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PWA Experiment -11

❖ Aim:

To use Google Lighthouse PWA Analysis Tool to test the PWA functioning.

❖ Theory:

Google Lighthouse: Overview

Google Lighthouse is an open-source automated tool developed by Google to audit web applications based on multiple parameters, including performance, accessibility, SEO, best practices, and Progressive Web App (PWA) implementations. It provides an in-depth analysis of a webpage by running different tests and generating a detailed report highlighting areas for improvement.

Lighthouse can be executed via **Chrome DevTools**, **Node.js command line**, or as a **browser extension**. It helps developers optimize their applications to enhance user experience, improve mobile responsiveness, and ensure compliance with best web development practices.

Key Features of Google Lighthouse

Lighthouse audits web pages for both **desktop** and **mobile** versions. The key metrics analyzed during an audit are as follows:

● Performance:

This metric evaluates how fast a webpage loads and becomes interactive for users. The score is based on various factors, including:

- **First Contentful Paint (FCP):** Measures the time taken to render the first visible content.
- **Largest Contentful Paint (LCP):** Measures the time taken for the largest visible element to load.
- **Time to Interactive (TTI):** Measures how long the page takes to become fully interactive.
- **Speed Index:** Indicates how quickly content is visually displayed.
- **Total Blocking Time (TBT):** Calculates the time a page remains unresponsive due to heavy JavaScript execution.

A **high performance score (closer to 100)** means the website loads quickly and delivers a smooth user experience.

● Progressive Web App (PWA) Analysis:

Google Lighthouse checks whether a web application follows the **Baseline PWA Checklist** set by Google. It verifies essential PWA components like:

- **Service Workers:** Ensuring offline functionality and background synchronization.
- **Web App Manifest:** Proper implementation of manifest.json for home screen installation.
- **Viewport Handling:** Ensuring mobile-friendliness with <meta name="viewport">.
- **HTTPS:** Ensuring a secure connection for user safety.
- **Responsive Design:** Optimizing layout and content for different screen sizes.
- **Offline Support:** Verifying if key resources are cached to enable offline access.

A high **PWA score** ensures that the application provides an **app-like experience** on mobile devices.

- **Accessibility:**

Accessibility measures how well a web page supports users with disabilities, including those using screen readers and assistive technologies. Lighthouse evaluates accessibility based on:

- **ARIA Attributes:** Proper use of aria-label, aria-required, etc. for better screen reader support.
- **Text Contrast:** Ensuring readable text against the background color.
- **Keyboard Navigation:** Ensuring all elements are accessible via keyboard (no mouse required).
- **Form Labels:** Ensuring form fields have proper labels and descriptions.
- **Alt Text for Images:** Checking if images have alt attributes for visually impaired users.

Accessibility scores are calculated based on pass/fail criteria. A **low score** means that the website is not user-friendly for people with disabilities.

- **Best Practices:**

Lighthouse evaluates whether a web application follows industry-recommended best practices to ensure security, efficiency, and maintainability. It checks for:

- **Use of HTTPS:** Ensuring a secure connection.
- **Deprecated Code:** Identifying outdated HTML tags, CSS styles, and JavaScript APIs.
- **Password Protection:** Verifying that users can securely input passwords (e.g., disabling "paste" for password fields).
- **Safe JavaScript Execution:** Identifying possible security risks and performance issues in JavaScript code.
- **Geo-Location and Cookie Alerts:** Ensuring compliance with privacy regulations like GDPR by displaying necessary permission prompts.

A **high Best Practices score** ensures the website is built using modern, secure, and efficient coding techniques.

- **SEO (Search Engine Optimization):**

SEO audits help determine how well a webpage is optimized for search engines. Lighthouse checks:

- **Meta Tags:** Ensuring title and meta description are properly set.
- **Mobile-Friendliness:** Verifying that the website is optimized for mobile devices.
- **Canonical URLs:** Preventing duplicate content issues.
- **Crawlability:** Ensuring search engines can index the website properly.

A high **SEO score** improves a website's ranking on search engines like

Google.

manifest.json

```
{
  "name": "Streamo -
  Netflix", "short_name":
  "Streamo", "start_url": "/",
  "display": "standalone",
  "background_color": "#000000",
  "theme_color": "#000000",
  "description": "Watch unlimited movies & TV shows.",
  "icons": [
    {
      "src": "/logo.png",
      "type": "image/png",
      "sizes": "192x192"
    },
    {
      "src": "/logo.png",
      "type": "image/png",
      "sizes": "512x512"
    }
  ]
```

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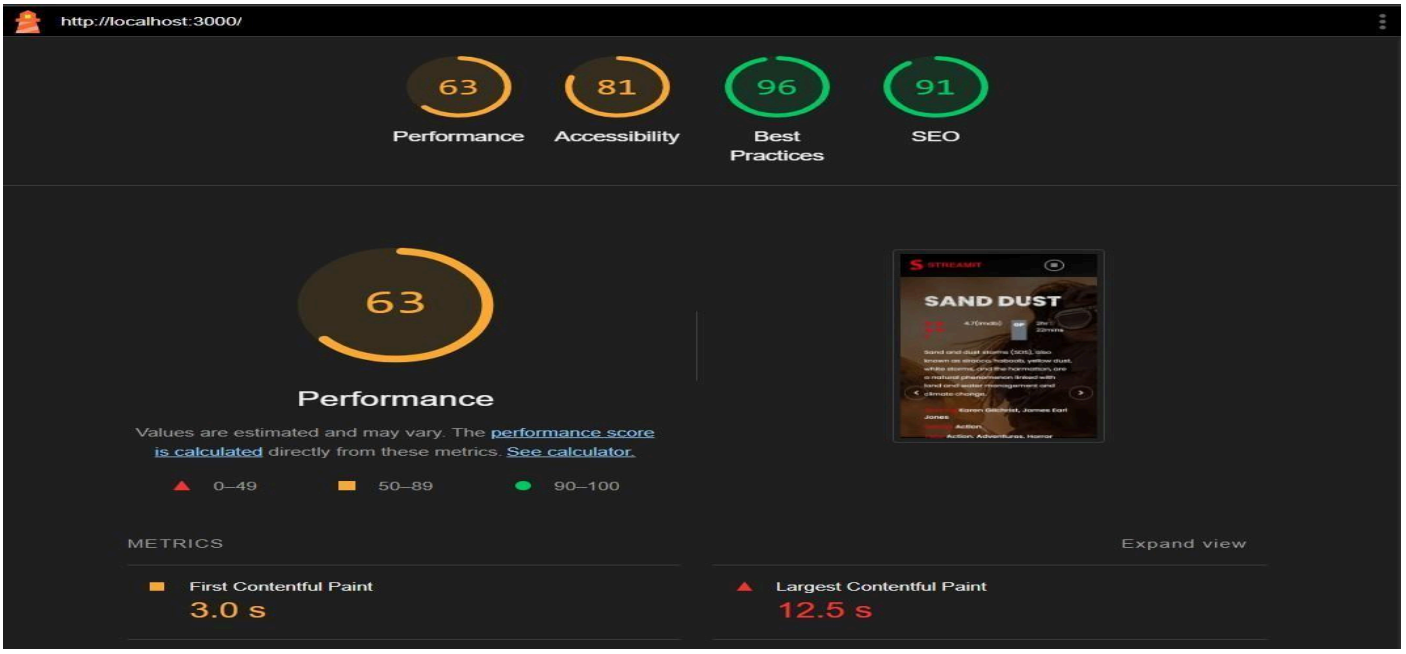
❖ Output

- Before Code change



- After code change