Methodology: Gaming Experience Awards

Millions of users around the world trust Speedtest® to measure the performance of their fixed and mobile networks every day. The Ookla® Gaming Experience Awards offer consumers a trustworthy assessment of the internet providers that will best meet their gaming needs.

This document provides licensees of Ookla Mobile and ISP Gaming Experience Speedtest Awards™ and interested parties with transparency into the methodologies used to calculate and validate Gaming Experience Awards. This document may be shared with regulatory bodies, media or others, as needed.

Overview

Game Score™, available for 5G, All Mobile Network Generations, and ISP, is based on Ookla's consumer initiated Speedtest results as well as Consumer QoE™ latency and jitter measurements taken to real world game servers. Game Scores are composed of eight components, each measuring a different aspect of consumer gaming experience. Each of these components is evaluated and scored on a scale of 0-100 for each eligible provider. Finally, scored components are combined in a weighted average to produce a Game Score for each eligible provider.

Process

Ookla's data analysis process consists of four main steps: collect, filter, normalize, and aggregate. The outputs of this process are then leveraged to determine Gaming Experience Award winners.

Data Quality Filtering and Sample Construction

To ensure that the data is reflective of actual consumer experience, each Speedtest result and Consumer QoE is subject to Ookla's proprietary data quality filters.

So that each user has an equal voice, we apply a user aggregation methodology to test results. This means that a user can record any number of tests during any arbitrary time period, but they will only contribute one "vote" to any period of observation.

Game Score Components

Game Scores are based on Ookla's consumer-initiated Speedtest results, Consumer QoE latency and jitter measurements taken to real-world game servers. Game Scores are composed of eight components, each measuring a different aspect of consumer gaming experience.

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Latency

Latency (also called ping or lag) measures how quickly a device gets a response after a request has been sent. Latency has always mattered to online experience, however, poor latency is of particular concern to online gamers who want a smooth gaming experience. Latency affects how quickly a gamer's response is reflected in gameplay and is therefore of particular interest to those who prefer games where reaction time is important.

Game Score Component (x)	Component Description	Statistics Used
Game Latency (ms)	Game Latency is a measure of latency to popular gaming server locations. A server selection process is performed which selects the best (lowest latency) gaming servers for the user, per game, for a set of popular online games (such as Fortnite and Free Fire). Latency tests performed to the selected gaming servers and results are recorded as Game Latency. Game Latency can be used to understand the typical responsiveness of your network when playing popular online games such as Fortnite or Free Fire.	Median, 10th Percentile The median is used to represent what a typical consumer might experience, whereas the 10th percentile is used to represent the typical experience of an avid gamer who optimizes their equipment, vendors, and plans for gaming.

Jitter

Jitter is a measure of the variability in latency. High jitter values can be frustrating to gamers and can affect their ability to adapt their gameplay to account for latency.

Game Score Component (x)	Component Description	Statistics Used
Game Jitter (ms)	Game Jitter is a measure of the variation in latency to popular gaming servers. See Game Latency for more information.	Median, 10th Percentile The median is used to represent what a typical consumer might experience, whereas the 10th percentile is used to represent the typical experience of an avid gamer who optimizes their equipment, vendors, and plans for gaming.

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Download Speed

Download speed plays an important role in creating a smooth gaming experience without interruptions or degradations in streaming quality. It is also important for downloading digitally distributed games and updates.

Game Score Component (x)	Component Description	Statistics Used
Download Speed (Mbps)	Download Speed is a measure of how quickly data can be pulled from a server on the internet to the user's device.	Median, 90th Percentile The median is used to represent what a typical consumer might experience, whereas the 90th percentile is used to represent the typical experience of an avid gamer who optimizes their equipment, vendors, and plans for gaming.

Upload Speed

Upload speed plays an important role in creating a smooth gaming experience without interruptions or degradations in streaming quality, particularly in multi-player games.

Game Score Component (x)	Component Description	Statistics Used
Upload Speed (Mbps)	Upload Speed is a measure of how quickly data can be transferred from the user's device to a server on the internet.	Median, 90th Percentile The median is used to represent what a typical consumer might experience, whereas the 90th percentile is used to represent the typical experience of an avid gamer who optimizes their equipment, vendors, and plans for gaming.

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Game Score

Game Score components are evaluated and then scored on a scale of 0-100 for each eligible provider using the scoring functions specified in the table below. Each component is assigned a weight based on its importance in creating a great overall gaming experience. For example, since gamers report that latency is one of the most impactful aspects of the Gaming Experience, the latency components carry a relatively high weight of 50% in the final Game Score. Component scores are then combined in a weighted sum to create the final Game Score.

Table 1: Scoring functions and weights associated with each Game Score component.

Category	Game Score Component (x)	Scoring Function*	Component Weight
Latency	Median Game Latency (ms)	$f(x) = e^{(-0.004*(x-20))}$	22.5%
	10th Percentile Game Latency (ms)	$f(x) = e^{(-0.005*(x - 8.3))}$	27.5%
Jitter	Median Game Jitter (ms)	$f(x) = e^{(-0.005x)}$	9.0%
	10th Percentile Game Jitter (ms)	$f(x) = e^{(-0.02x)}$	11.%
Download Speed	Median Download Speed (Mbps)	$f(x) = 0.1 + 0.17*\ln(x)$	9.0%
	90th Percentile Download Speed (Mbps)	$f(x) = 0.1 + 0.13*\ln(x)$	11.0%
Upload Speed	Median Upload Speed (Mbps)	$f(x) = 0.4 + 0.16*\ln(x)$	4.5%
	90th Percentile Upload Speed (Mbps)	$f(x) = 0.1 + 0.15*\ln(x)$	5.5%

**All scoring functions are bounded to [0,1] and then multiplied by 100; logic omitted here for readability.*

Component Weight

Component weights are computed by multiplying the component's metric type weight and category weight as shown in the table below:

Table 2: Game Score Category Weights

Category	Category Weight
Latency	50%
Jitter	20%
Download Speed	20%
Upload Speed	10%

Table 3: Game Score Metric Type Weight

Category	Metric Type Weight
Median	45%
10th Percentile or 90th Percentile	55%

Table 4: Example calculation of the component weight for Median Game Latency.

Game Score Component	Category (weight)	Metric Type (weight)	Component Weight Calculation	Component Weight
Median Game Latency	Latency (50%)	Median (45%)	0.5 * 0.45 = 0.225	22.5%
10th Percentile Game Latency	Latency (50%)	10th Percentile (55%)	0.5 * 0.55 = 0.275	27.5%

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Scoring Functions

Component scores for latency and jitter decrease exponentially with increasing latency and jitter values, whereas component scores for download and upload speed increase with increasing download and upload speed values.

Figure 1a

50th Percentile Game Latency (ms)

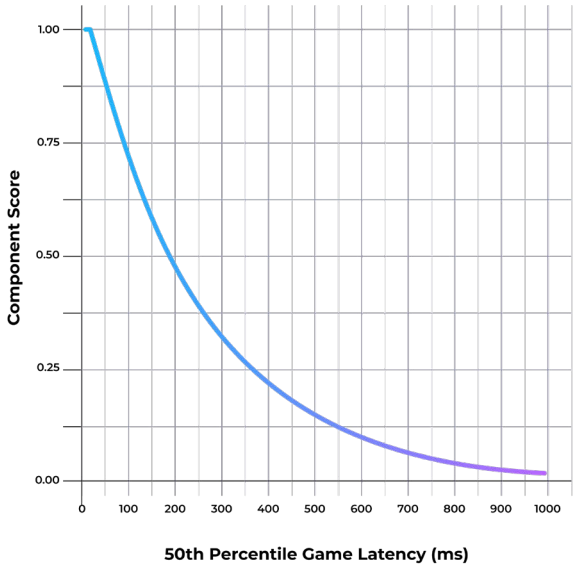


Figure 1b

10th Percentile Game Latency (ms)

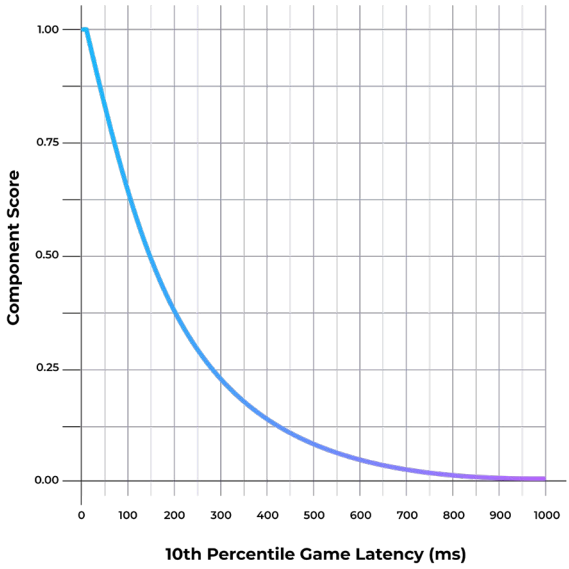


Figure 1c

50th Percentile Game Jitter (ms)

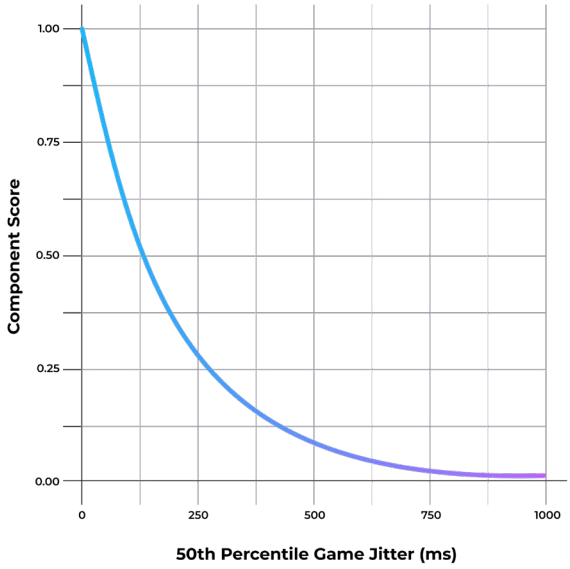
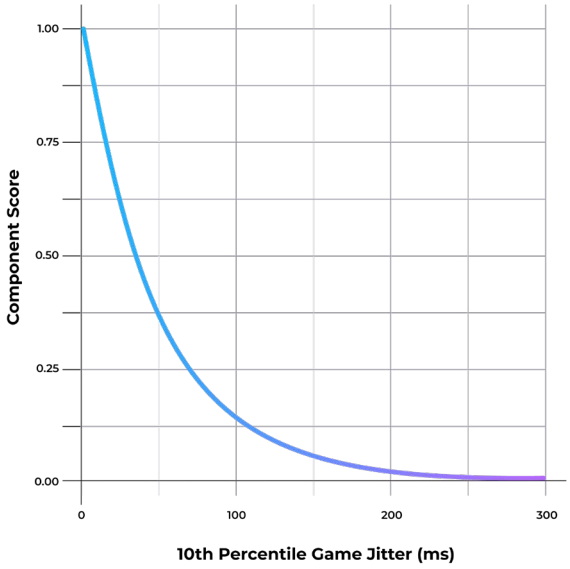


Figure 1d

10th Percentile Game Jitter (ms)



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Scoring Functions

Component scores for latency and jitter decrease exponentially with increasing latency and jitter values, whereas component scores for download and upload speed increase with increasing download and upload speed values.

Figure 1e

50th Percentile Download Speed (Mbps)

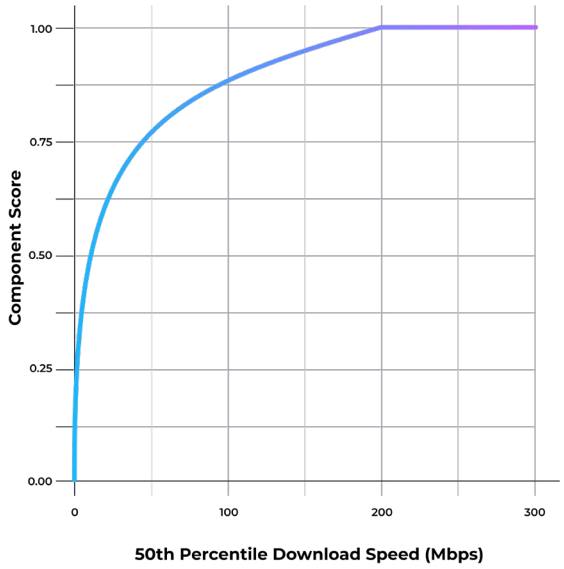


Figure 1f

90th Percentile Download Speed (Mbps)

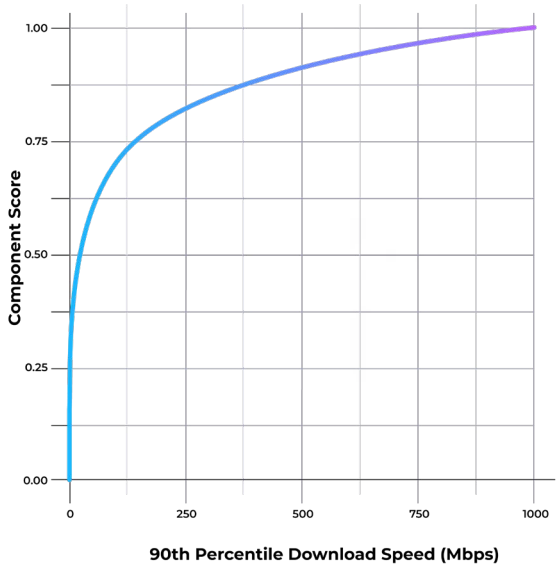


Figure 1g

50th Percentile Upload Speed (Mbps)

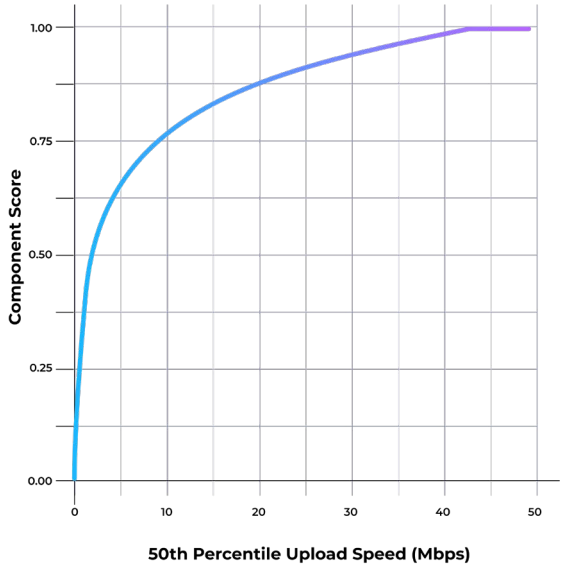
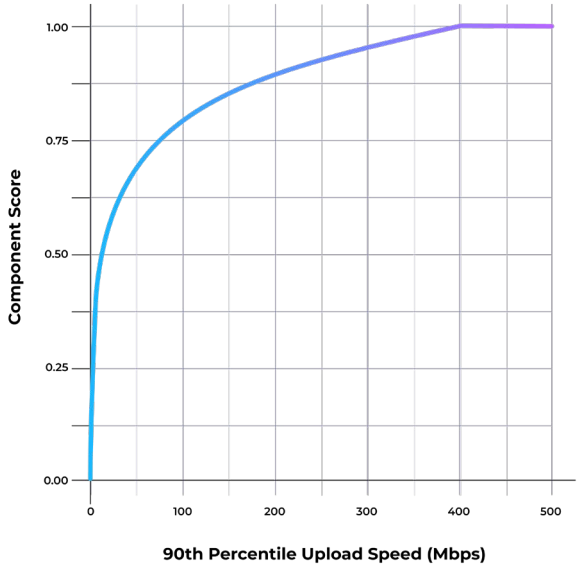


Figure 1h

90th Percentile Upload Speed (Mbps)



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Statistical Evaluation and Criteria

Winners

Winners are providers that have the highest Game Score among competitors in the market after accounting for statistical uncertainty. Specifically, Multiple Comparisons with Best (MCB) is used to evaluate winners.

Period

All Speedtest Awards are based on aggregated historical data from six months within the same calendar year, called the award period. Using a six-month time period reduces the likelihood that short-term fluctuations in measurements will significantly influence the analysis.

Geography and Market Share

All Speedtest Awards are tied to a specific country. To be considered for the Speedtest Awards, a network must have a minimum of 3% of the total number of Speedtest samples within that country area over the specified time range and cannot be a MVNO. If a provider has less than 3% of the total Speedtest samples in a region, it is an indication that they are not widely available in that location. Gaming Experience Awards identify the Best Gaming Experience offered by networks that are generally available to consumers in a specific geographic area as determined by the Speedtest sample share being at least 3%. This threshold allows us to include relevant start-ups or other local providers, while removing those that are otherwise not generally available within the area. For consistency with other Speedtest Awards, only the Speedtest sample share is considered when evaluating whether a provider is widely available in a location.

Additional Eligibility Criteria

In addition to having at least 3% Speedtest sample share, a provider must have at least 30 Speedtest and 30 Consumer QoE™ samples to be considered eligible for evaluation for Best Gaming Experience. The winner must have 100 Speedtest samples and 100 CQoE samples and there must be at least one other eligible competitor in the market.

Understanding Game Score

Ookla's Gaming Experience Award reports provide full transparency into the construction of Game Scores, including how each individual component contributes to the final score. Table 5 provides a hypothetical example to illustrate how Game Scores are constructed. Game Scores are composed of eight components, each measuring a different aspect of consumer gaming experience.

In the example below, the provider achieved a Median Game Latency of 35.55 ms. Using the scoring function for Median Game Latency specified in Table 1, the provider's score for this component was 93.97 (rounded to 2 decimal points for display). Since Median Game Latency represents one of the most impactful aspects of the Gaming experience, this component carries a relatively high weight of 22.5% in the final Game Score. Multiplying the component score by its weight gives the total contribution for Median Game Latency to the Gaming Score - in this case 21.14 (rounded to 2 decimal points for display). The sum across all component score points is the final Gaming Score (90.25 in this example).

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Table 5: Illustrative example of a scorecard used to compute a hypothetical provider's Game Score. Note that Game Score component values should be converted to the units specified in Table 1 before scoring.

Category	Game Score Component (x)	Component Value	Component Score	Component Weight	Game Score Points
Latency	Median Game Latency (ms)	35.55	93.97	22.5%	21.14
	10th Percentile Game Latency (ms)	26.06	91.50	27.5%	25.16
Jitter	Median Game Jitter (ms)	5.82	97.13	9.0%	8.74
	10th Percentile Game Jitter (ms)	2.19	95.71	11.0%	10.53
Download Speed	Median Download Speed (Mbps)	64.31	80.78	9.0%	7.27
	90th Percentile Download Speed (Mbps)	394.22	87.70	11.0%	9.65
Upload Speed	Median Upload Speed (Mbps)	15.98	84.34	4.5%	3.80
	90th Percentile Upload Speed (Mbps)	62.25	71.97	5.5%	3.96

Game Score: 90.25

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