

## PWA Lab

### PRACTICAL 9

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**Aim:** To implement Service worker events like fetch, sync and push for E-commerce 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.

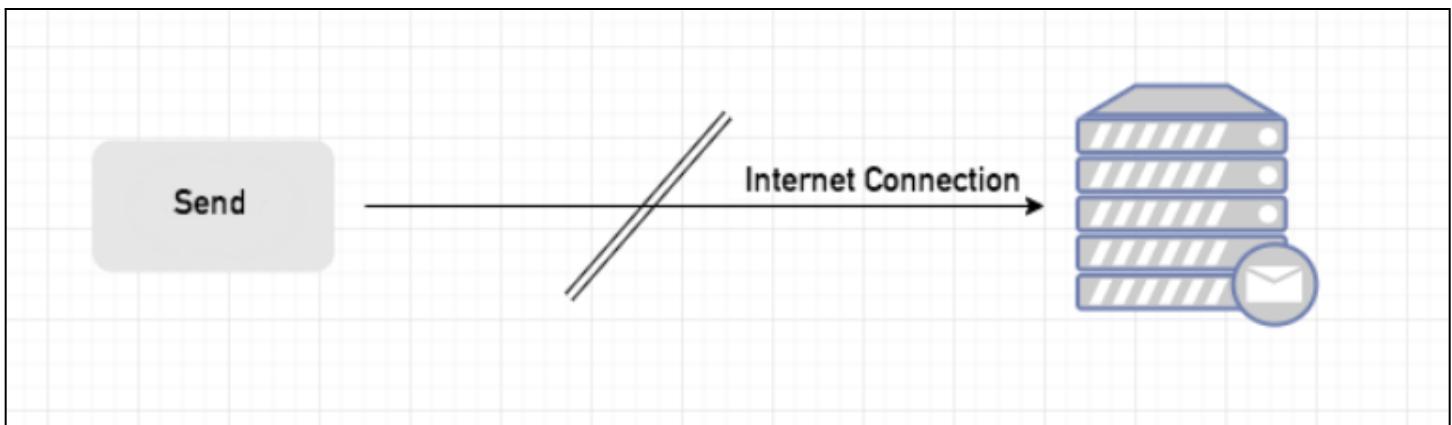
You can return dummy content or information messages to the page.

## Sync Event

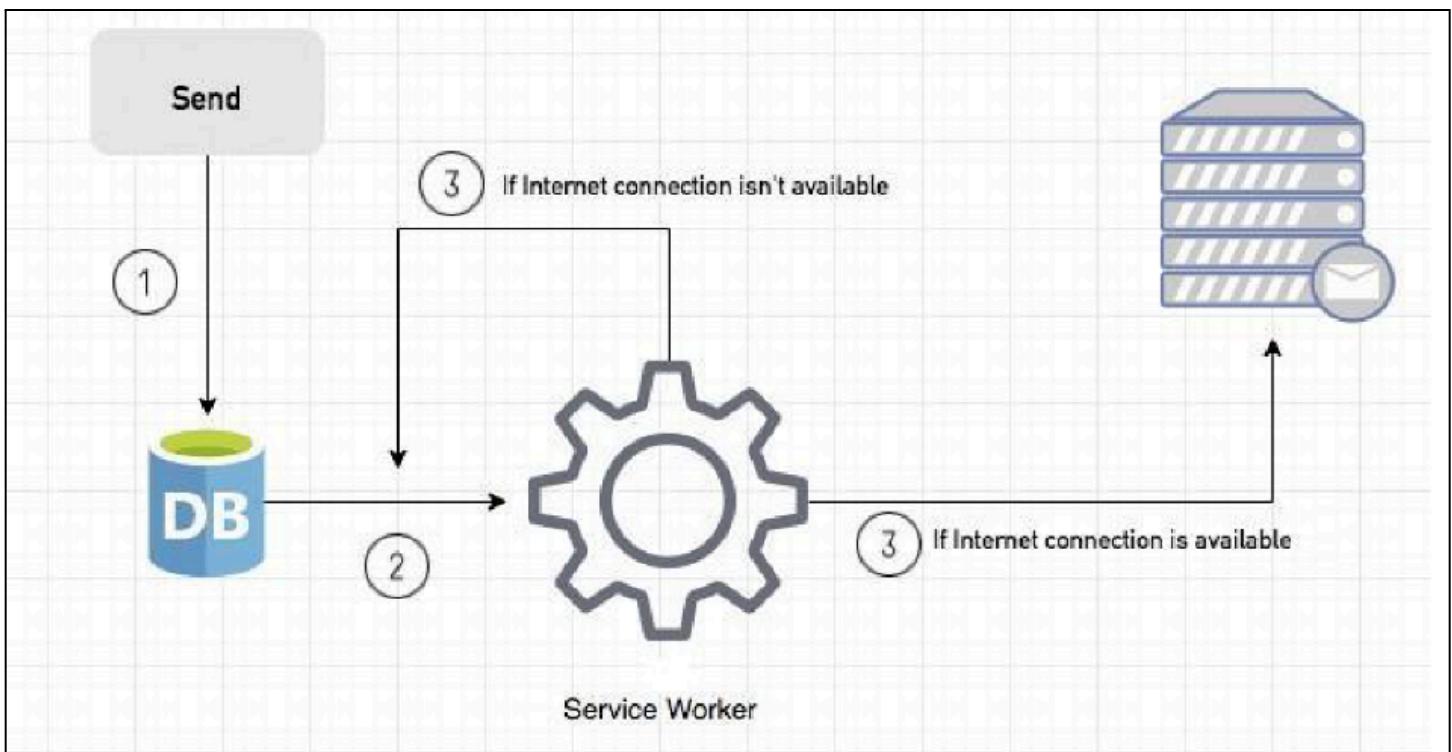
Background Sync is a Web API that is used to delay a process until the Internet connection is stable. We can adapt this definition to the real world; there is an e-mail client application that works on the browser and we want to send an email with this tool. Internet connection is broken while we are 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.



Here, you can create any scenario for yourself. A sample is in the following for this case.



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.

#### Event Listener for Background Sync Registration

#### Event Listener for sw.js

#### 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.

### CODE AND OUTPUT:

#### service-worker.js

```
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) {
    try {
      var data = event.data.json();
      if (data && data.method === "pushMessage") {
        console.log("Push notification sent");
        self.registration.showNotification("Twiggy", {
          body: data.message,
        });
      }
    } catch (error) {
      console.error("Error parsing push data:", error);
    }
  }
});
};

var preLoad = function () {
  return caches.open("offline").then(function (cache) {
    // caching index and important routes
    return cache.addAll([
      '/',
      '/index.html',
      '/style.css',
      '/app.js',
      '/blog.html',
      '/about.html',
      '/contact.html',
      '/menu.html',
      '/products.html',
      '/review.html',
      '/script.js'
    ]);
  });
};

var checkResponse = function (request) {
  return new Promise(function (fulfill, reject) {
    fetch(request)
      .then(function (response) {
        if (response.status !== 404) {
          fulfill(response);
        } else {
          reject(new Error("Response not found"));
        }
      })
  });
};

```

```

        })
        .catch(function (error) {
            reject(error);
        });
    });
};

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

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

```

## app.js

```

if ('serviceWorker' in navigator) {
    window.addEventListener('load', () => {
        navigator.serviceWorker.register('serviceworker.js')
            .then(registration => {
                console.log('Service Worker registered with scope:', registration.scope);
            })
            .catch(error => {
                console.error('Service Worker registration failed:', error);
            });
    });
}

<script>
if ('Notification' in window) {
    Notification.requestPermission().then(function (result) {
        if (result === 'granted') {
            console.log('Notification permission granted');
        } else {

```

```

        console.warn('Notification permission denied');
    }
});
}

</script>

```

## 1) Fetch Event

The screenshot shows the Chrome DevTools Application tab for the URL `http://127.0.0.1:5500/index.html`. The left sidebar lists various storage and background services. The main panel displays a service worker registration for `http://127.0.0.1:5500/` with the source file `serviceworker.js`. The registration has been active since 3/25/2024, 8:10:33 PM. It shows a status of '#307 activated and is running' and a push message received on 1/1/1970, 5:30:00 AM with the content 'Hello! This is Shubham'. There is also a sync message from 'test-tag-from-devtools'. The update cycle shows three events: Install, Wait, and Activate. The bottom Console tab shows log entries for 'Fetch successful!' and 'Service Worker registered with scope: http://127.0.0.1:5500/'. The right side of the DevTools interface shows network requests, updates, and unregistration buttons.

## 2) Push Event

The screenshot shows a Twiggy E-commerce PWA on the left and the Chrome DevTools Application tab on the right. The PWA displays a pizza with toppings like ham, cheese, and arugula. The DevTools Application tab shows a push event from 'serviceworker.js' with the message 'Hello! This is Shubham'. A red box highlights the 'Push' button in the DevTools interface.

http://127.0.0.1:5500/index.html

Application

- Manifest
- Service workers
- Storage

Storage

- Local storage
- Session storage
- IndexedDB
- Web SQL
- Cookies
- Private state tokens
- Interest groups
- Shared storage
- Cache storage

Background services

- Back/forward cache
- Background fetch
- Background sync
- Bounce tracking mitigation
- Notifications
- Payment handler

Periodic Sync

Update Cycle

Service workers from other origins

Console

```
Notification permission granted
Service Worker registered with scope: http://127.0.0.1:5500/
Fetch successful!
Push notification sent
```

Sync successful!

Sync

Periodic Sync

Update Cycle

Service workers from other origins

See all registrations

Default levels ▾ 4 Issues: 4 1 hidden

Google Chrome

Ecommerce website

Hello! This is Shubham

127.0.0.1:5500

## 3) Sync Event

The screenshot shows a Twiggy E-commerce PWA on the left and the Chrome DevTools Application tab on the right. The PWA displays a pizza with toppings like ham, cheese, and arugula. The DevTools Application tab shows a sync event from 'serviceworker.js' with the message 'syncMessage'. A red box highlights the 'Sync' button in the DevTools interface.

http://127.0.0.1:5500/index.html

Application

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Periodic Sync

Update Cycle

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See all registrations

Default levels ▾ 4 Issues: 4 1 hidden

index.html:401

app.js:5

serviceworker.js:11

serviceworker.js:24

serviceworker.js:16

Sync successful!

## Conclusion:

In this experiment, we have successfully implemented service worker events like fetch, sync and push for my Twiggy E-commerce PWA and found out output for above implementation.