Understanding the Impact of Video Quality on User Engagement

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CONVIVA® intel CONVIVA®

2005: Beginning of Internet Video Era

100M streams first year

Premium Sports Webcast on Line

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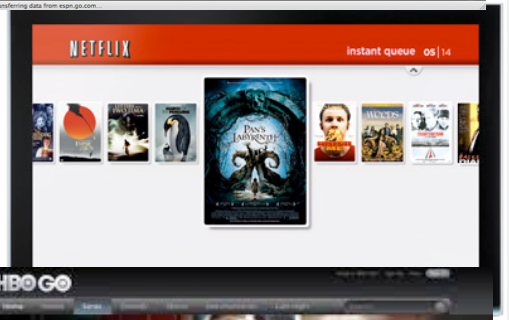
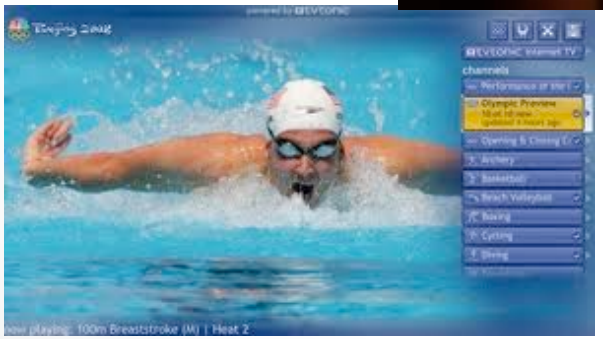
2006 – 2011: Internet Video Going Prime Time





2006 2007 2008 2009 2010 2011

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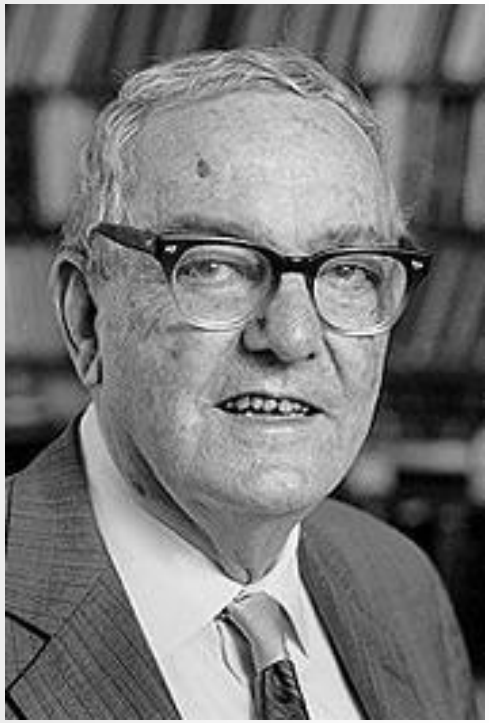
Herb Simon Attention Economics



Overabundance of information implies a scarcity of user attention!

Onus on content publishers to *increase engagement*

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What Impacts Engagement?

What is understood:

Content & Personal Taste

Impact significantly

What is NOT Understood: how much does quality matter?

"Compelling Content, even fuzzy, can capture the attention of the world"

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Given the same video (content), Does Quality Impact Engagement?

- What are the most critical metrics?
- Do these critical metrics differ across genres?
- How much does optimizing a metric help?

Overview of the Paper

Empirical study of video quality vs. engagement

- A week of data from multiple premium video sites &
  - Full census measurement from video player
- Three genres: Live, LVoD, SVoD
- Five quality metrics
  - Buffering Ratio
  - Rate of Buffering
  - Join time
  - Rendering Quality
  - Average Bit Rate
- Two granularities: view/viewers

Highlights of Results

- Quality has substantial impact on engagement
- Buffering ratio is most critical across genres
  - Highest impact for live:
    1% increase in buffering reduces 3min play time
- Bitrate and Buffering Rate also important for live
- Join time impacts engagement at viewer level but not view level
- Many interesting dependencies
  - Need context , multiple “lenses” to extract dependencies

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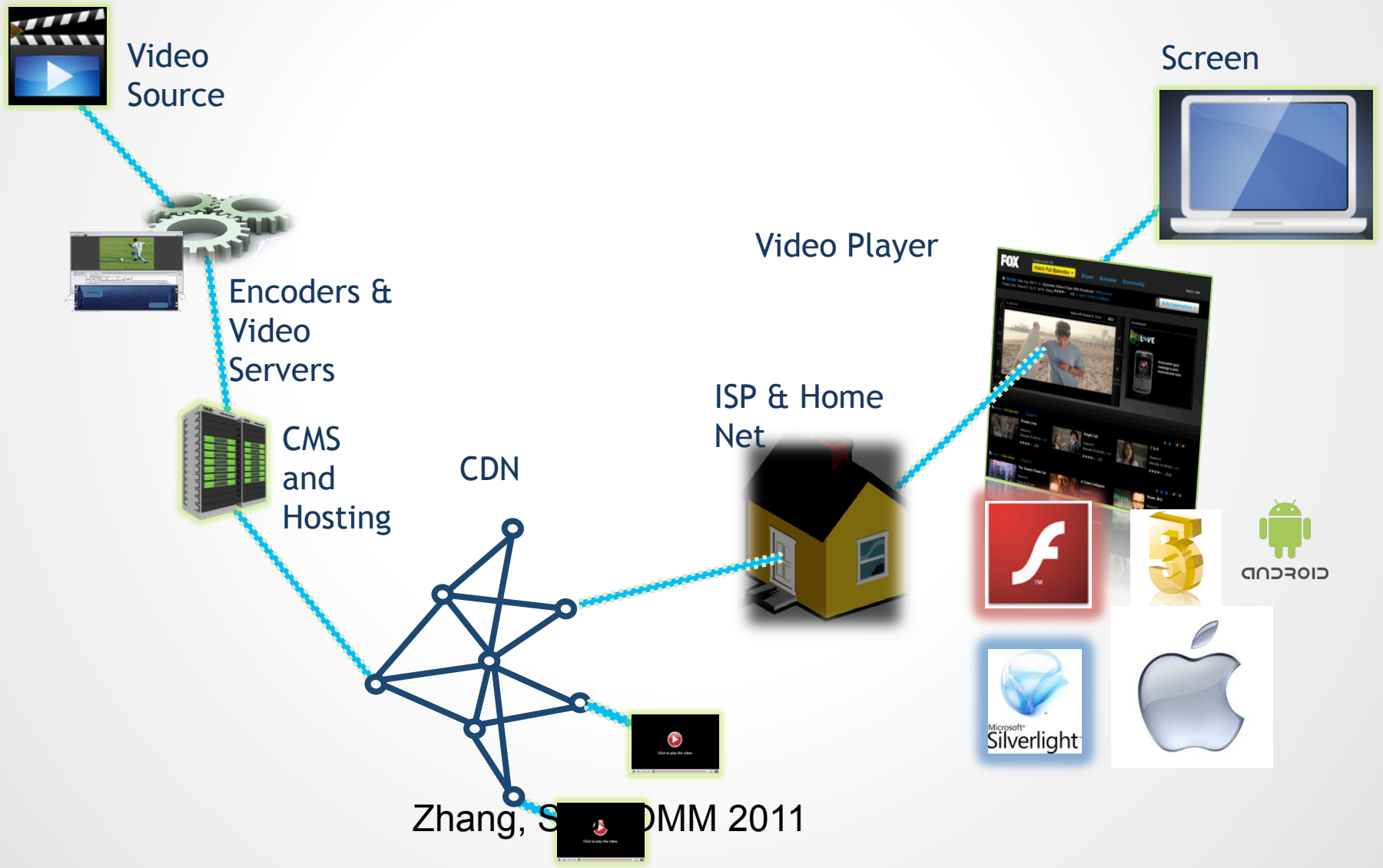
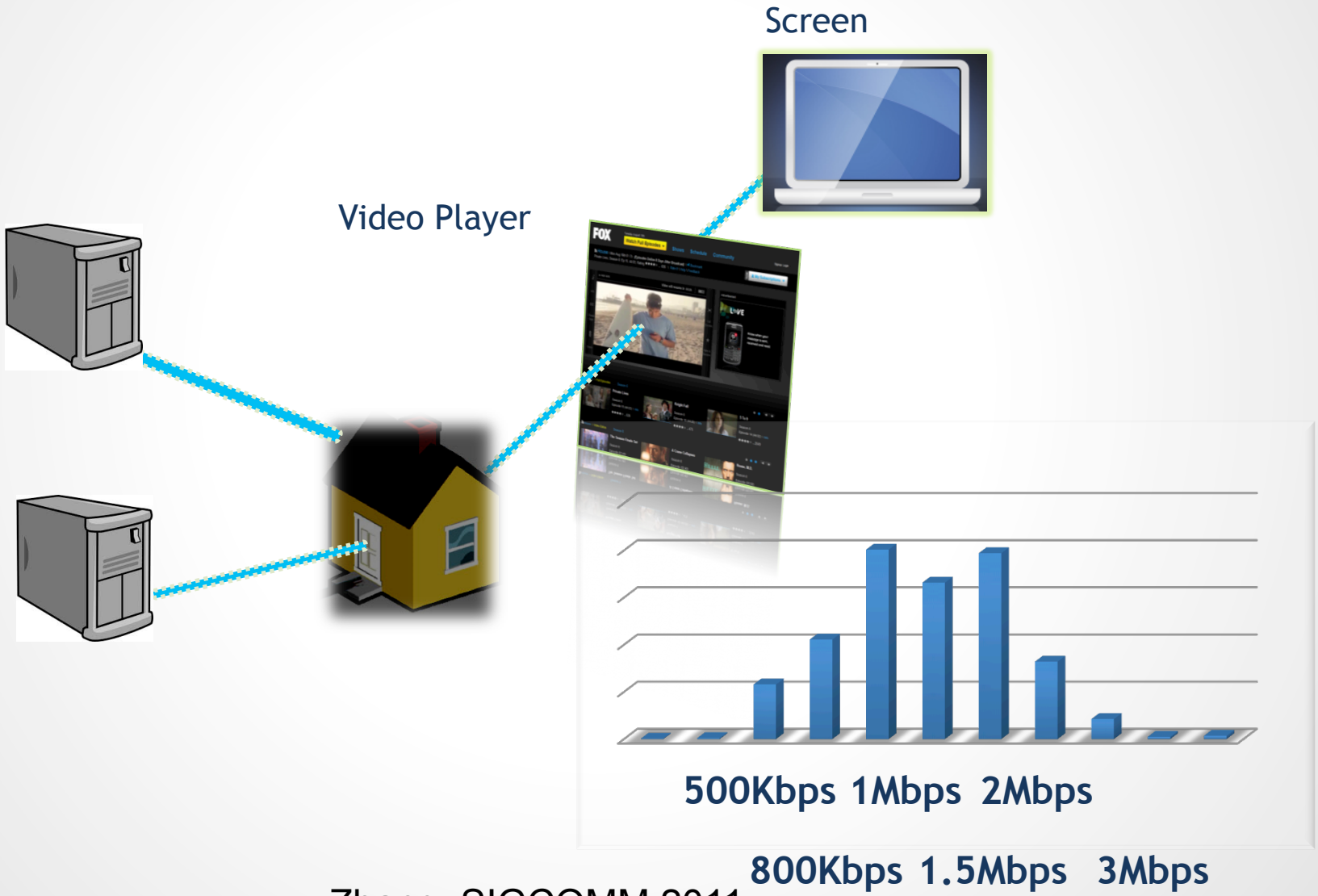
Outline

- Introduction
- Dataset and setup
- Selected results
- Concluding remarks

Internet Video Eco-System Today:



Adaptive Multi-Bit Rate & Multiple Servers For the Same Stream



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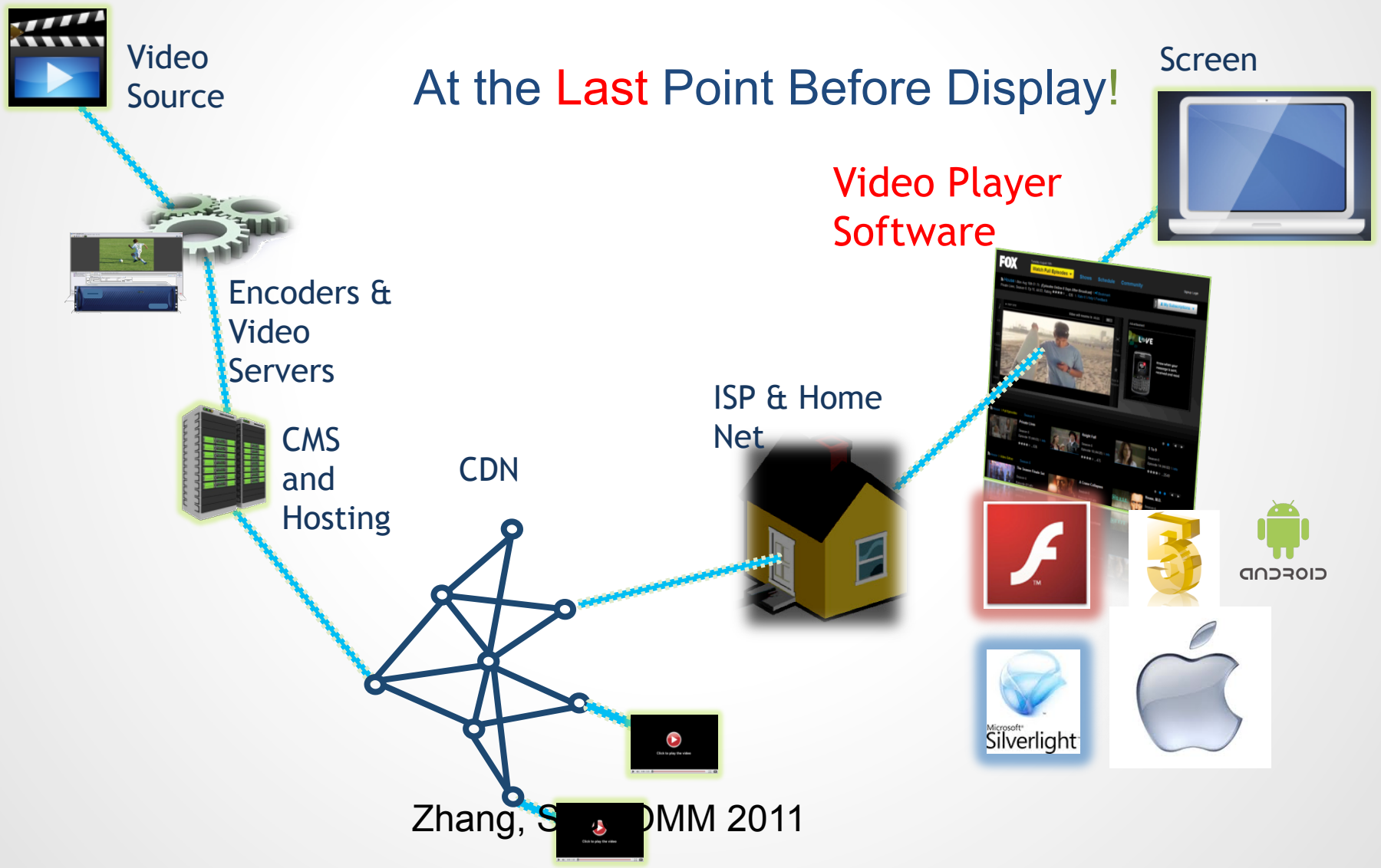
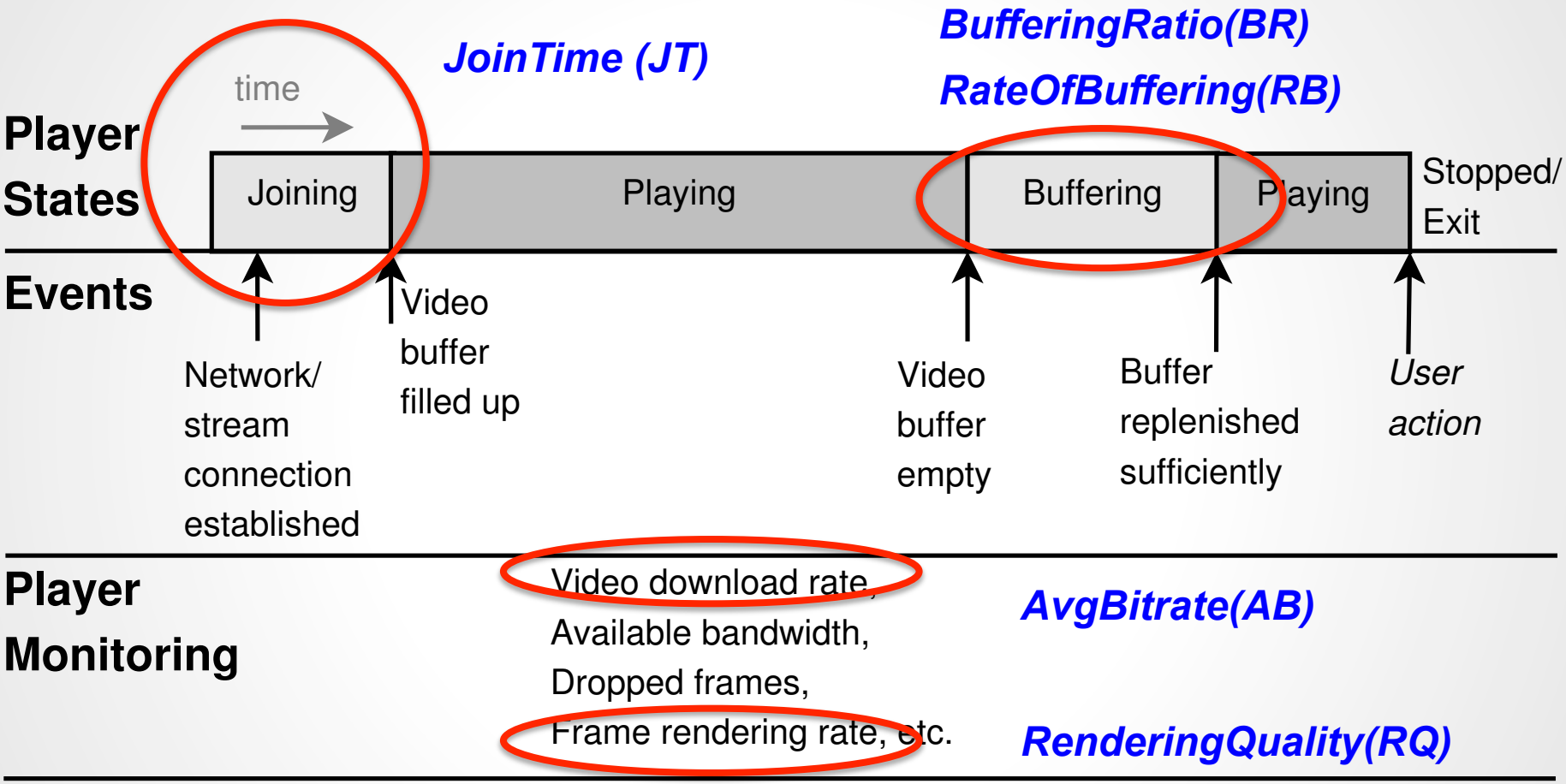
Where to Measure Video Quality?



Video Player Instrumentation



Quality Parameters NOT Available in ISP or CDN

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Engagement Metrics

- View-level
  - Play time of a video session
- Viewer-level
  - Total play time by a viewer in a period of time
  - Total number of views by a viewer in a period of time

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Content Genres

One week of data in Fall 2010 + FIFA world cup

	Dataset	# videos	# viewers (100K)
2-5 mins e.g., trailers	SVoDA	43	4.3
	SVoDB	53	1.9
35-60 mins TV episodes	LVoDA	115	8.2
	LVoDB	87	4.9
Live sports	LiveA	107	4.5
	LiveB	194	0.8
	FIFA	3	29

Premium content providers in US

Diverse platforms and optimizations

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High-level questions & Analysis Techniques

Which metrics matter most? → (Binned) Kendall correlation

Are metrics independent? → Information gain

How do we quantify the impact? →Linear regression

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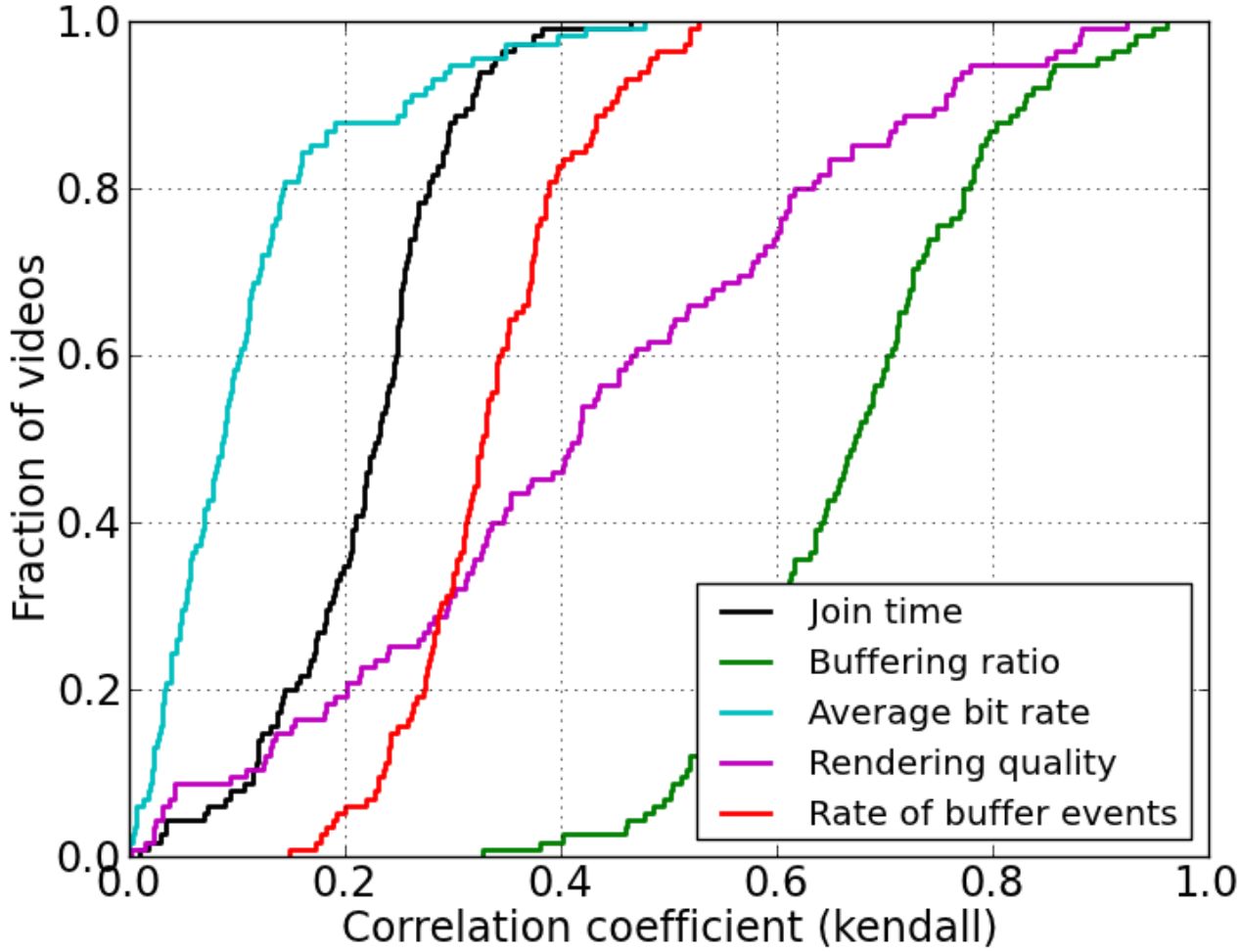
LVoD at View Level



Buffering Ratio correlates with engagement the most

Bit Rate and **Join Time** not much**?**

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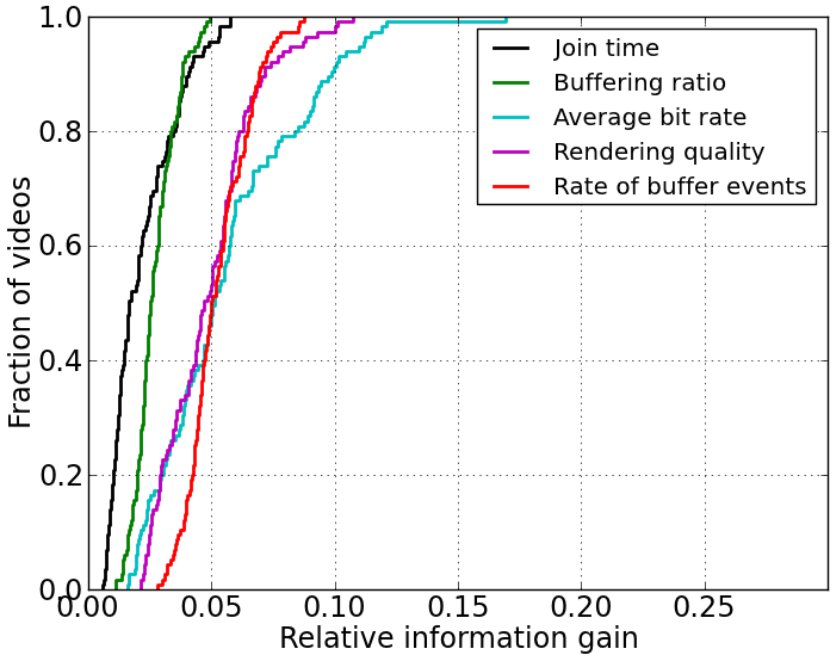
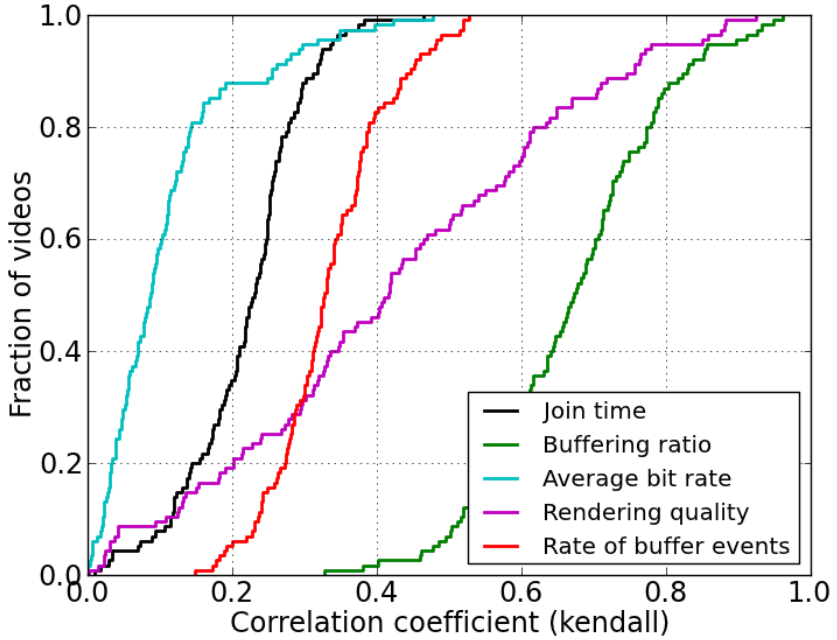
Seeing the World via Two Lenses: (LVoD View level)

Information Gain



Bit Rate Gain High

Correlation



Bit Rate Correlation Low

Why the Difference?

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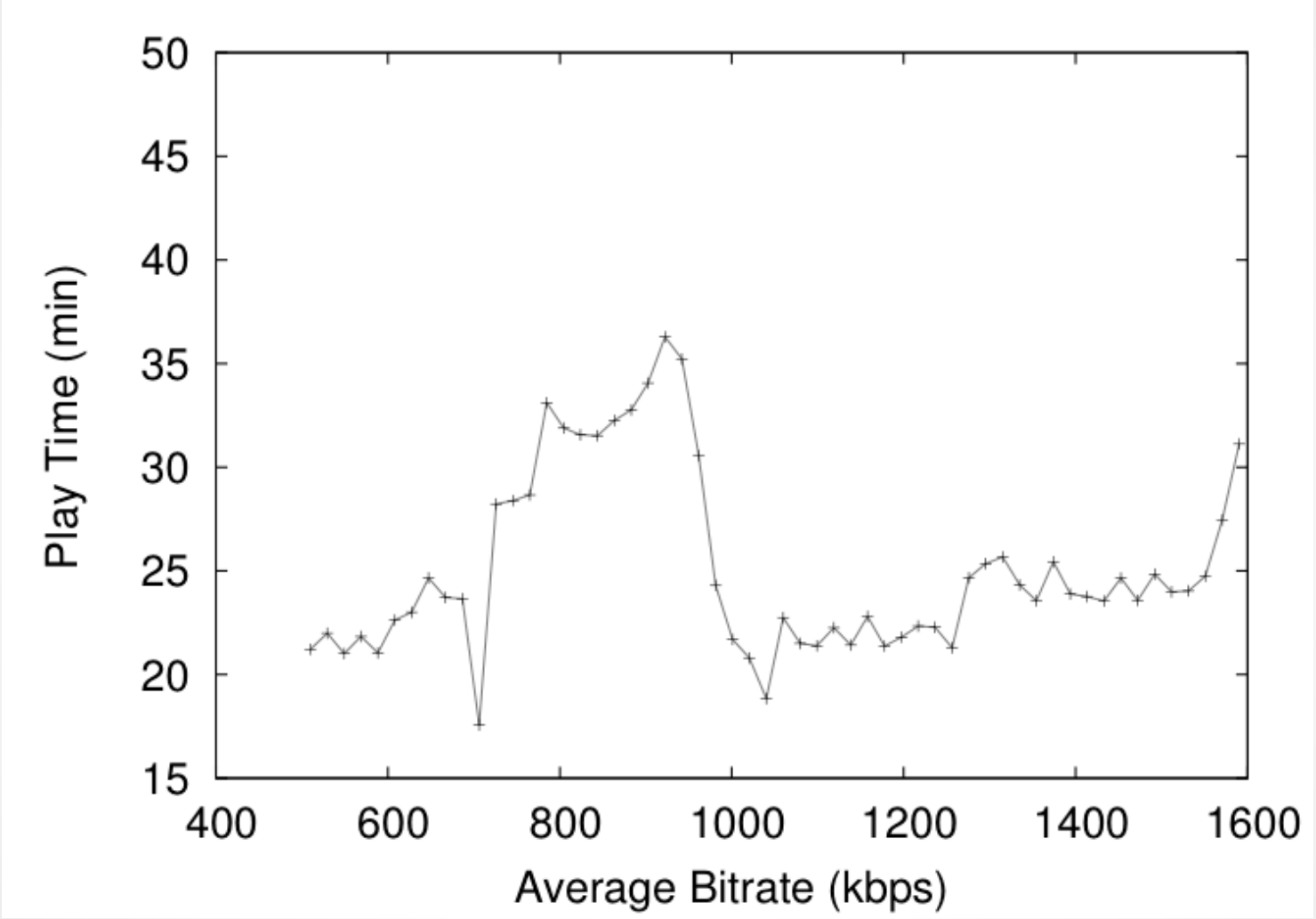
Engagement vs. Bit Rate for LVoD View Level



Non-monotone → Low Correlation

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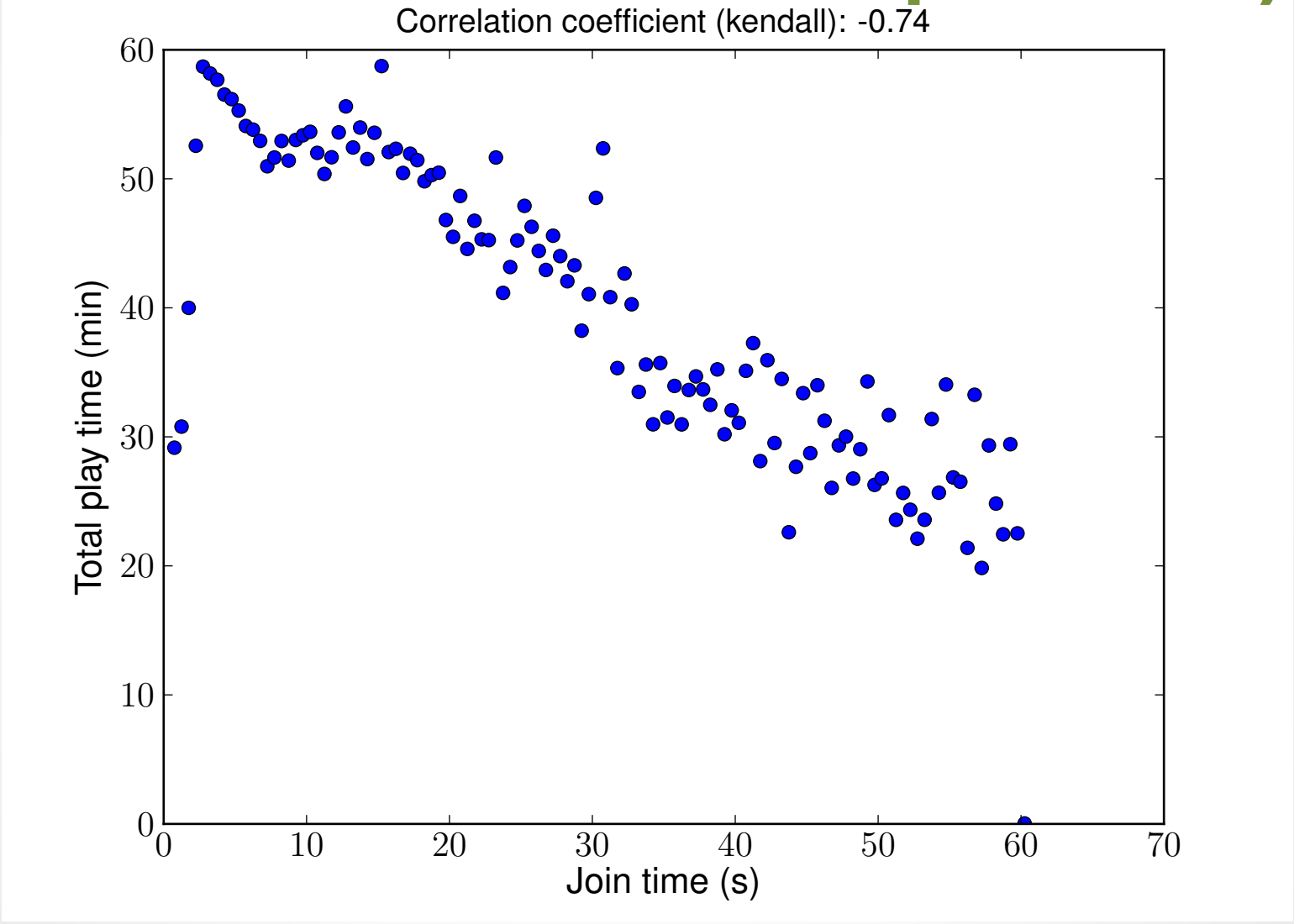
Join Time Analysis at Viewer Level (same viewer across multiple views)



Join time is critical for user retention

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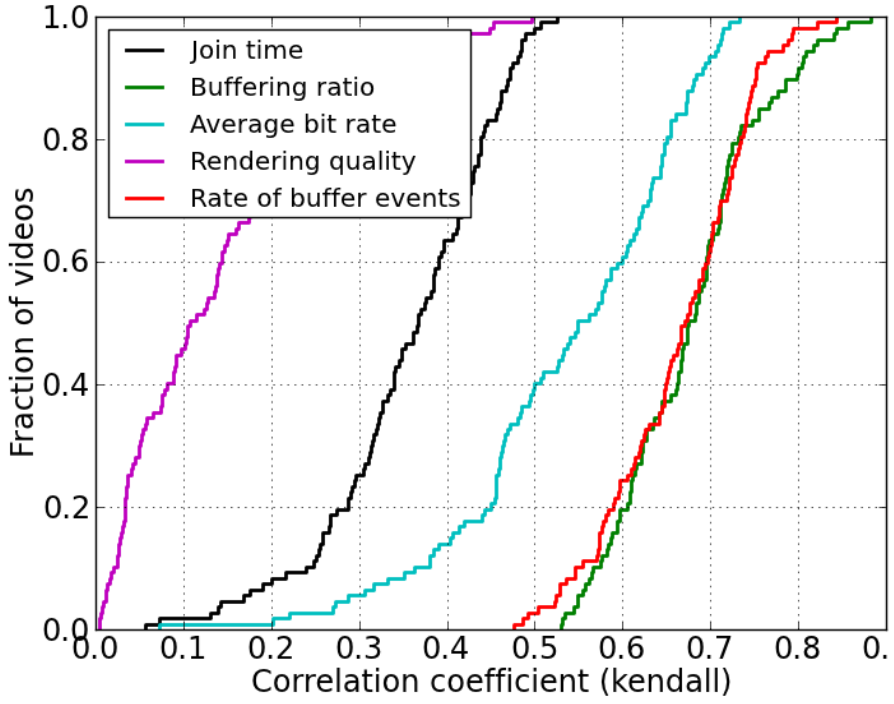
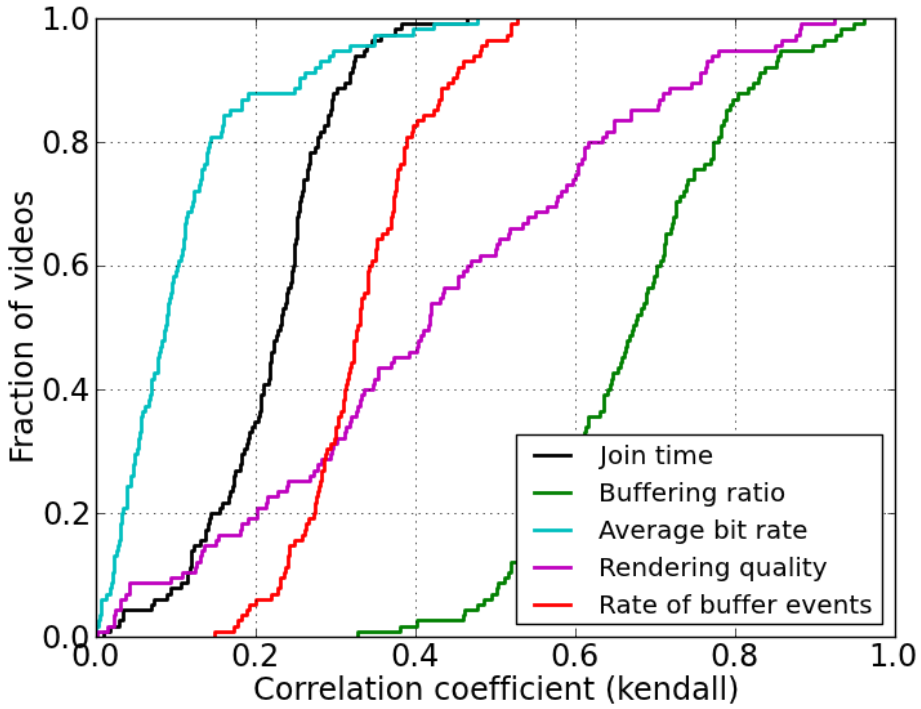
View Level

Live vs LVoD





Buffering Ratio remains the most significant

Bitrate and Rate of Buffering matter much more

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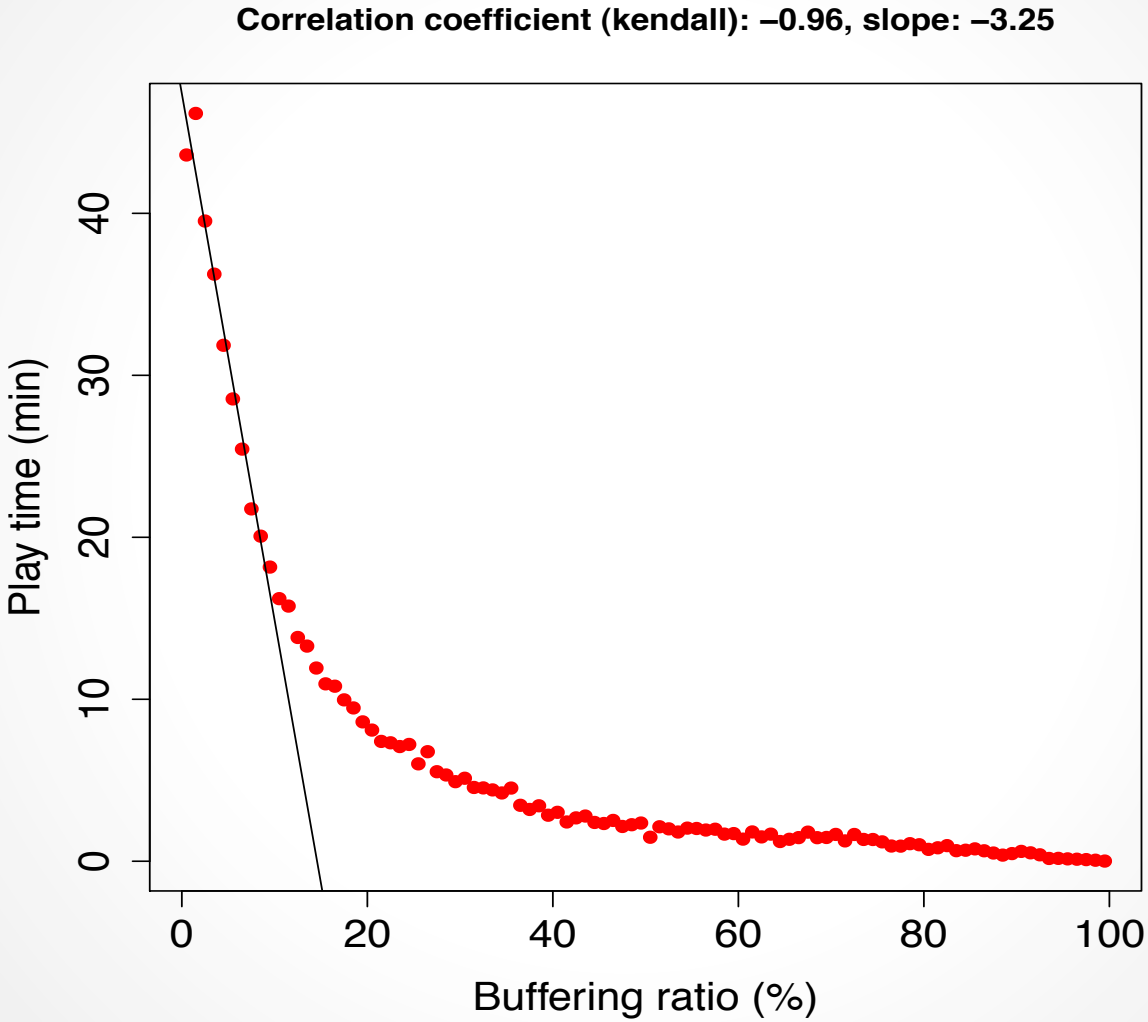
Quantitative Impact:



1% increase in buffering reduces engagement by 3 minutes

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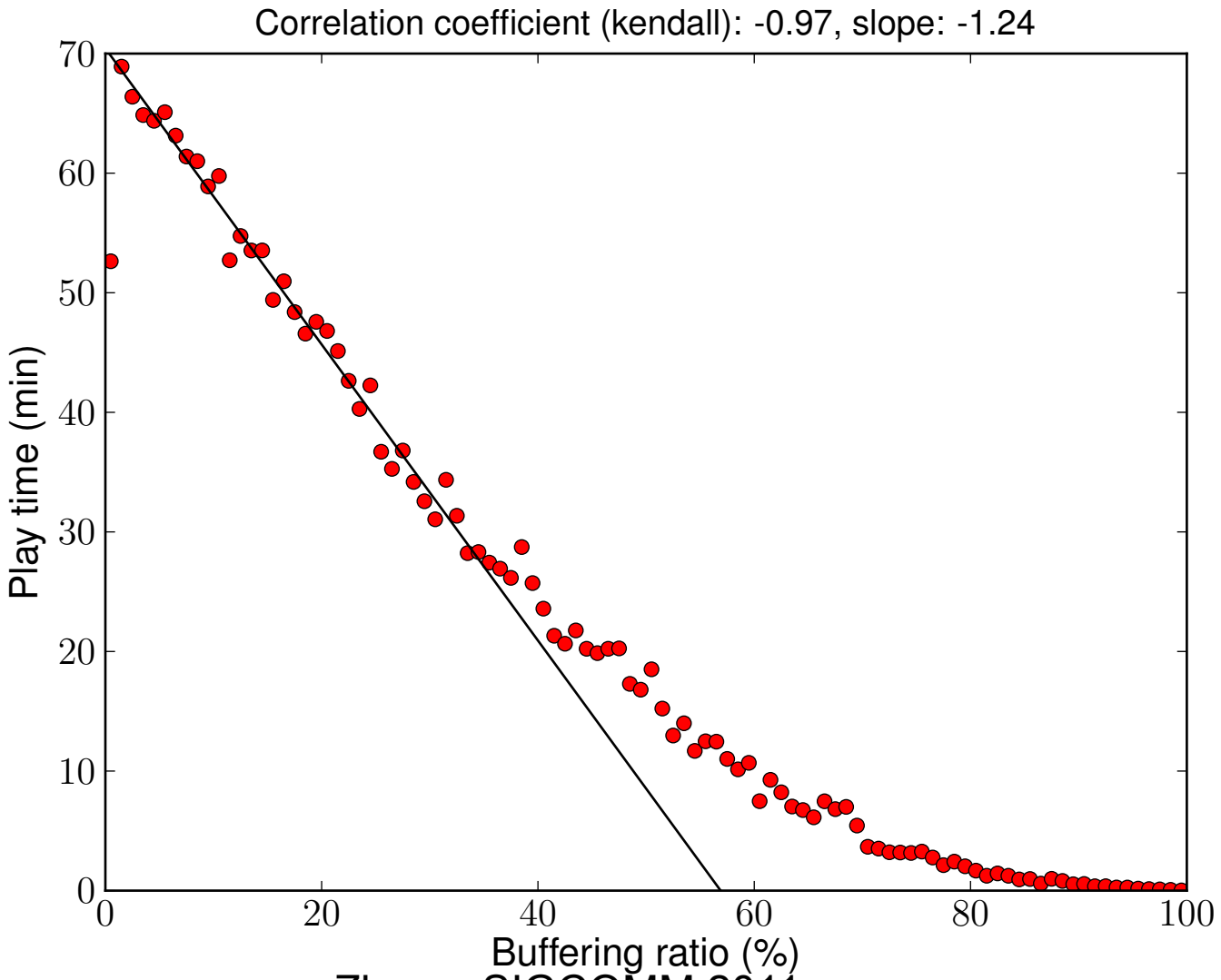
LVod Viewer level
Play Time vs. Buffering Ratio:



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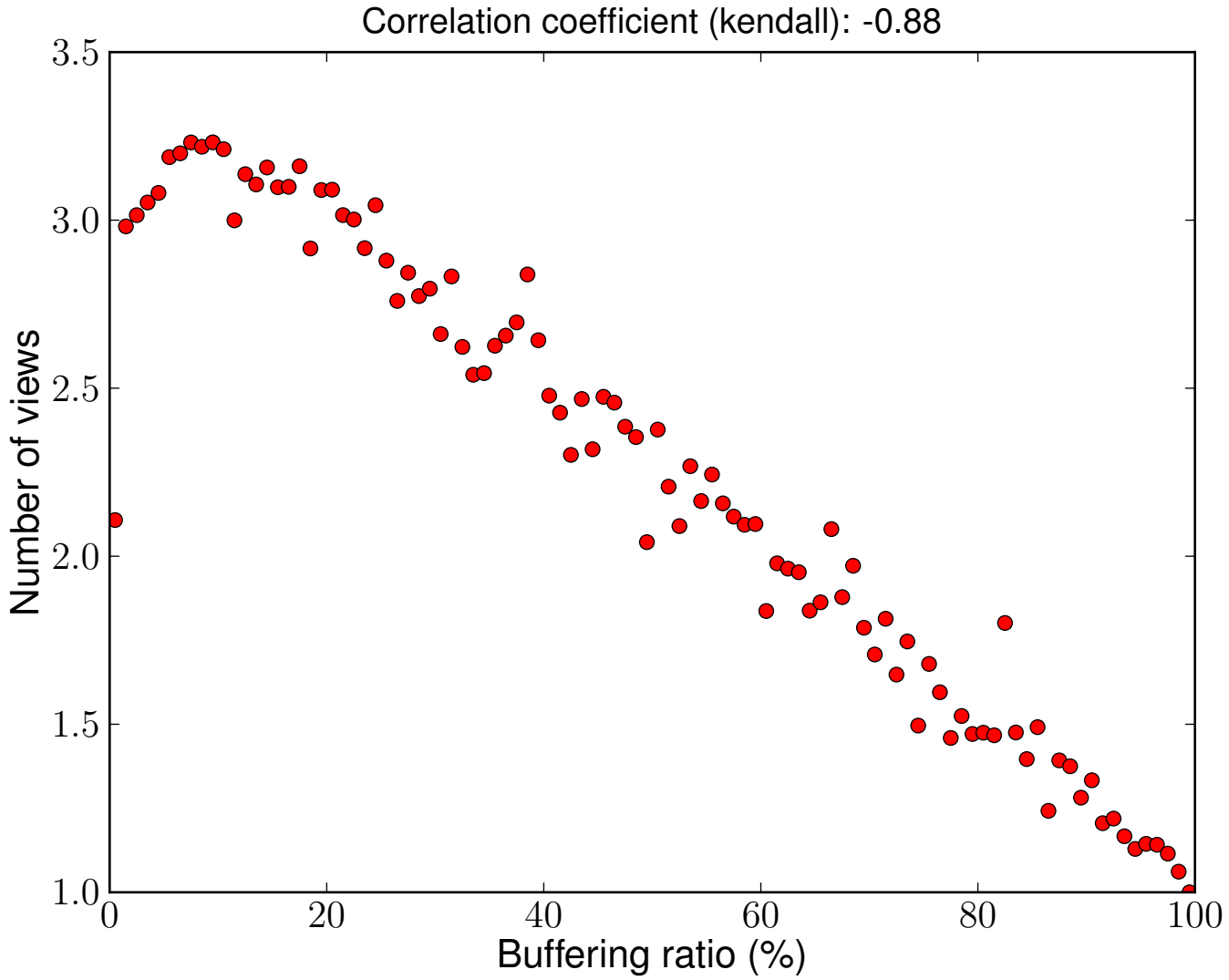
LVoD Viewer level # of Views vs Buffering Ratio:



Low Buffering Ratio Is Good for Viewer Retention

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Concluding Remarks

- First empirical analysis of video quality vs. engagement
  - 100% coverage measured at video player
  - Across sites, genres, metrics, granularity of engagement
- Video quality does impact engagement
  - Buffering ratio most important metric
  - Live video engagement even more sensitive to quality
  - Need to look at both viewer and view level engagement impact
- Video quality presents opportunity and challenge
  - Follow the traffic: 60% Internet traffic today, will be more than 95% in near future → elephants will stepping on each other's toes!
  - Premium video will be consumed via lean back experience on big screens → zero tolerance for poor quality?

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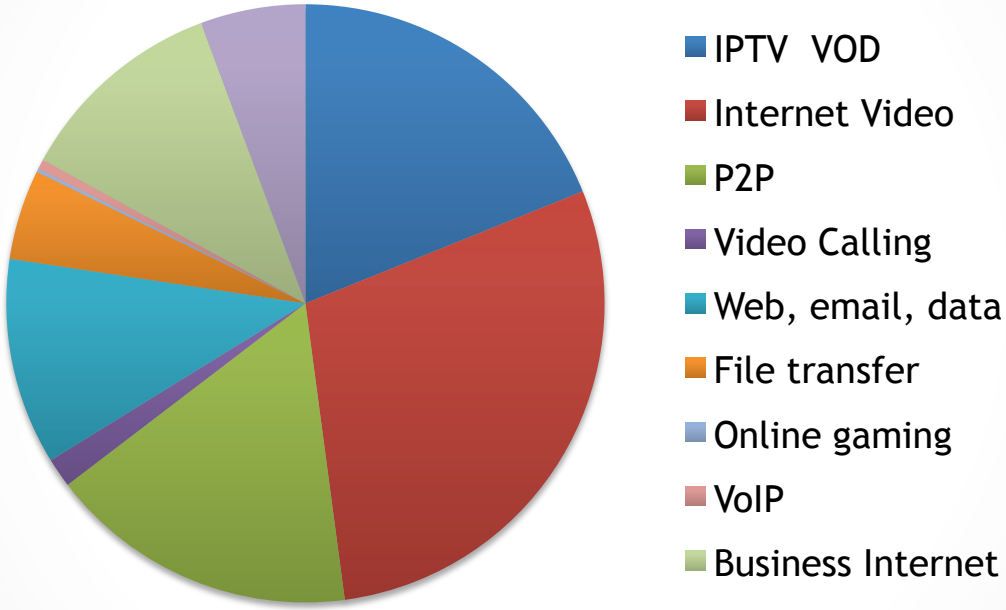
2011 Internet Traffic Distribution



66% Internet Traffic is Video

Source: Akamai

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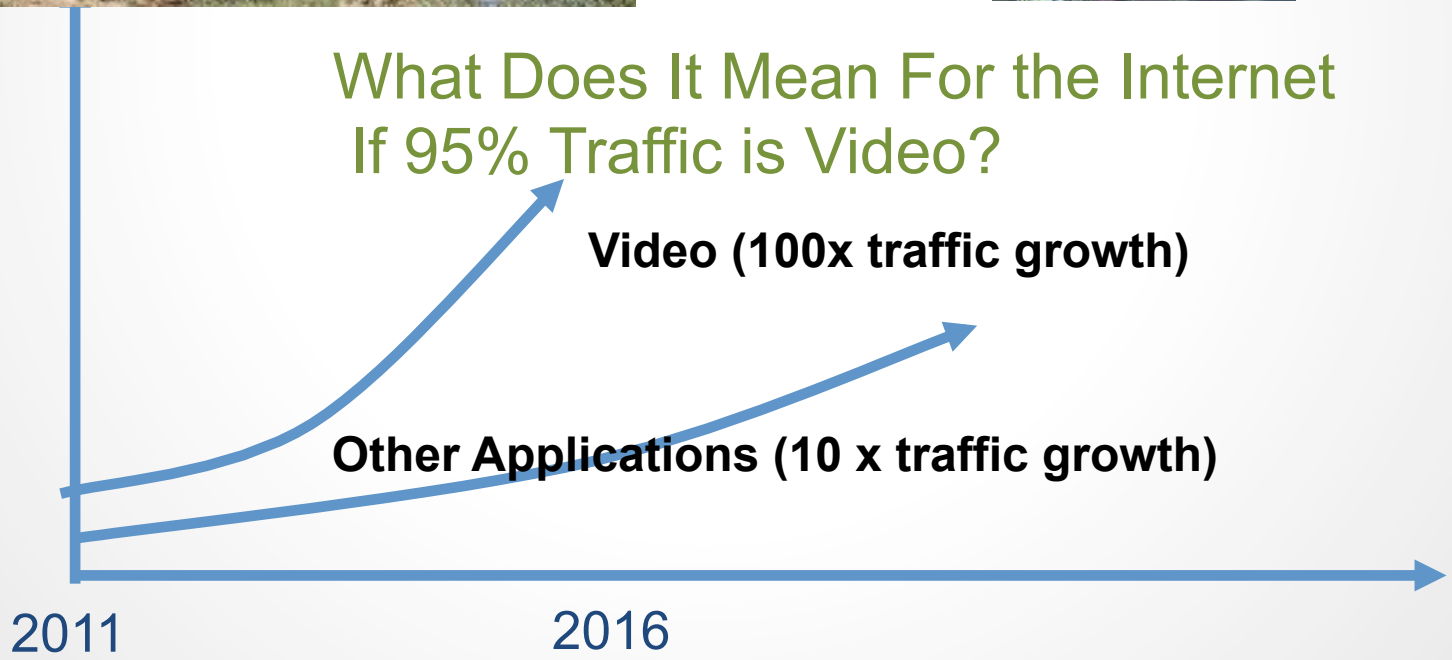
2011 and Beyond: A World Full of Elephants



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