LIVE STREAMING SURVEY

NOVEMBER 2022

QWILT | REPORT

Given the growing number of major live events being streamed – from sports to concerts to significant world news developments – this perspective from content publishers gives us valuable insight into these massive shared experiences, and the way in which the issues of peak viewing and scale will be addressed.

Executive Summary

BUILDING A LIVE STREAMING EVENT FOR 10M VIEWERS

Qwilt conducted a survey of content publishers in conjunction with a well-know streaming industry analyst in which they were presented with the task of running a live streaming event for an audience of 10 million viewers. Over 300 responses to the 12 questions covering requirements for this event are summarized in this report.

Key takeaways:

1. **It's all about CDN capacity and performance.** The greatest concerns for event success mentioned by a majority of content publishers are securing sufficient CDN delivery capacity ahead of the event and CDN performance during the event.

2. **At least 50 Tbps of capacity is needed at peak.** This is a huge event in terms of expected capacity needed for success. When taking into account a safety margin for peak traffic, the total capacity rises to 65 Tbps.

3. **Multiple CDNs and solid load balancing required.** Given the capacity needed and concerns about CDN performance, at least four or more CDNs would be required along with a load balancing system that can route traffic in real time based on QoE, reserve capacity and Geo.

4. **QoE metrics and measurement are critical.** 'Exits before video starts' and 'average bit rate' are the top two metrics used to evaluate QoE, but several other metrics would also be tracked and reported for a complete understanding. QoE measurement is conducted using in-house client data, third-party QoE platforms and data from CDN providers.

5. **New technology may play a role.** There is interest in multicast ABR and ATSC 3.0 to support an event of this scale.

6. **Overall event success captured in two KPIs.** When asked about the KPIs that assess overall event success, the responses focused in on just two – 'average bit rate delivered' and 'average minute audience or AMA.'

SURVEY SET UP

Live Streaming of a Major Sports Event

ASSIGNMENT TO RESPONDENTS

You are planning to exclusively stream a global live sports event. The event can only be viewed via your streaming platform – there is no broadcast option. You expect 10 million concurrent viewers at peak for the roughly 90 minute event. You will use commercial CDNs for distribution as you have no in-house, private CDN of your own. There are pre and post events that will likely have far fewer viewers.

SURVEY RESPONDENTS:

310 Individuals

Streaming content publishers

95% are in US and EU

AUDIENCE

distribution for the event will likely be:

EUROPE - 40-50%

AMERICAS - 20-30%

ASIA - 10-20%

ROW - 1-10%

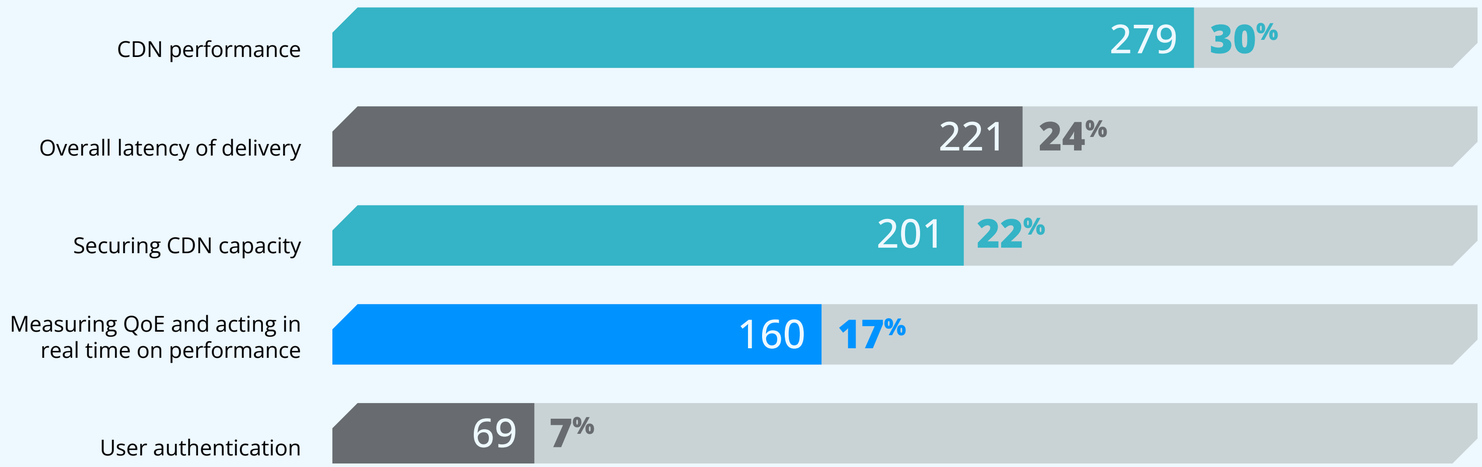
60% - 70%

Portion of viewers on desktop/smart TV/wifi (fixed BB)

30% - 40%

Portion of viewers on mobile devices (mobile networks)

Q1 What would be your **greatest technical concerns** regarding the video delivery? **(pick 3)**



When asked about their greatest concerns for this event, the majority of respondents **(52%)** were concerned about their commercial CDNs in terms of either: **a.** securing enough capacity for the event or **b.** overall CDN performance during the event. The next most significant concerns include overall latency **(24%)**, measuring QoE **(17%)** and User Authentication **(7%)**.

THE RESULTS SUGGEST THE GREATEST PERCEIVED RISK FOR THE SUCCESS OF A LIVE EVENT IS CDN CAPACITY AND PERFORMANCE.

CDN CAPACITY AND PERFORMANCE

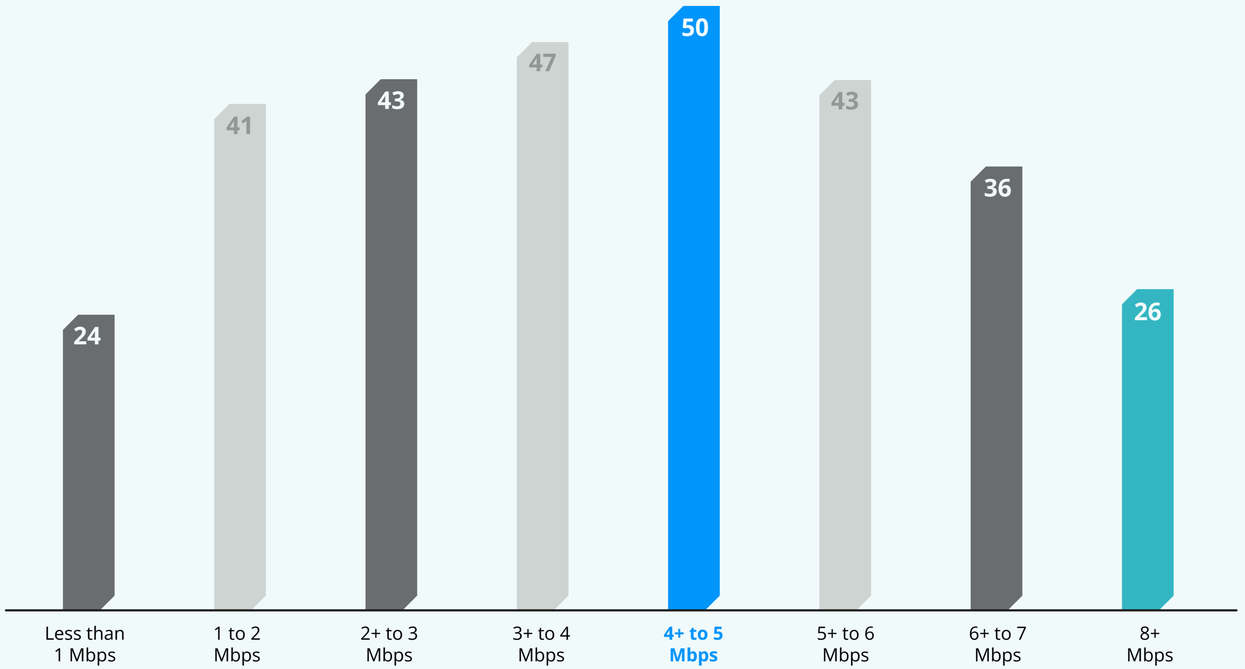
52%

17%

MEASURING QoE

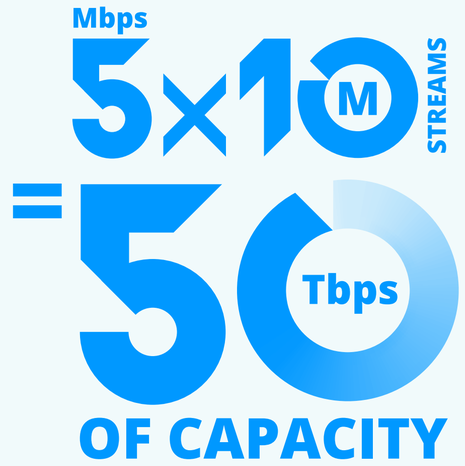
Q2

What is the **average bit rate** you would expect to deliver across all broadband and mobile users for the event?



When asked about the average bit rate (ABR) across all viewers at the live event, which includes both mobile and broadband connected devices, respondents were asked to choose from a range of possible ABR values. A consensus opinion of **5 Mbps** would mean the event should be expected to generate about **50 Tbps** (5 Mbps x 10 M viewer streams) of peak capacity across all CDNs streaming the event and across all regions.

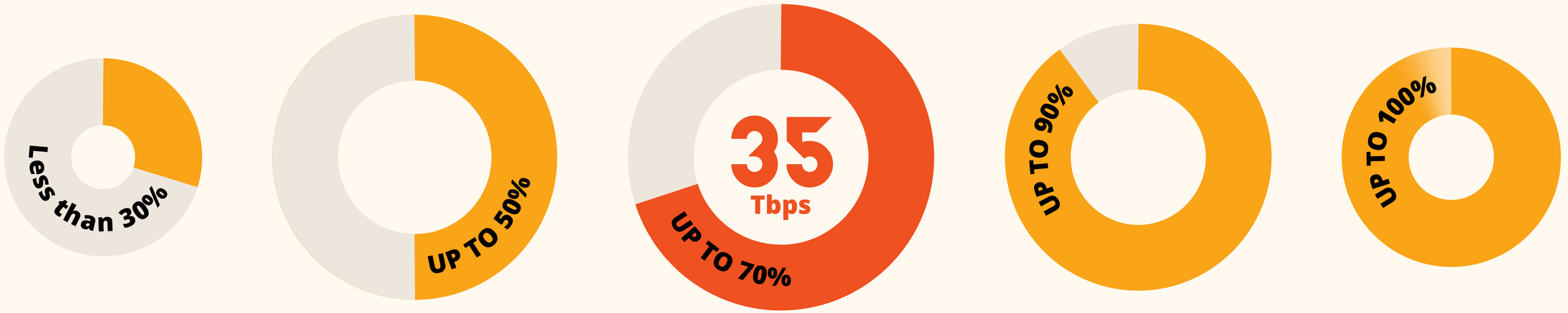
AT THE HIGH END OF THE RANGE, PEAK TRAFFIC COULD BE 80TBPS.



Q3

How much **delivery capacity** (as a percentage of expected peak) would you attempt to reserve ahead of the event?

When asked about how much delivery capacity (as a fraction of the total expected peak capacity) would be reserved with commercial CDNs ahead of the event, respondents again provided a range from **less than 30%** to as much as **100% of needed capacity**. The consensus of about **70% capacity reserved** ahead of time suggests around **35 Tbps (50 Tbps x 70%)** would be reserved through commercial agreements with CDNs before the event.

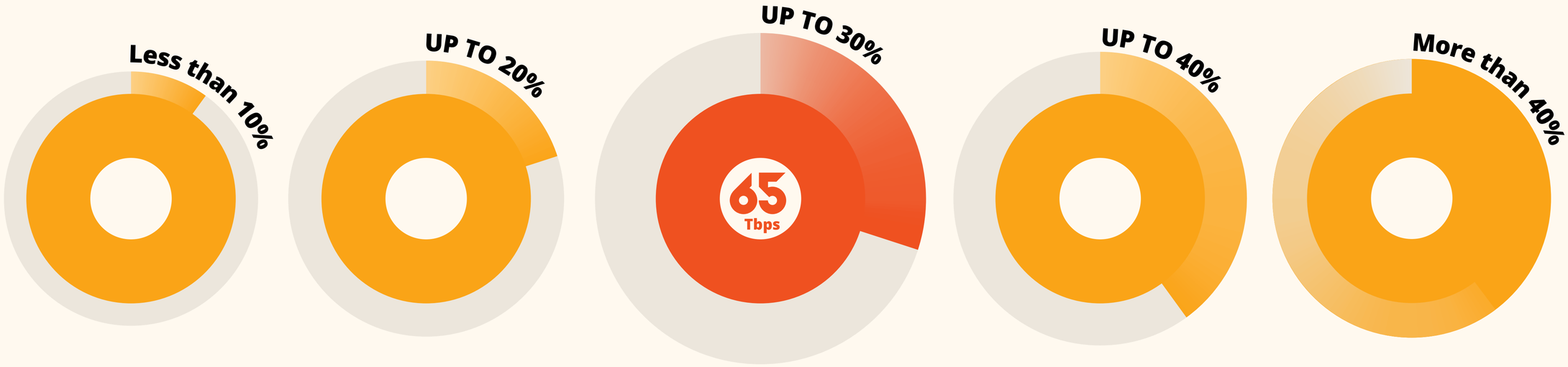


50 Tbps × 70% = 35 Tbps

Q4

How much **delivery capacity** (as a percentage of expected peak) would you plan to secure beyond the expected peak? **(as a safety margin in case demand is higher than expected)**

When asked about a safety margin, respondents provided a general consensus of a **margin above peak of about 30%**. This suggests, based on the earlier result of **50 Tbps** of peak traffic, an additional **15 Tbps** (for a total of **65 Tbps**) of capacity would be available if needed to handle unexpected traffic peaks for the event.

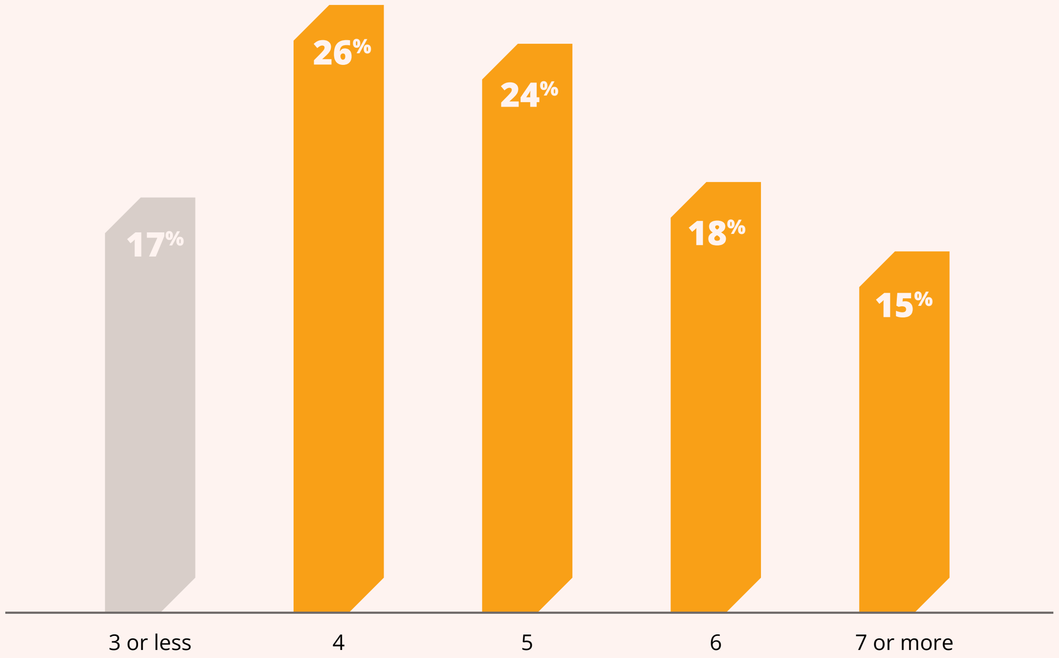


WHEN CONSIDERED TOGETHER, THE HIGH END RANGE OF THE EVENT COULD BE AS MUCH AS

50 Tbps + 30% = **65 Tbps**

TOTAL CAPACITY

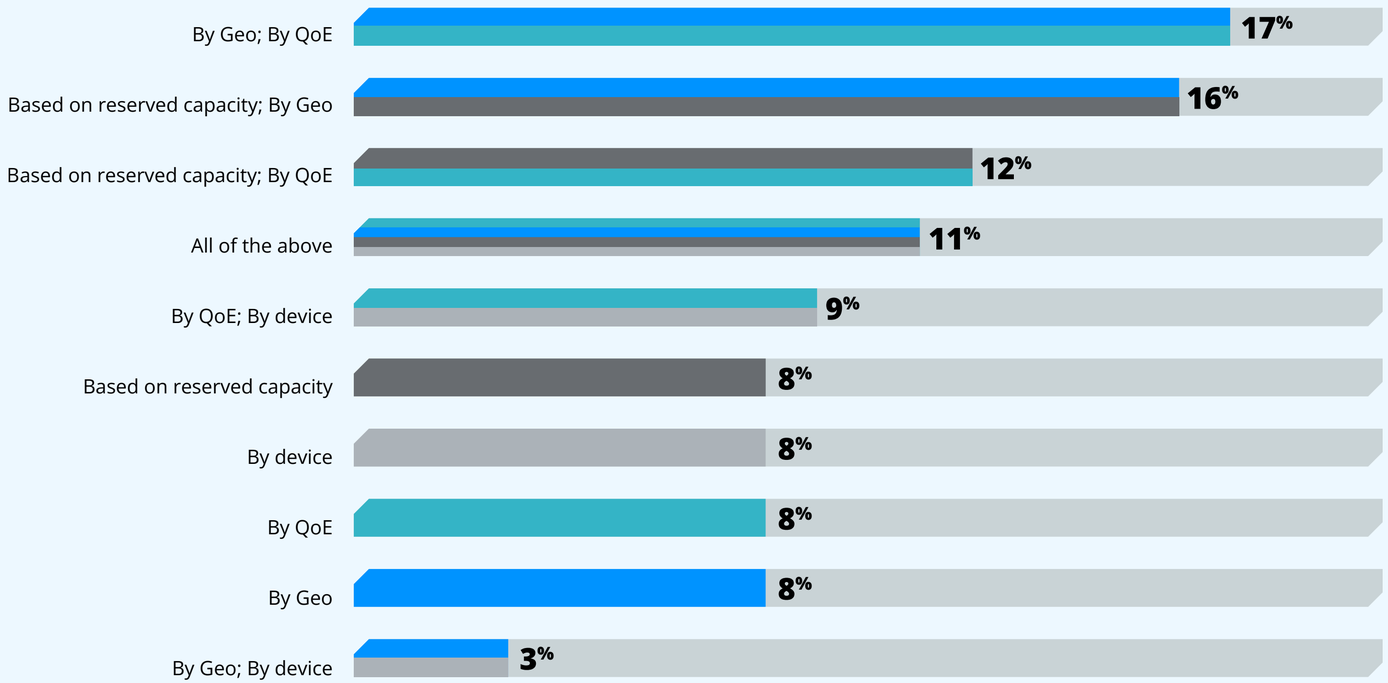
Q5 How many **CDNs** would you use globally?



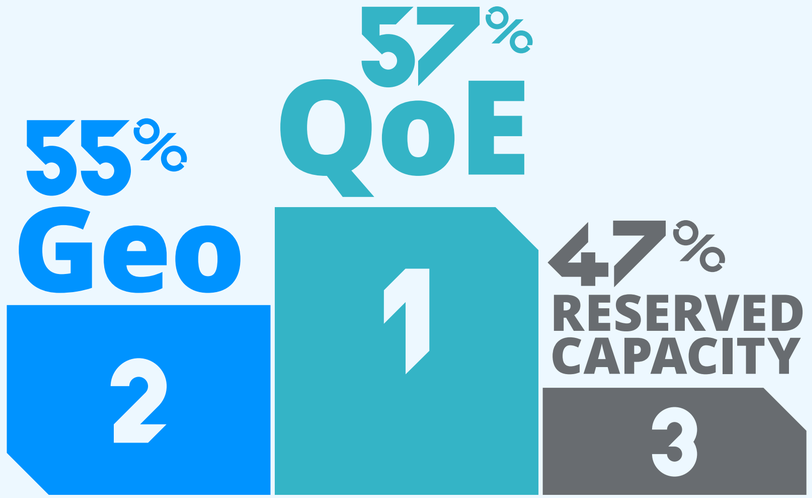
Today, massive live events almost always require multiple commercial CDNs for scale and geographic reach. This event is no exception as respondents agreed generally **(83%)** that **4 or more CDNs** would be required for a successful event in terms of delivering peak capacity at high quality.

83%
4 OR MORE CDNS

How would you **load balance** with your CDN partners? **(pick up to 2)**

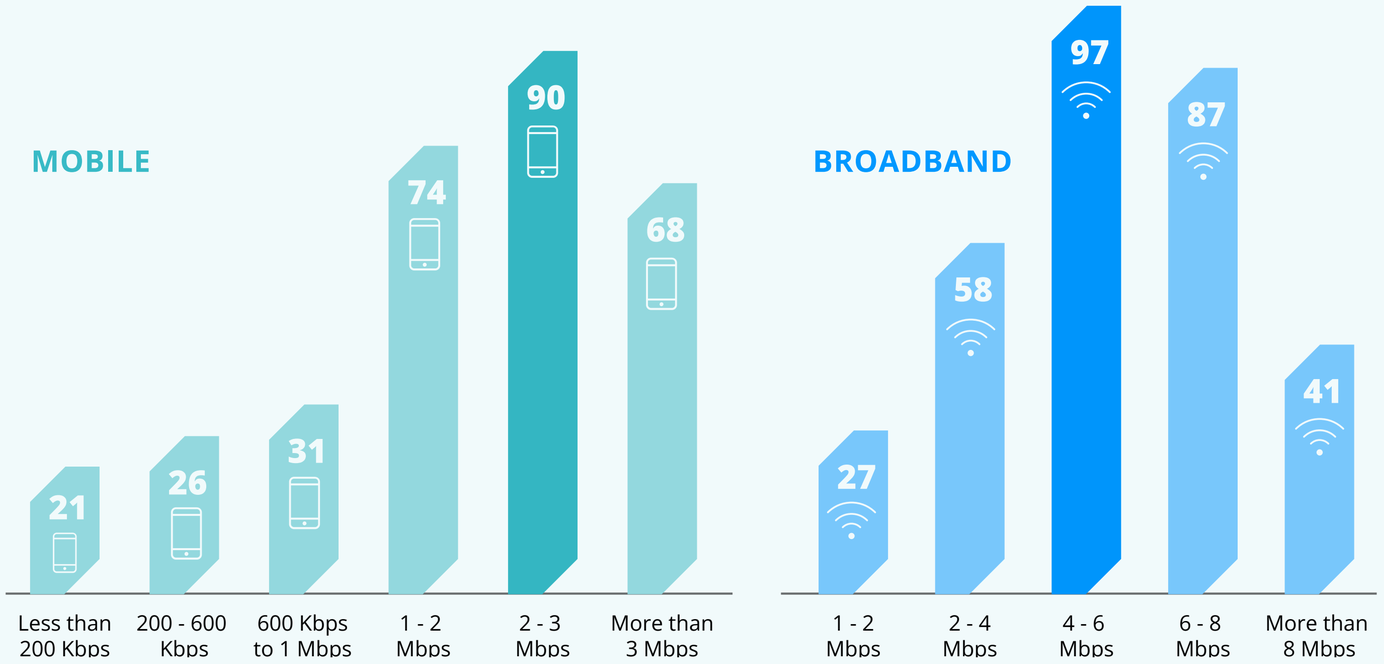


When asked about the factors used to load balance among CDN partners for the event, QoE ranked highest at **57%** of respondents. This ranking makes QoE the clear priority for content publishers who are streaming live events. Geo ranked next as **55%** of respondents said regional proximity is important when load balancing CDNs. Finally, reserve capacity was noted by **47%** of respondents as a consideration, suggesting a focus on ensuring any contracted reserved capacity with CDNs is utilized, so long as QoE is maintained.



Q7/8

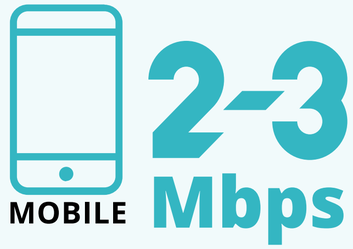
What is the **max bitrate** you would encode to deliver across broadband networks and mobile networks?



When asked about the max bitrate that content publishers would encode **across broadband networks**, the responses ranged from 1 Mbps to 'more than 8 Mbps'. The consensus of around **6 Mbps** seems a bit low when recent live events in the US have seen **7+ Mbps** average bit rate on broadband networks.

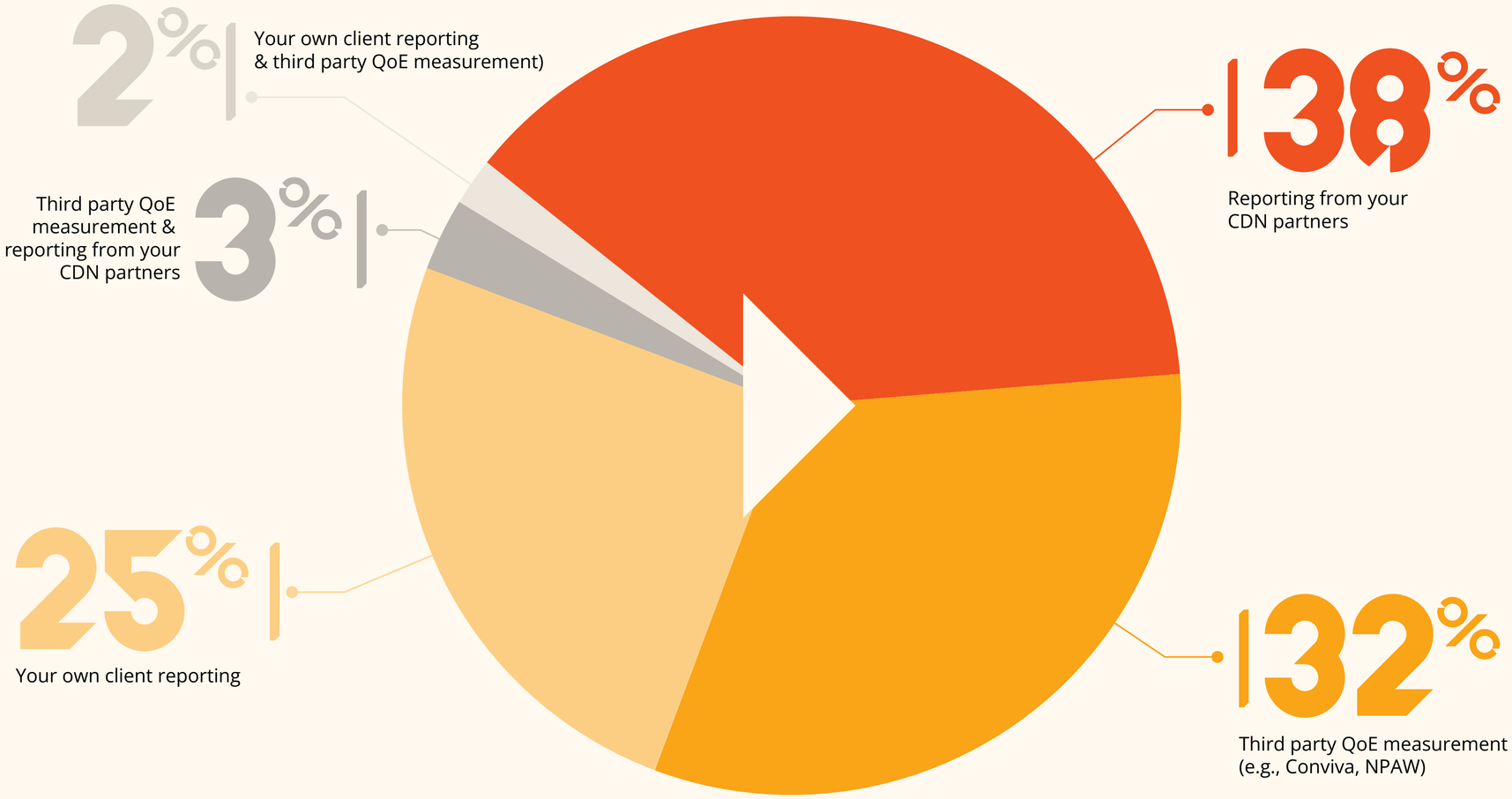
Across mobile networks, the responses ranged from 'Less than 200 Kbps' to 'more than 3 Mbps'. The consensus of responses is around **2-3 Mbps**.

These figures likely reflect the range of broadband network performance across North America and Europe.

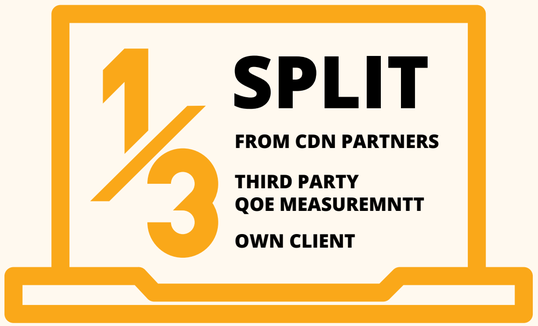


A BROADBAND MAX BIT RATE CONSENSUS OF AROUND 6 MBPS SEEMS A BIT LOW WHEN RECENT LIVE EVENTS IN THE US HAVE SEEN 7+ MBPS ON AVERAGE.

How would you measure **quality of the video stream**? **(check all that apply)**



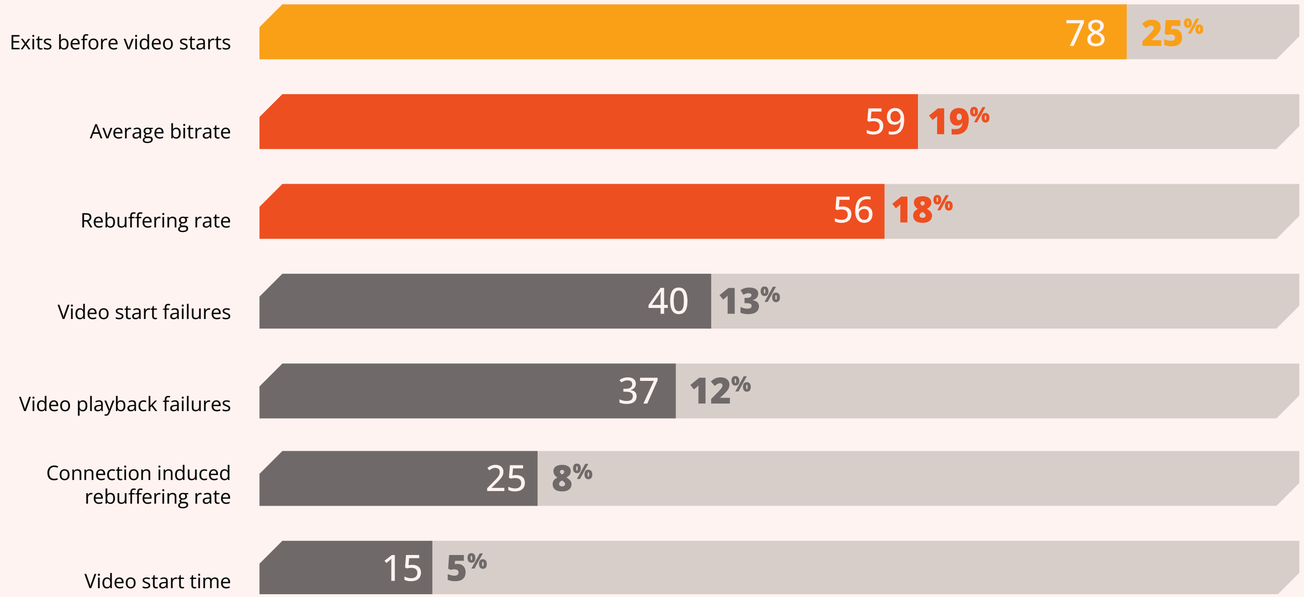
When asked about measuring video stream quality, the respondents were split to a degree between CDN partner reporting **(38%)**, 3rd party QoE measurement **(32%)** and their own client reporting **(25%)**. Few respondents **(5%)**, when given the choice indicated they would measure QoE based on the combined inputs of these three QoE measurement systems (CDNs, 3rd Party, in house client).



THE MOST COMMON FORM OF QOE MEASUREMENT WAS FROM CDN PARTNER REPORTING

Q10

Which three **streaming quality metrics** are most important to you? **(pick 3)**



When asked to choose the three most important streaming quality metrics from a list, the respondents ranked ‘exits before video starts’ the highest **(25%)**. Average bitrate **(19%)** and rebuffering rate **(18%)** ranked second and third, respectively. The lowest ranked metric, video start time, was selected by only **6%** of the respondents, suggesting that ‘exits before video starts’ is a better overall metric to understand the quality of streaming experienced by the viewer.

25%

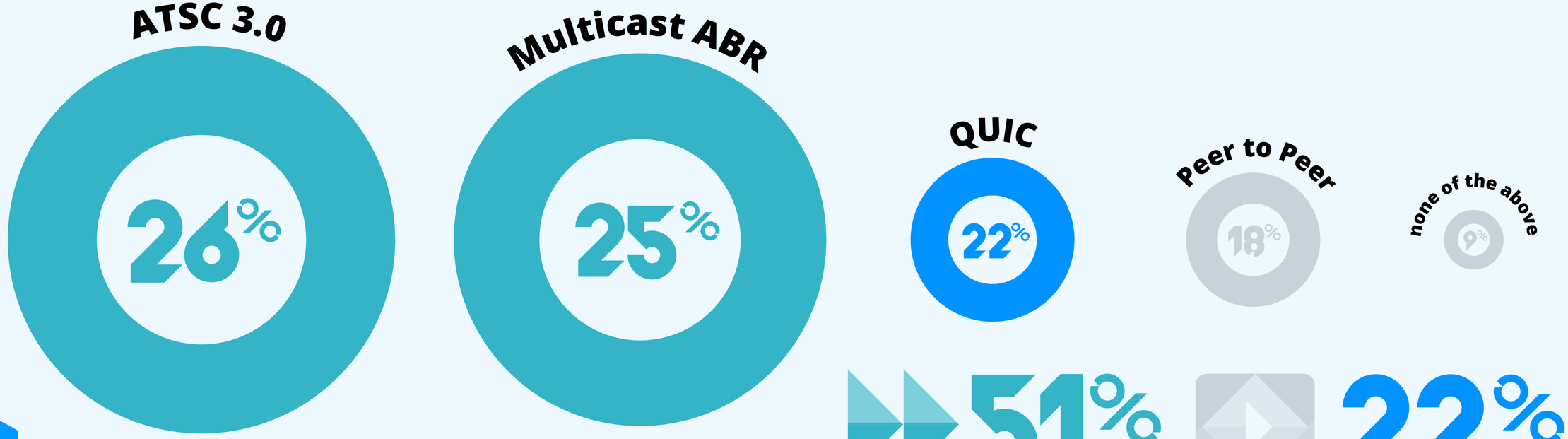
SUGGESTS ‘EXITS BEFORE VIDEO STARTS’ IS A BETTER METRIC TO UNDERSTAND THE QUALITY OF STREAMING EXPERIENCE

Q11

Would you have any interest in making use of the following **technologies for the event**?

(check all that apply)

When asked about their interest in using new technology as part of the live streaming event, respondents selected both ATSC 3.0 and Multicast ABR at the top of their list. This is not surprising, as both technologies promise more efficient streaming by applying a ‘broadcast’ model to what is otherwise a unicast streaming scenario. This result makes intuitive sense as one considers a mass live streaming event, although neither technology has seen significant adoption or commercialization to date.

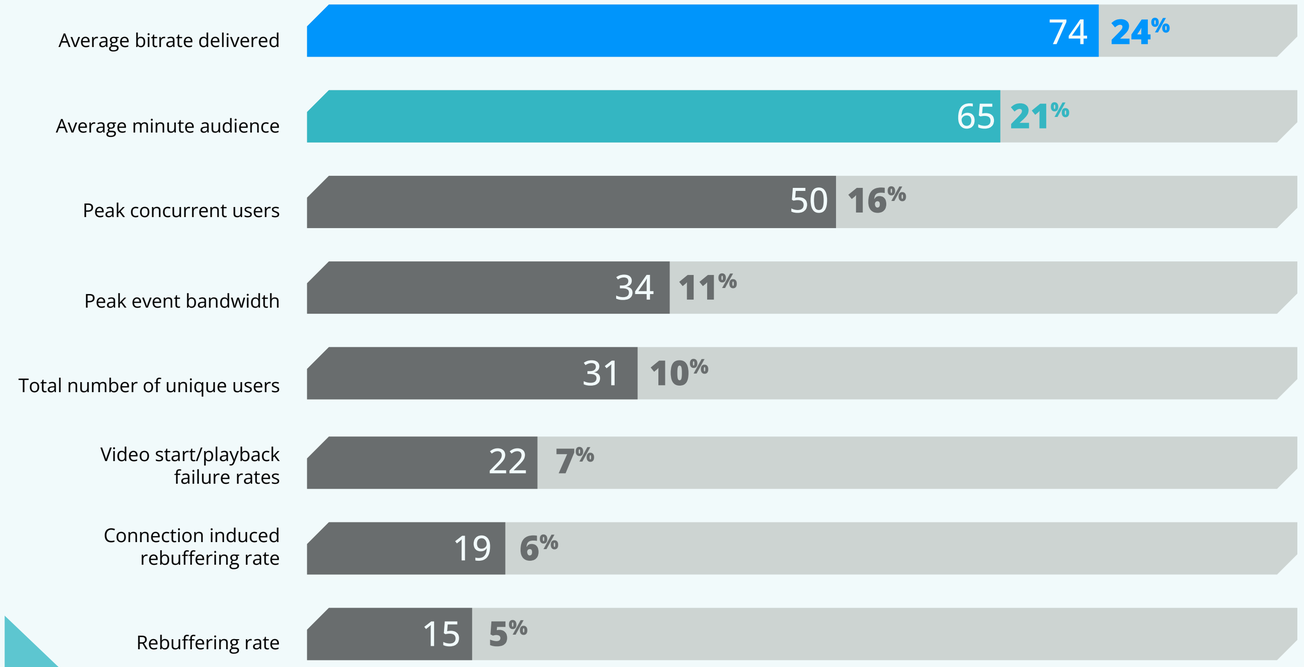


51%
INTEREST IN ATSC 3.0 OR MULTICAST ABR

22%
INTEREST IN QUIC

Q12

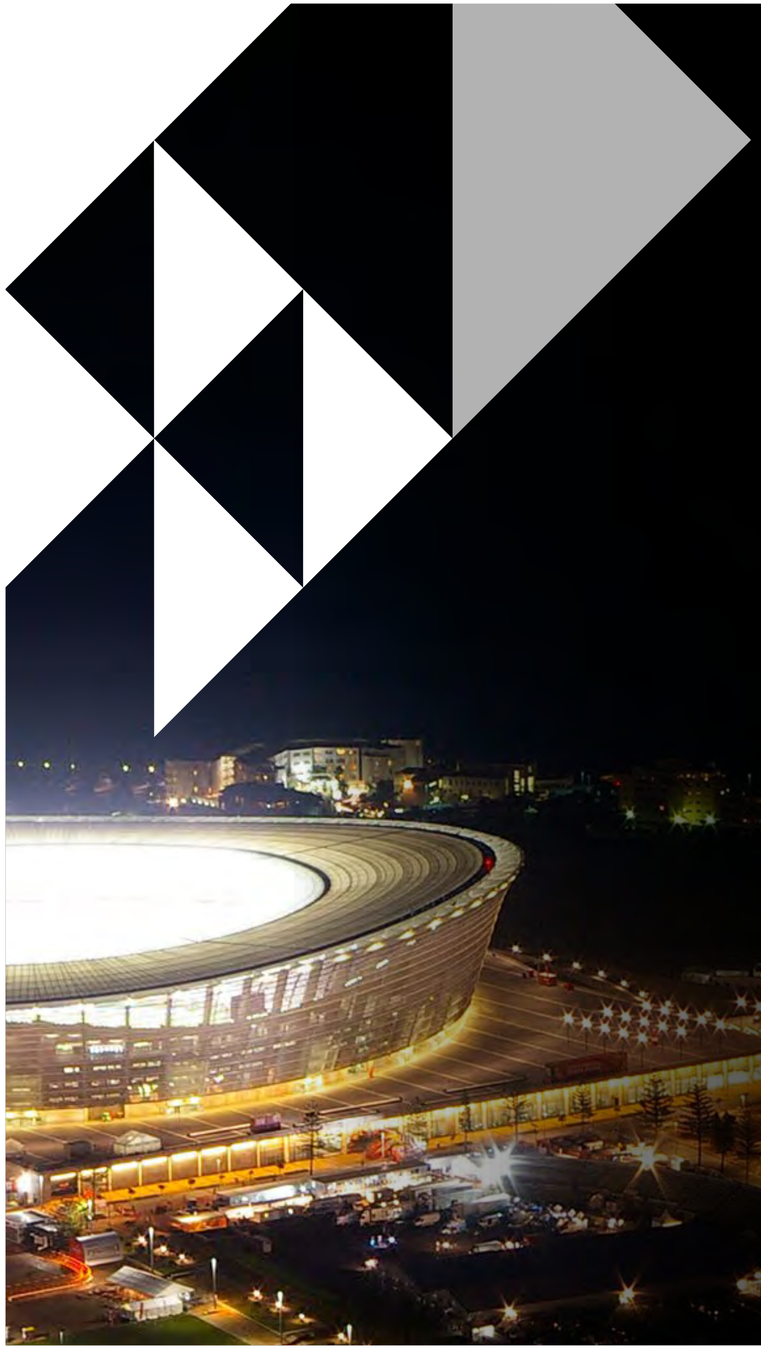
What metrics do you feel are the **best overall indicator of success** for a live streaming event? **(pick 3)**



When asked to pick three key performance indicators (KPIs) that would best demonstrate the overall success of the event, respondents selected average bit rate delivered **(24%)** and average minute audience or AMA **(21%)** as the two KPIs that should be given the most attention. This result speaks to OTT's emerging role as a replacement for broadcast TV, as AMA is now more important than peak concurrent users **(16%)** or unique users **(10%)** as a measure of audience size and attention.
It's also noteworthy that QoE metrics, discussed in Q10, seem to be captured by a single event KPI (average bit rate).

AVERAGE BITRATE DELIVERED **24%**

AVERAGE MINUTE AUDIENCE **21%**



About Qwilt

Qwilt's mission is to deliver connected experiences at the quality they were imagined. Our model is built on partnerships with service providers and content publishers, globally, to create a fabric that powers high-performance delivery of media and applications at the very edge of neighborhoods, big and small.

Qwilt's open architecture and inclusive business model make local edge delivery more accessible than ever before, unlocking more reliable, higher quality-of-experience at greater scale than previously possible. A growing number of the world's leading content publishers and cable, telco, and mobile service providers rely on Qwilt for Edge Cloud services, including Airtel, BT, Telecom Argentina, Telecom Italia, TIM Brazil and Verizon.

Qwilt is a leader of the Open Caching movement and a founding member of the Streaming Video Technology Alliance. Working in collaboration with service providers and content publishers, Qwilt's Open Caching-based solution is the gateway to realizing live streaming at scale, delivering the best viewing experience to fans and other viewers around the globe.

For more information, **visit www.qwilt.com**.

ADDITIONAL RESOURCES

Qwilt Blog -

> Live Time - Are Networks Ready to Stream at Scale

> A New Standard of Content Delivery Quality from the Service Provider Edge

> It's Time to Redefine the High Performance Live Experience

QWILT

We are an Edge Cloud application developer. Our solutions bring to life the content and application delivery platform of the future in service provider networks.