Performance Testing Overview

Performance Testing checks how well a system performs in terms of speed, responsiveness, and stability under different conditions. It helps to understand how fast and stable a website or application is when users interact with it.

Key Metrics to Measure in Performance Testing

1. **First Contentful Paint (FCP)**:

2. FCP measures how long it takes for the first piece of content (like text or images) to appear on the screen when the page starts loading.

    a. **What it tells us**: How quickly the user can see something on the screen.
    b. **Good score**: Less than 1.8 seconds
    c. **Poor score**: More than 3.8 seconds
    d. **Where to measure**: Both lab (testing in controlled conditions) and field (real user conditions).
3. **Largest Contentful Paint (LCP)**:

LCP measures how long it takes for the largest visible element (like a large image or block of text) to load on the page.

    a. **What it tells us**: How long it takes for the main content of the page to fully load.
    b. **Good score**: 2.5 seconds or less
    c. **Poor score**: More than 4.0 seconds
    d. **Where to measure**: Lab and field.
4. **Interaction to Next Paint (INP)**:

INP measures how long it takes for the page to respond after a user interaction, such as clicking, tapping, or typing. The worst interaction time is recorded as the overall response time.

    a. **What it tells us**: How responsive the page is to user actions.
    b. **Good INP**: 200 milliseconds or less
    c. **Needs improvement**: Between 200ms and 500ms
    d. **Poor INP**: More than 500 milliseconds
    e. **Where to measure**: Lab and field.

5. **Total Blocking Time (TBT)**:

TBT measures the total time between when the page starts loading and when it becomes interactive. It counts how long the main thread is blocked from responding to user input.

    a. **What it tells us**: How much time the page is unresponsive due to heavy processing.
    b. **Where to measure**: Lab.
6. **Cumulative Layout Shift (CLS)**:

CLS measures how much the layout of the page changes unexpectedly while it is loading. A high CLS means elements are moving around, which can confuse users.

    a. **What it tells us**: Whether the page layout is stable or if elements shift while the page loads.
    b. **Good score**: 0.1 or less
    c. **Poor score**: More than 0.25
    d. **Where to measure**: Lab and field.
7. **Time to First Byte (TTFB)**:

TTFB measures how long it takes for the server to send the first byte of data after a user makes a request.

    a. **What it tells us**: How fast the server responds to the user's request.
    b. **Where to measure**: Lab and field.

Details on Key Metrics

Largest Contentful Paint (LCP)

- **What it measures**: How long it takes for the largest visible element (like an image or text) to load after the user navigates to a page.
- **Good score**: 2.5 seconds or less
- **Poor score**: Over 4.0 seconds
- **Important elements**: Images, videos, text blocks.
- **How to improve LCP**:
    - Make sure the server responds quickly.
    - Prioritize loading important elements first.

    - Reduce delays caused by JavaScript.

Cumulative Layout Shift (CLS)

- **What it measures**: Unexpected movements of elements on the page during loading. If content shifts around, it can make the page feel unstable and frustrating for users.
- **Good score**: 0.1 or less
- **Poor score**: Greater than 0.25
- **How it works**: CLS tracks how far elements move within the screen, considering both the size and distance of the shifts.
- **How to improve CLS**: Ensure that elements are loaded in their final positions and avoid using unexpected content changes or animations that could move things around.

Interaction to Next Paint (INP)

- **What it measures**: The delay in response after a user interacts with the page, like clicking a button, tapping on a screen, or pressing a key.
- **Good INP**: 200 milliseconds or less
- **Needs improvement**: 200ms to 500ms
- **Poor INP**: Over 500 milliseconds
- **How to improve INP**:
    - Minimize JavaScript blocking and optimize the main thread for faster interactions.

Action	Adding 10 items	Adding 50 items	Adding 500 items
LCP score	0.31 seconds	0.90 seconds	4.3 seconds (poor)
CLS score	0.02	0.16	0.63 (poor)
INP score	56ms	74ms	1944ms (poor)

Improving Performance

- **LCP**: Ensure fast server response times, prioritize the loading of important elements like images and texts, and avoid blocking JavaScript that can slow down the rendering.
- **CLS**: Avoid unexpected layout shifts by setting fixed sizes for elements and using animations carefully.
- **INP**: Reduce JavaScript processing on the main thread, and make sure user interactions like clicks and taps are handled as quickly as possible.

By focusing on these metrics, you can enhance your website's performance, making it faster, more responsive, and providing a better user experience.