

Performance Testing Overview

Performance testing examines a system's ability to deliver fast, responsive, and stable performance across various conditions. Below are the essential metrics assessed to identify improvement areas and ensure an optimal user experience:

Core Metrics

First Contentful Paint (FCP)

Definition: Measures the time it takes for the browser to display the first visible content on the screen after page loading begins.

Significance: Indicates to users that the page is loading.

Measurement: Tested in controlled (lab) and real-world (field) scenarios.

Ideal Score: Less than 1.8 seconds.

Largest Contentful Paint (LCP)

Definition: Tracks the time needed to render the largest visible content (e.g., images, text) in the viewport.

Scoring:

Good: ≤ 2.5 seconds

Needs Improvement: 2.5–4 seconds

Poor: > 4 seconds

Optimization Tips:

Reduce server response time.

Prioritize loading essential elements.

Minimize or defer JavaScript.

Tools: Lighthouse, Chrome DevTools, PageSpeed Insights.

Interaction to Next Paint (INP)

Definition: Assesses the responsiveness of a page to user interactions, focusing on the slowest interaction during a session.

Ideal Score:

Good: ≤ 200 milliseconds

Needs Improvement: 200–500 milliseconds

Poor: > 500 milliseconds

Influencing Factors:

JavaScript blocking the main thread.

Delayed rendering updates after user input.

Total Blocking Time (TBT)

Definition: Tracks the total duration when the main thread is blocked for over 50 milliseconds between FCP and Time to Interactive (TTI).

Purpose: Highlights delays caused by tasks like JavaScript execution.

Application: Primarily tested in lab environments.

Cumulative Layout Shift (CLS)

Definition: Measures unexpected layout shifts during loading, ensuring visual stability.

Scoring:

Good: ≤ 0.1

Needs Improvement: 0.1–0.25

Poor: > 0.25

Optimization Tips:

Use placeholders for dynamic content.

Preload key assets.

Define aspect ratios for images and videos.

Time to First Byte (TTFB)

Definition: Calculates the time for a browser to receive the first byte of a server's response.

Purpose: Reflects server speed and efficiency.

Measurement: Applicable in both lab and field environments.

METRIC	Adding 10 elements	Adding 50 elements	Adding 100 elements
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LCP	0.31s (Good)	0.90s	4.3s
CLP	0.02 (Good)	0.16 (Needs Improvement)	0.63 (Poor)
INS	56ms (Good)	74ms (Good)	1944ms (Poor)