitrate

screen_3342x2160-7.yuv
psnr_a by actual_bitrate

AV1 Wins in RTC

Better compression efficiency

Quickly adapt to the network during a call

Special RTC scenario, e.g., screen sharing

Challenges and Mitigations Desktop v.s. Mobile

Challenge 1: Binary Size Increase

AV1 support (libaom) will add more than 1 MB to your application, or more than 500 kB when compressed for distribution

Mitigation for Challenge 1: Binary Size Increase
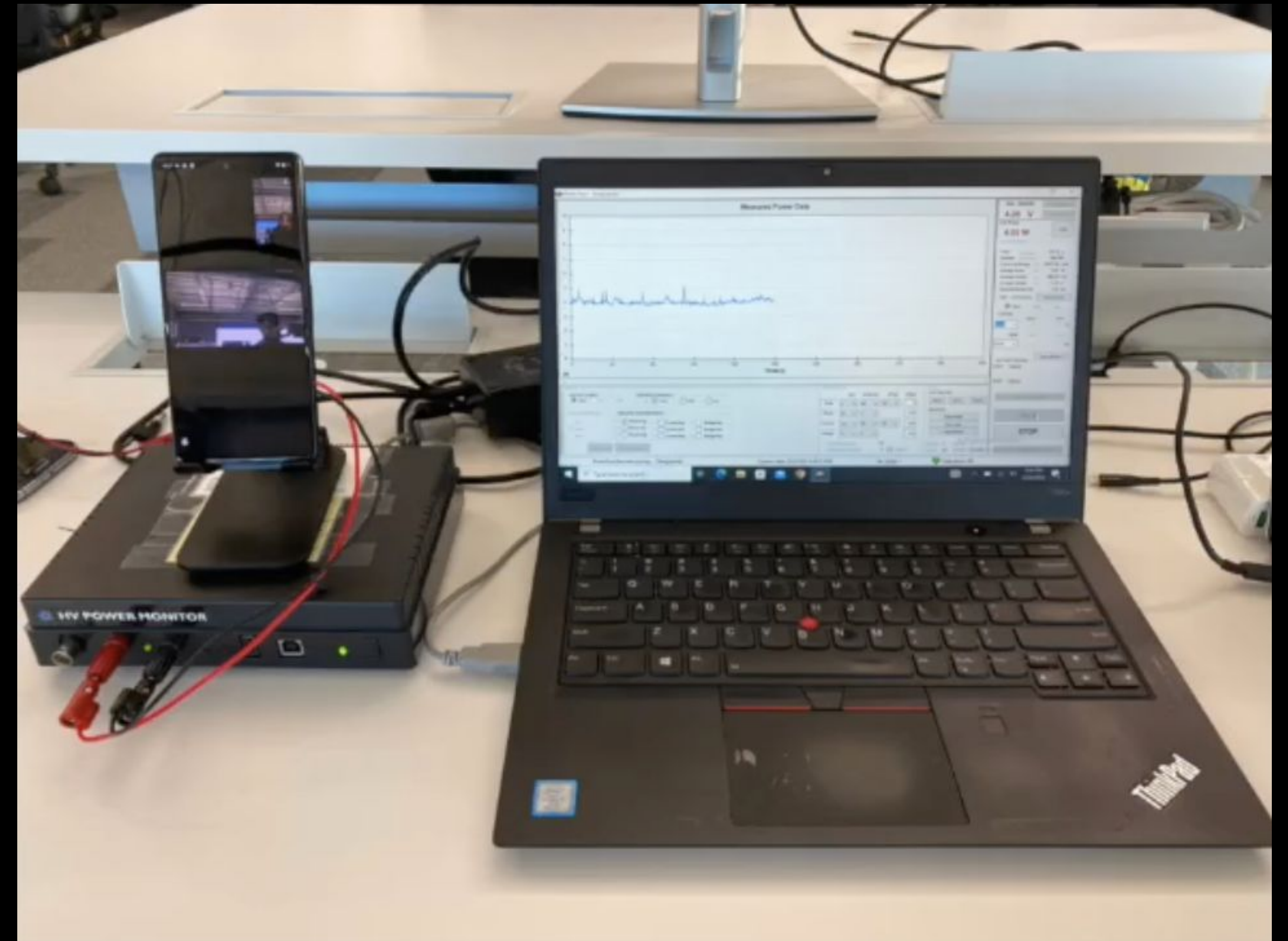
1   Dynamic download framework

2   Optimize library binary size : ~ 30k~60k reduction

3   System level optimization

Challenge for Increasing AV1 Coverage: More Power and More Memory Usage

Power increase (14%) compared with Openh264

Memory usage increase

Solution to Challenge 2: More Power and More Memory Usage

1 High-end device list
iPhone list is easy, but Android is challenging

2 Memory usage increase

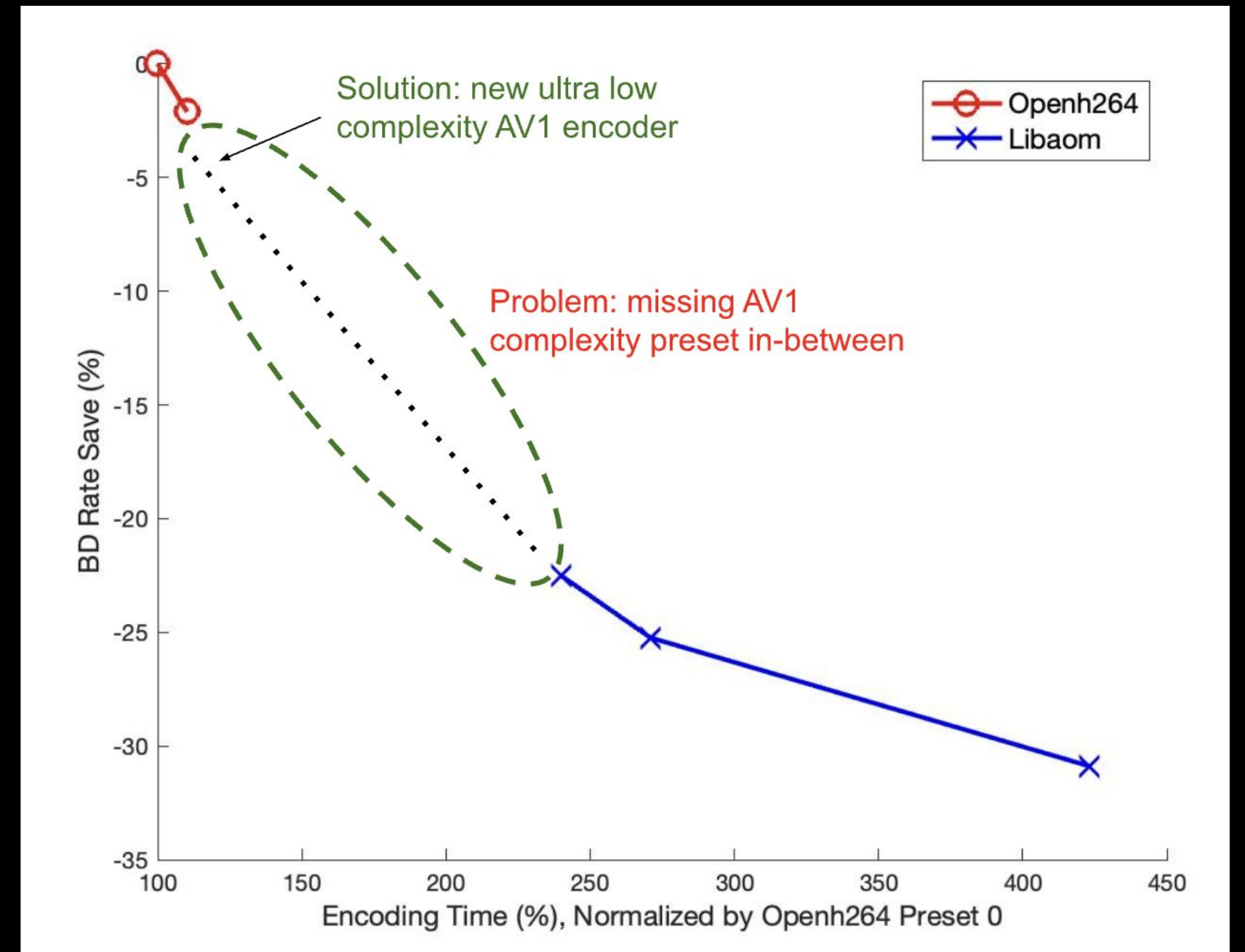**3** Codec switch based on rate/resolution/device heath measurement

AV1 Encoder Power Tests

Software Encoding

Encoder	Power
Openh264	100% (Anchor)
Libaom	114%

Hardware Encoding

Pixel 8 HW AV1	87%

Challenge 3 and Solutions:
AV1 Quality Optimization

1   CPU preset tuning

2   Rate control tuning

3   Resolution tuning and enabling RPR

4   Encoding algorithm optimization

5   System optimization (packetization, network resilience)

Conclusion / Takeaways

1 Good industry moment to adopt AV1 in RTC

2 Low complexity AV1 software encoder

3 Hardware AV1 encoder support is important

4 Potentially helpful hints for Improving next generation AOM codec

Get Involved!

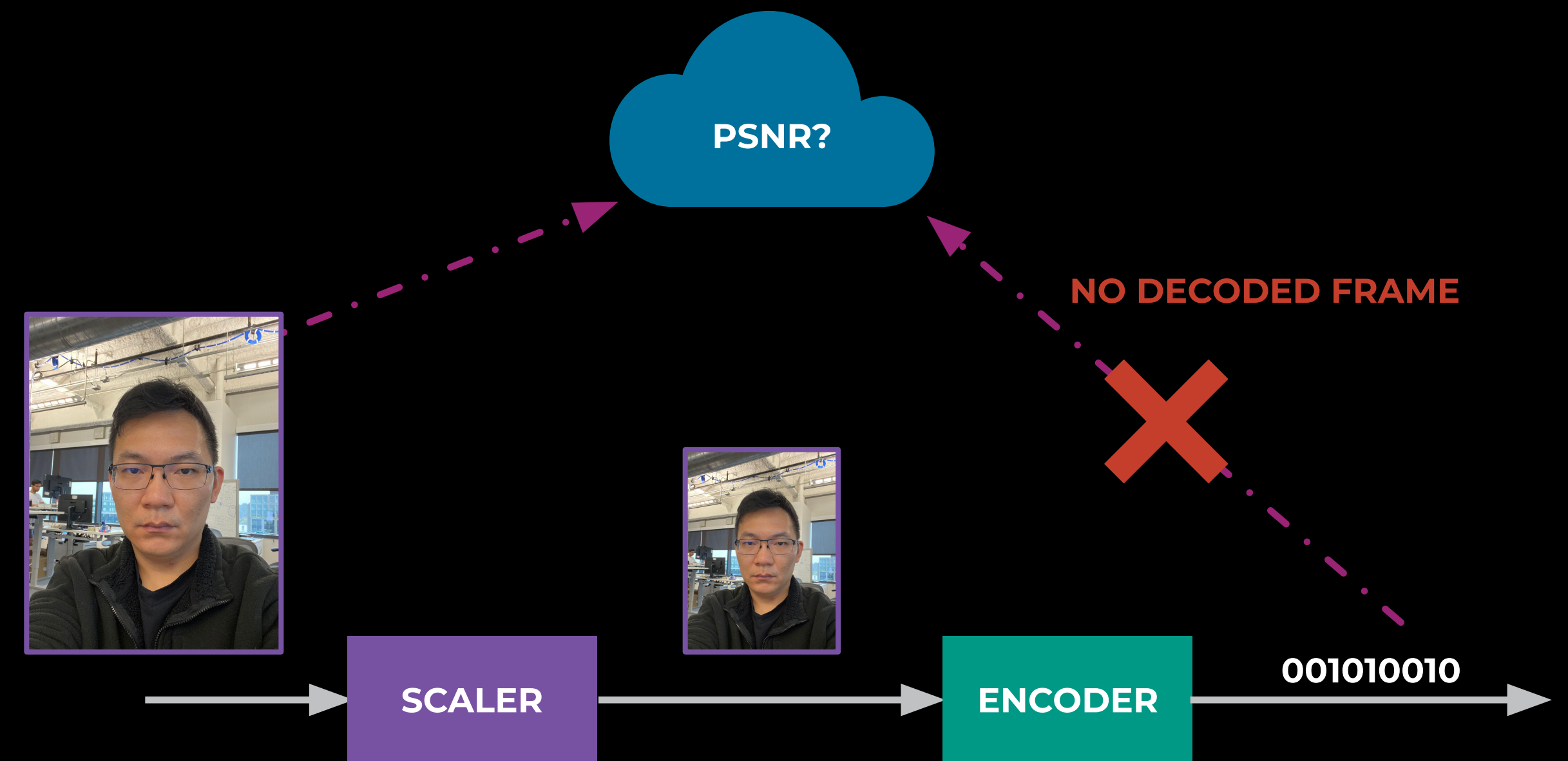📍 facebook.com/yuchen.sun

✉️ ycsun@meta.com

Thank you.

In-Product
Quality Measurement
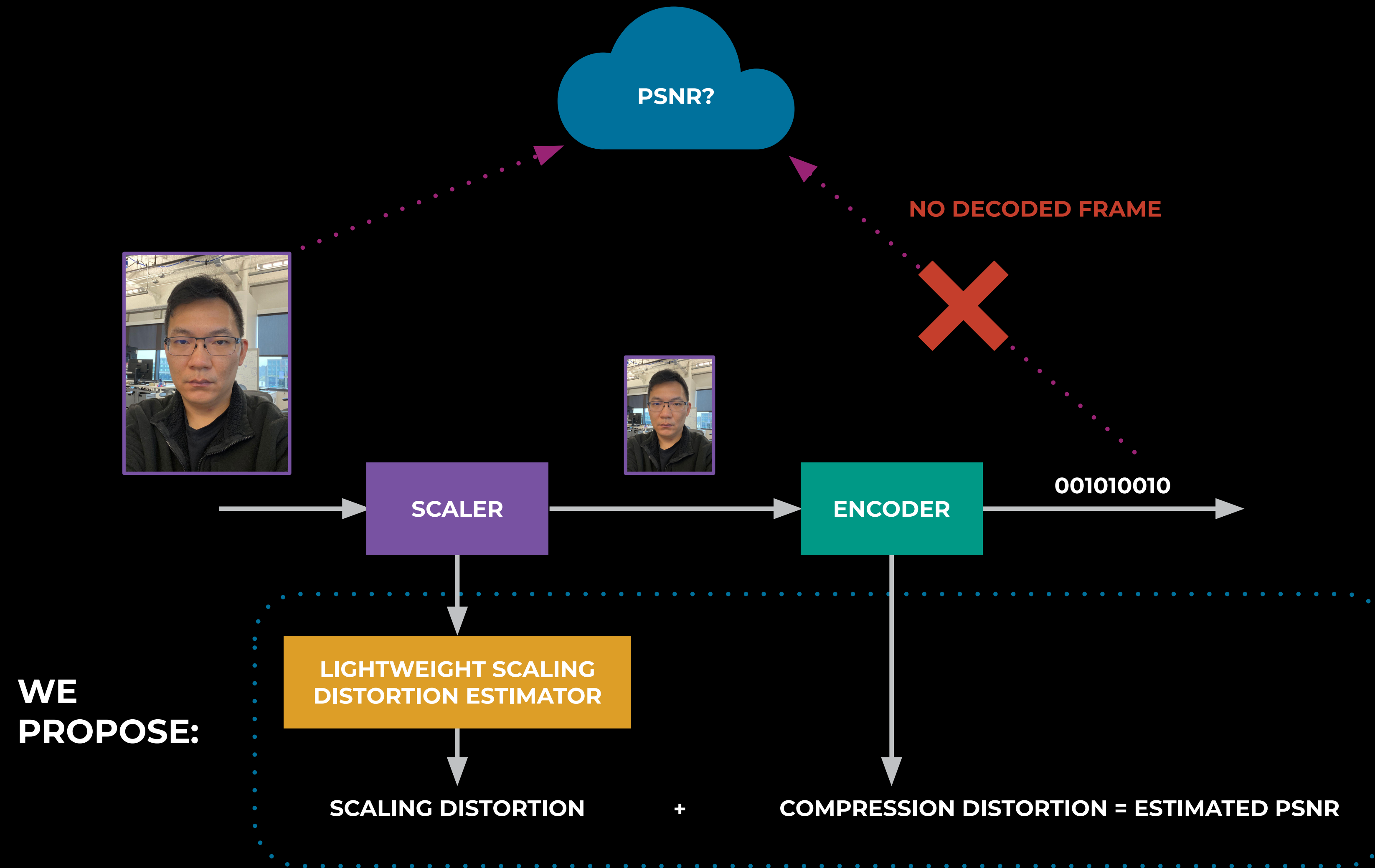
Challenge of In-product Quality Measurement

We need an in-product quality measurement

Low complexity

PSNR metric

Proposed In-product Quality Measurement

"Low-Complexity Video PSNR Measurement in Real-Time Communication Products" ICME2024

Meta is Looking for Collaboration

HW encoder coverage

- Apple recently announced the new PSNR API support on iOS 17.4+.

- We are looking for industry collaboration on adding this in the Android eco-system.

We are **preparing to contribute this method to WebRTC** and looking forward to collaboration opportunities

Conclusion / Takeaways

1   Good industry moment to adopt AV1 in RTC

2   In-product quality measurement is critical

3   Low complexity AV1 software encoder

4   Hardware AV1 encoder support is important

5   Potentially helpful hints for Improving next generation AOM codec