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MAD Lab 11

Aim:

To evaluate and improve a Progressive Web App (PWA) using Google Lighthouse by analyzing its performance, accessibility, best practices, and PWA compliance.

Theory:

Google Lighthouse is an open-source auditing tool built into Chrome DevTools. It helps developers evaluate the quality of web applications by testing various aspects such as:
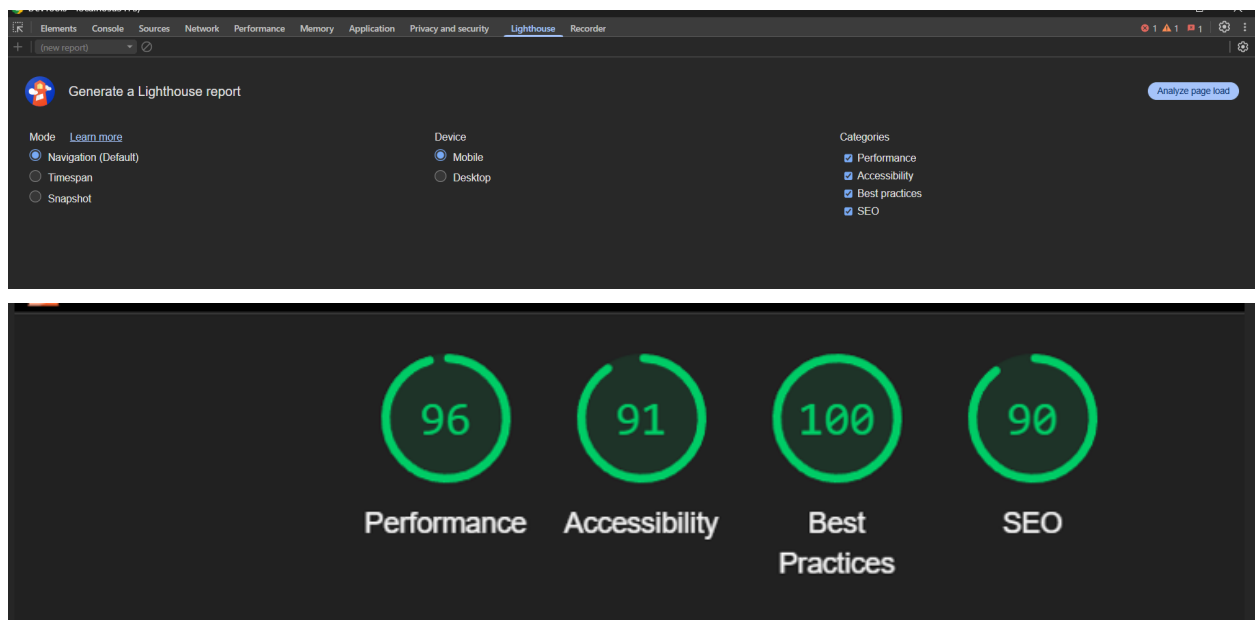
- **Performance** – Measures page load speed and responsiveness.

- **Accessibility** – Checks if the app is usable by people with disabilities.

- **Best Practices** – Ensures modern and secure coding standards are followed.

- **SEO** – Analyzes search engine optimization features.

- **PWA Compliance** – Verifies service worker, manifest file, offline support, and installability.
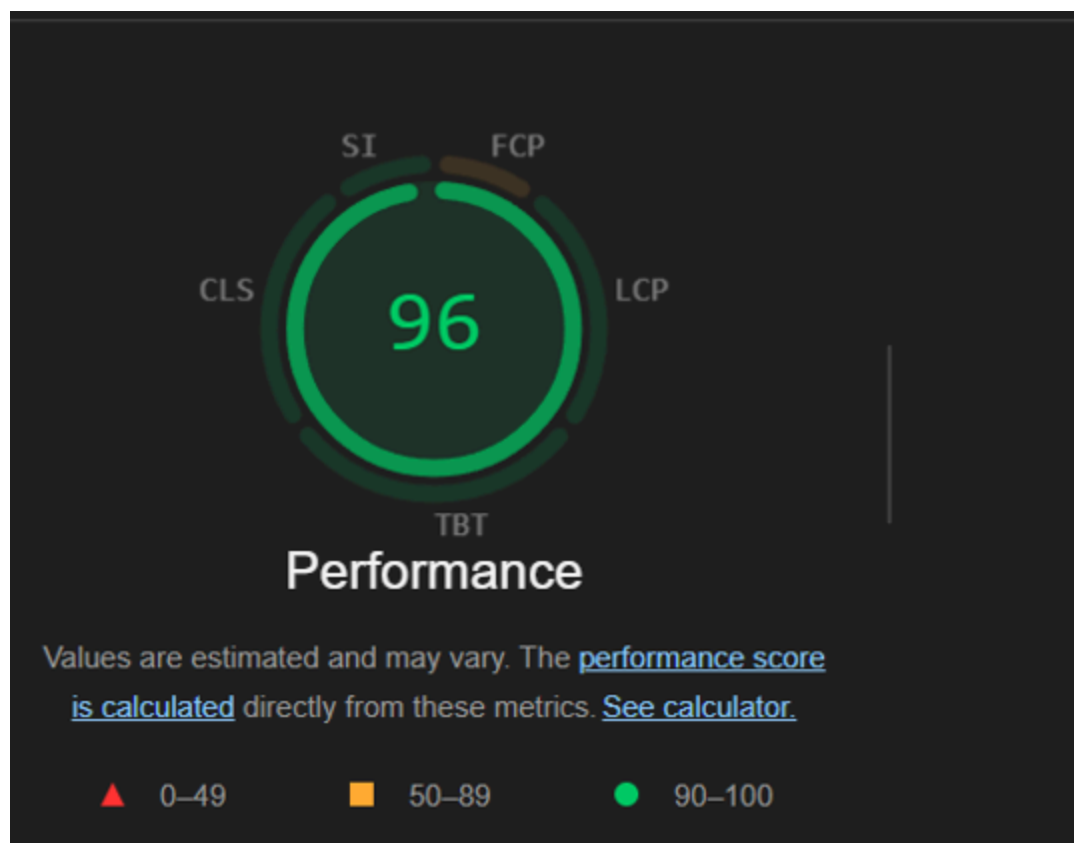
Using Lighthouse helps developers identify issues and optimize the user experience of PWAs. It highlights missing or misconfigured files such as `manifest.json`, icons, service workers, and other critical elements.

Steps to Use Google Lighthouse for PWA Analysis

1. **Open Chrome DevTools** – Open Google Chrome and press F12 or right-click on the page and select **Inspect**.

2. **Go to Lighthouse Tab** – Navigate to the **Lighthouse** tab in DevTools.

3. **Select Audit Criteria** – Choose **Performance, PWA, Accessibility, Best Practices**, and other relevant metrics.

4. **Run the Audit** – Click the **Generate Report** button and wait for the analysis to complete.

5. **Review Results** – Check the generated report, which includes PWA compliance, performance, and accessibility insights.

6. **Make Necessary Changes** – Modify **theme color, icons, manifest.json**, and other settings to improve PWA compliance.

7. **Re-run Lighthouse** – Test again to verify improvements and ensure all PWA requirements are met.

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Performance

Values are estimated and may vary. The **performance score is calculated** directly from these metrics. **See calculator.**

▲ 0–49   ■ 50–89   ● 90–100

METRICS   Expand view

■ First Contentful Paint   ● Largest Contentful Paint
2.2 s   2.2 s

● Total Blocking Time   ● Cumulative Layout Shift
0 ms   0

● Speed Index
2.2 s

DIAGNOSTICS

▲ Eliminate render-blocking resources — Potential savings of 970 ms

▲ Enable text compression — Potential savings of 18 KiB

▲ Page prevented back/forward cache restoration — 1 failure reason

■ Minify JavaScript — Potential savings of 135 KiB

■ Remove duplicate modules in JavaScript bundles — Potential savings of 16 KiB

■ Reduce unused CSS — Potential savings of 21 KiB

■ Reduce unused JavaScript — Potential savings of 121 KiB

■ Minimize main-thread work — 2.8 s

○ Avoid non-composited animations — 1 animated element found

○ Initial server response time was short — Root document took 10 ms

Conclusion:

By using Google Lighthouse, we effectively analyzed and enhanced our PWA for performance, accessibility, and compliance with modern web standards. The tool provided actionable insights which we used to make necessary adjustments, such as updating the manifest file, optimizing assets, and refining the theme and metadata. Re-running the audit confirmed our improvements, resulting in a well-optimized and fully compliant Progressive Web App.