

**EXP 8**

**Aim:** To implement Service worker events like fetch, sync and push for a PWA.

**Theory:**

**Service Worker**

Service Worker is a script that works on browser background without user interaction independently. Also, It resembles a proxy that works on the user side. With this script, you can track network traffic of the page, manage push notifications and develop “offline first” web applications with Cache API.

Things to note about Service Worker:

- A service worker is a programmable network proxy that lets you control how network requests from your page are handled.
- Service workers only run over HTTPS. Because service workers can intercept network requests and modify responses, "man-in-the-middle" attacks could be very bad.
- The service worker becomes idle when not in use and restarts when it's next needed. You cannot rely on a global state persisting between events. If there is information that you need to persist and reuse across restarts, you can use IndexedDB databases.
- Service workers make extensive use of promises, so if you're new to promises, then you should stop reading this and check out Promises, an introduction.

**Fetch Event**

You can track and manage page network traffic with this event. You can check existing cache, manage “cache first” and “network first” requests and return a response that you want.

Of course, you can use many different methods but you can find in the following example a “cache first” and “network first” approach. In this example, if the request’s and current location’s origin are the same (Static content is requested.), this is called “cacheFirst” but if you request a targeted external URL, this is called “networkFirst”.

- **CacheFirst** - In this function, if the received request has cached before, the cached response is returned to the page. But if not, a new response requested from the network.
- **NetworkFirst** - In this function, firstly we can try getting an updated response from the network, if this process completed successfully, the new response will be cached and returned. But if this process fails, we check whether the request has been cached before

or not. If a cache exists, it is returned to the page, but if not, this is up to you. You can return dummy content or information messages to the page.

### **Sync Event**

Background Sync is a Web API that is used to delay a process until the Internet connection is stable. We can adapt this definition to the real world; there is an e-mail client application that works on the browser and we want to send an email with this tool. Internet connection is broken while we are writing e-mail content and we didn't realize it. When completing the writing, we click the send button.

Here is a job for the Background Sync.

The following view shows the classical process of sending email to us. If the Internet Connection is broken, we can't send any content to Mail Server.

1. When we click the "send" button, email content will be saved to IndexedDB.
2. Background Sync registration.
3. **If the Internet connection is available**, all email content will be read and sent to Mail Server.

**If the Internet connection is unavailable**, the service worker waits until the connection is available even though the window is closed. When it is available, email content will be sent to Mail Server.

You can see the working process within the following code block.

### **Push Event**

This is the event that handles push notifications that are received from the server. You can apply any method with received data.

We can check in the following example.

"Notification.requestPermission();" is the necessary line to show notification to the user. If you don't want to show any notification, you don't need this line.

In the following code block is in sw.js file. You can handle push notifications with this event. In this example, I kept it simple. We send an object that has "method" and "message" properties. If the method value is "pushMessage", we open the information notification with the "message" property.

### **serviceworker.js**

```
var staticCacheName = "pwa";
```

```
self.addEventListener("install", function (event) {  
  event.waitUntil(preLoad());  
});
```

```
self.addEventListener("fetch", function (event) {  
  event.respondWith(  
    checkResponse(event.request).catch(function () {  
      console.log("Fetch from cache successful!");  
      return returnFromCache(event.request);  
    })  
  );  
  console.log("Fetch successful!");  
  event.waitUntil(addToCache(event.request));  
});
```

```
self.addEventListener("sync", (event) => {  
  if (event.tag === "syncMessage") {  
    console.log("Sync successful!");  
  }  
});
```

```
self.addEventListener("push", function (event) {  
  if (event && event.data) {  
    var data = event.data.json();  
    if (data.method === "pushMessage") {  
      console.log("Push notification requested");  
  
      if (Notification.permission === "granted") {  
        event.waitUntil(  
          self.registration.showNotification("To Do List", {  
            body: data.message,  
          }).catch(function(error) {  
            console.error("Error showing notification:", error);  
          })  
        );  
      } else if (Notification.permission === "denied") {  
        console.error("Notification permission denied.");  
      }  
    }  
  }  
});
```

// Handle the case where notification permission is denied, such as showing a message to the user.

```
    } else {
      Notification.requestPermission().then(function(permission) {
        if (permission === "granted") {
          console.log("Notification permission granted, showing notification");
          self.registration.showNotification("To Do List", {
            body: data.message,
          });
        } else {
          console.error("Notification permission denied.");
          // Handle the case where notification permission is denied after requesting.
        }
      });
    }
  }
}
});
```

```
var filesToCache = ["/login", "/Home", "/About", "/index.html"];
```

```
var preLoad = function () {
  return caches.open("index").then(function (cache) {
    return cache.addAll(filesToCache);
  });
};
```

```
var checkResponse = function (request) {
  return new Promise(function (fulfill, reject) {
    fetch(request)
      .then(function (response) {
        if (response.status !== 404) {
          fulfill(response);
        } else {
          reject();
        }
      })
      .catch(reject);
  });
};
```

```
};
```

```
var addToCache = function (request) {  
  return caches.open("index").then(function (cache) {  
    return fetch(request).then(function (response) {  
      return cache.put(request, response);  
    });  
  });  
};
```

```
var returnFromCache = function (request) {  
  return caches.open("index").then(function (cache) {  
    return cache.match(request).then(function (matching) {  
      if (!matching || matching.status === 404) {  
        return cache.match("index.html");  
      } else {  
        return matching;  
      }  
    });  
  });  
};
```

```
self.addEventListener("activate", (event) => {  
  event.waitUntil(  
    caches.keys().then((cacheNames) => {  
      return Promise.all(  
        cacheNames  
          .filter((name) => {  
            return name !== staticCacheName;  
          })  
          .map((name) => {  
            return caches.delete(name);  
          })  
      );  
    })  
  );  
});
```

## Fetch Event :

The screenshot shows a web browser at `localhost:3000/login` displaying a login form for 'iNotebook'. The form has fields for 'Email address' and 'Password', a 'Log In' button, and a message: 'We'll never share your email with anyone else.' The Chrome DevTools Application panel is open, showing the 'Service workers' section. The service worker is active and running. The 'Fetch Event' log shows a successful fetch from the cache.

**Service workers**

- Source: `serviceworker.js` 8
- Received: 3/25/2024, 1:44:53 PM
- Status: #6636 activated and is running stop
- Push: ("method": "pushMessage", "message": ...) Push
- Sync: syncMessage Sync
- Periodic Sync: test-tag-from-devtools Periodic Sync
- Update Cycle: Version Update Activity Timeline
- #6636 Install |
- #6636 Wait |

**Fetch Event Log**

- Uncaught (in promise) TypeError: Failed to fetch at `serviceworker.js:83:12`
- Fetch successful! `serviceworker.js:14`
- Fetch from cache successful! `serviceworker.js:10`

## Sync Event :

The screenshot shows the same web browser at `localhost:3000/login` displaying the login form. The Chrome DevTools Application panel is open, showing the 'Service workers' section. The service worker is active and running. The 'Sync Event' log shows a successful sync event.

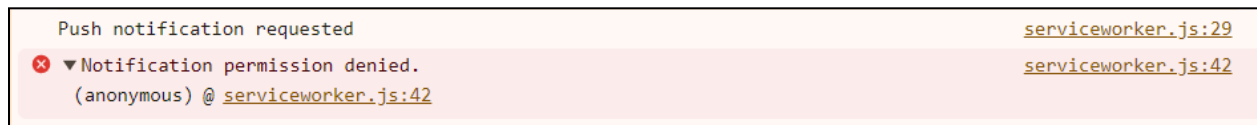
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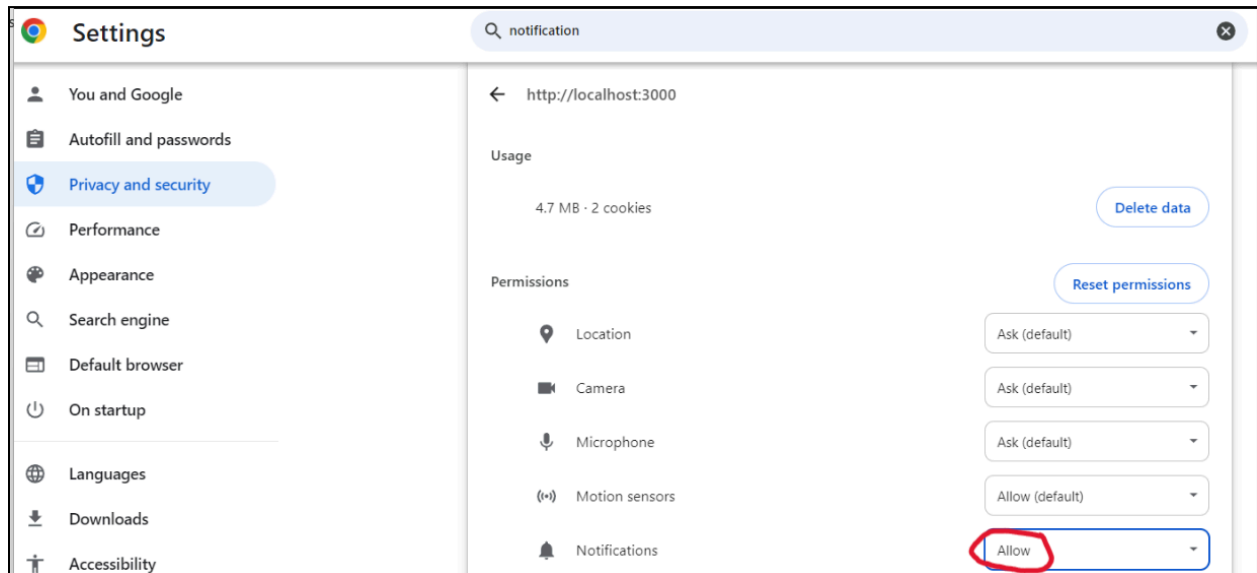
**Sync Event Log**

- ServiceWorkerRegistration {installing: null, waiting: null, active: ServiceWorker, navigationPreload: NavigationPreloadManager, scope: 'http://localhost:3000/', ...}
- Sync successful! `serviceworker.js:20`

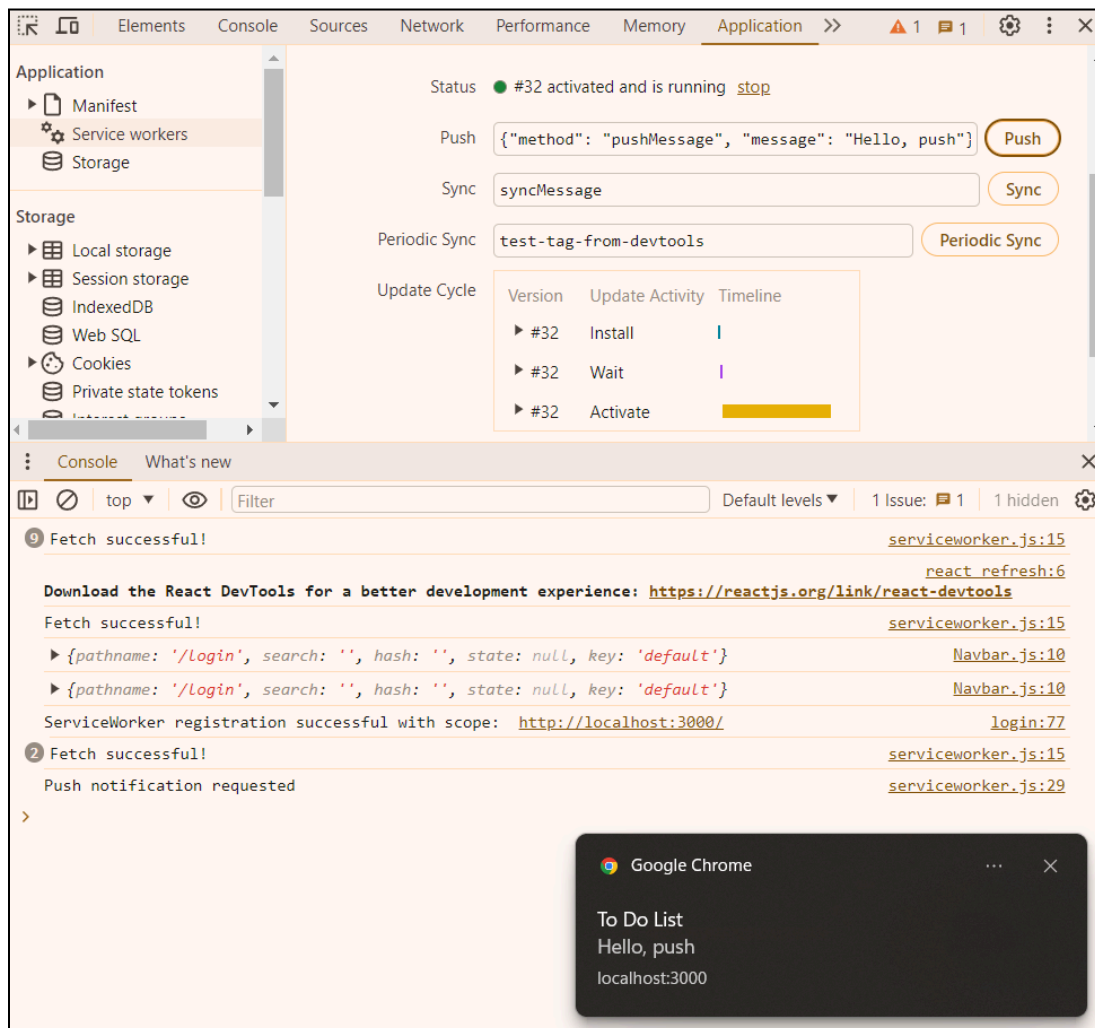
## Push Event:



Go to Site Settings and allow Notifications:



Now, we can see the desired result:



**CONCLUSION:**

- The aim is to enhance the functionality and user experience of a Progressive Web App (PWA) by implementing service worker events such as fetch, sync, and push.
- These events enable the app to efficiently cache resources for offline access, synchronize data in the background, and deliver timely notifications to users, thereby improving performance, reliability, and engagement.