Aaryan Kalbhor
DISB-26

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MPL Assignment - 2

Define progressive webApp (PWA) and explain its significance in modern web development. Discuss the key characteristics that differentiate PWA's from traditional mobile apps

A progressive web App (PWA) is a type of web application that works like a mobile app but runs in browser. It can be installed on a device works offline and provides a fast and a smooth user experience

Significance of PWA in modern web development

- Cross platform compatibility
- offline support
- fast performance
- No app store required
- lower development cost

Key difference between PWA & traditional mobile App

Features	PWA	Traditional Mobile Apps
Installation	Direct from browser	Download from App Store
Internet Required	Works offline with caching	Usually requires internet
Performance	Fast with service workers	Faster but needs Installation
Updates	Automatic no appstore approval	manual update needs
Development cost	Lower	Higher

Q2) Define responsiveness web design and explain its importance in the context of progressive web Apps compare and contrast responsiveness fluid & adaptive web design approaches

→ Responsive web design (RWD) is technique that makes web pages adjust automatically to different screen sizes and devices. It ensures a good user experience on mobiles, tablets and desktops without needing separate version of website.

* Importance of responsiveness design in PWA.
- Better user experience - PWA's work smoothly on any device.
- faster load time - optimised design improves speed
- SEO benefits - Google ranks responsive sites higher
- Cost effective - No need to build multiple versions for different screens.

** Comparison of web design approaches

Approaches	How it works	Pros	Cons.
- Responsiveness	Uses flexible grids and CSS media queries to adjust layout	works on cell. devices	Can be complex to design
- Fluid	Uses parent based widths instead of fixed pixels fo. elements resize smoothly	works well on diff screen sizes, easy to implement	less control over layout on large screens
- Adaptive	Uses fixed layouts that change at specific breakpoints	optimised for known screen sizes	more efficient required to design for each screen size.

Key differences

- Responsive Adapts dynamically to all screens.
- Fluid resizes smoothly, but may be fully optimised
- Adaptive load different layouts based on device types.

Describe the lifecycle of service workers including registration installation and activation phase

Lifecycle of service workers.

A service workers is a script that runs in background and helps a web app work offline load faster and send push notification. Its lifecycle has three main phases.

Registration Phase

The browser registers the source worker using Javascript.

Code Eg:-

```
If ('service worker' in navigator) {
    navigator service worker.register ('/sw.js')
.then (() => console.log ('service worker registered'))
.catch (error) => console.log ('registration failed', error)
```

This tells the browser to install and activate the service worker.

Installation phase

The source worker downloads necessary files (HTML, CSS, JS) and stores them in cache.

If successful it moves to activation phase.

Eg:

```
Self.addEventListener ('install', event => {
    event.waitUntil(
```

```
.caches.open(app.cache).then(cache => {
    return cache.addAll(['/','/index.html','/styles.css'
    });
});
```

This ensure the app load even without internet.

3) Activation phase

- The old service worker is replaced with new one
- Unused cache files from the previous version are deleted

Final step fetch & sync

One activated the service worker intercepts network requests serves cached files and sync data when the Internet is available. This lifecycle make PWA's faster, more reliable and capable of working offline.

Q4) Explain the use of Indexed DB in the system service worker of data storage

Ans Use of Indexed DB. in service worker for data storage

Indexed DB is browser database that stores large amounts of structured data like json objects. It helps PWA's work offline by saving and retrieving data efficiently.

Why use Indexed DB. in service worker?

1) Office Support - Stores data when offline and sync is later
2) Efficient storage - Saves structured data like user setting cost items or forms inputs.
3) Faster Access - Retrieves data quickly without needing a network request.

Persistent Data - Data remains saved even after the browser is closed.

How service workers uses Indexed DB?

Opening the database

```
let db;
let request = indexDB.open('My database');
request.onsuccess = function (event) {
    db = event.target.result;
};
```

Creating a store & Adding Data.

```
request.onupgradeneeded = function (event) {
    let db = event.target.result;
    let store = db.createObjectStore('users' & keypath: 'id' })
store.add ({id: 1, name: 'John Doe', age: 25 });
};
```

Fetching Data in service worker.

```
let transaction = db.transaction('users' : 'readonly');
let store = transaction.objectStore('users');
let getuser = store.get(1);

getusers.onsuccess = function() {
    console.log('get user detail');
};
```