### Lesson of the Week



If you're using BD-Rate computations to estimate the real-world savings of adopting a new codec, you're wasting your time (and almost certainly reaching the wrong conclusion)

This lesson teaches you why

### Lesson: BD-Rate Stats: OK for Research; Bad for Application

- What BD-Rate computations are
- How they are used
- Why it fails in real world applications
- Weighted average computations the best alternative

## This Lesson is Included in Two SLC Courses





bit.ly/slc\_courses

# Bjontegaard Functions (BD-Rate)

- Quantifies differences between two curves
  - BD-Rate data rate saving for the same quality



bit.ly/NF\_codec\_comp

## The Problem with BD-Rate Computations





- Some of the bitrate ranges are far higher or lower than typically deployed by actual producers
- Usually computed on 4 full-resolution encodes, not a real encoding ladder
- They measure "savings" without considering the frequency at which each rung actually plays

# Actual Savings Depend Upon Usage

- How much bandwidth do you save delivering HEVC to mobile viewers in ladder A rather than H.264?
  - Very little:
    - H.264 might be 3.29 Mbps 720p stream
    - HEVC would be 3.29 Mbps 1080p stream
    - Quality higher, but no bitrate savings
- How much bandwidth do you save delivering HEVC to TV viewers in ladder B rather than H.264?
  - The difference between the bitrates of the top rungs

#### Ladder A: Mobile

Device type	Usage [%]	Average bandwidth [Mbps]
PC	0.004	7.5654
Mobile	94.321	3.2916
Tablet	5.514	3.8922
TV	0.161	5.4374
All devices	100	3.3283

#### Ladder B: IPTV

Device type	Usage [%]	Average bandwidth [Mbps]		
PC	0.0	N/A		
Mobile	0.0	N/A		
Tablet	0.0	N/A		
TV	100	35.7736		
All devices	100	35.7736		

## Recent Consulting Project (Live, 25i to 50p)



deliver

## Suggested Approach – Weighted Average Savings

Compute weighted average delivery bitrate and average VMAF score using actual usage stats with <u>current codec</u>

H.264	Bitrate	VMAF	Usage	Weighted Bitrate	Weighted VMAF
	145,000	21.50	2%	2,900	0.43
	365,000	52.52	3%	10,950	1.58
	730,000	69.10	5%	36,500	3.46
	1,100,000	80.61	5%	55,000	4.03
	2,000,000	88.02	5%	100,000	4.40
	3,000,000	92.89	10%	300,000	9.29
	4,500,000	95.06	10%	450,000	9.51
	6,000,000	96.99	20%	1,200,000	19.40
	7,800,000	97.71	40%	3,120,000	39.09
Average			100%	5,275,350	91.17

2 Compute weighted average delivery bitrate and average VMAF score using actual usage stats with <u>new codec</u>

HEVC	Bitrate	VMAF	Usage	Weighted Bitrate	Weighted VMAF
	145,000	26.56	2%	2,900	0.53
	365,000	65.12	3%	10,950	1.95
	730,000	78.45	5%	36,500	3.92
	1,100,000	87.32	5%	55,000	4.37
	2,000,000	92.94	5%	100,000	4.65
	3,000,000	95.86	10%	300,000	9.59
	4,500,000	97.53	10%	450,000	9.75
	4,500,000	97.53	20%	900,000	19.51
	4,500,000	97.53	40%	1.800.000	39.01
Average			100%	3,655,350	93.28
			i	30.71%	2.11

Bitrate savings

VMAF boost

## **Bottom Line**

- BD-Rate stats are useful for codec research
- Your actual savings will vary significantly depending upon your encoding ladder and consumption patterns
- For the most accurate measure of the benefits of a new codec, use weighted average computations