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PWA Experiment - 9

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.

```

self.addEventListener("fetch", function (event) {
  const req = event.request;
  const url = new URL(req.url);

  if (url.origin === location.origin) {
    event.respondWith(cacheFirst(req));
  }
  else {
    event.respondWith(networkFirst(req));
  }
});

async function cacheFirst(req) {
  return await caches.match(req) || fetch(req);
}

async function networkFirst(req) {
  const cache = await caches.open("pwa-dynamic");
  try {
    const res = await fetch(req);
    cache.put(req, res.clone());
    return res;
  } catch (error) {
    const cachedResponse = await cache.match(req);
    return cachedResponse || await caches.match("./noconnection.json");
  }
}

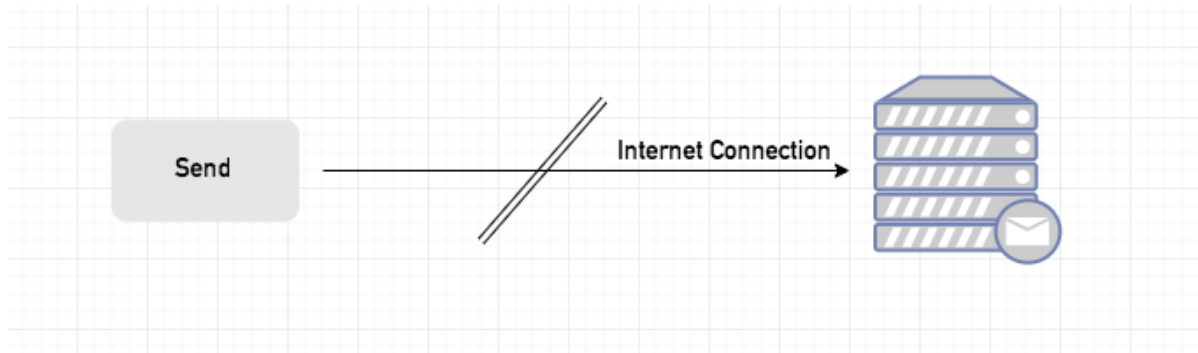
```

Sync Event

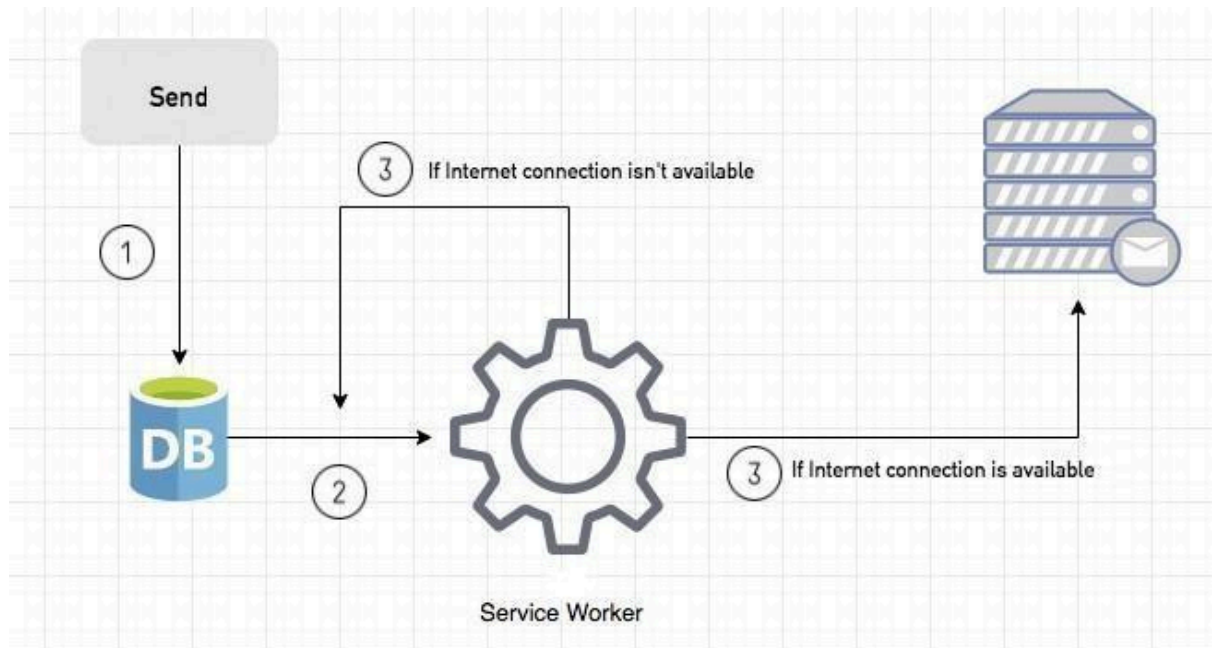
Background Sync is a Web API that is used to delay a process until the Internet connection is stable. We can adapt this definition to the real world; there is an e-mail client application that works on the browser and we want to send an email with this tool. Internet connection is broken while we are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

```

document.querySelector("button").addEventListener("click", async () => {
  var swRegistration = await navigator.serviceWorker.register("sw.js");
  swRegistration.sync.register("helloSync").then(function () {
    console.log("helloSync success [main.js]");
  });
});

```

Event Listener for sw.js

```
self.addEventListener('sync', event => {  
  if (event.tag == 'helloSync') {  
    console.log("helloSync [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

```
self.addEventListener('push', event => {  
  if (event && event.data) {  
    var data = event.data.json();  
    if (data.method === "pushMessage") {  
      event.waitUntil(self.registration.showNotification("Test App", {  
        body: data.message  
      }));  
    }  
  }  
});
```

value is “pushMessage”, we open the information notification with the “message” property.

You can use Application Tab from Chrome Developer Tools for testing push notification.

```
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') {
```

Code:

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("Learn2Drive", {
```

```

        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',
            '/index.css',
            '/index.js',
            '/images/one_512.png',
            '/images/two_.png');
    });
};
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(new Error("Fetch failed"));
            });
    });
};

```

```

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)                                     r
{                                     o
r                                     r
e                                     )
j                                     ;
e                                     });
c
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;
      });
    });
  });
};

```

Output- Push-

The screenshot shows the Chrome DevTools Application tab with the Service Workers panel selected. The service worker is registered for the scope `http://127.0.0.1:5500/` and is currently activated. The 'Push' button is highlighted, and a notification is being sent with the message 'Hello, Sneha here!'.

Service workers

☐ Offline ☒ Update on reload ☐ Bypass for network

http://127.0.0.1:5500/ [Network requests](#) [Update](#) [Unregister](#)

Source: [service-worker.js](#)

Received 3/30/2024, 1:10:38 PM

Status: #2549 activated and is running [stop](#)

Clients: [http://127.0.0.1:5500/](#) [focus](#)

Push: `{ "method": "pushMessage", "message": "Hello, Sneha here!" }` [Push](#)

Sync: `syncMessage` [Sync](#)

Periodic Sync: `test-tag-from-devtools` [Periodic Sync](#)

Update Cycle

Version	Update Activity	Timeline
#2549	Install	
#2549	Wait	
#2549	Activate	■

Console What's new Issues

Live reload enabled.

Notification permission granted

Service Worker registered with scope: [http://127.0.0.1:5500/](#)

Push notification sent

[\(index\):46](#)

Google Chrome

Learn2Drive

Hello, Sneha here!

127.0.0.1:5500

[\(index\):46](#)

Google Chrome

Learn2Drive

Hello, Sneha here!

127.0.0.1:5500

Fetch-

127.0.0.1:5500/index.html

Dimensions: Pixel 7 412 x 915 71%

Fetch successful!

Notification permission granted

Fetch successful!

Service Worker registered with scope: http://127.0.0.1:5500/

Fetch successful!

Fetch from cache successful!

The FetchEvent for "http://127.0.0.1:5500/favicon.ico" resulted in a network error response: an object that was not a Response was passed to respondWith().

GET http://127.0.0.1:5500/favicon.ico net::ERR_FAILED

Uncaught (in promise) TypeError: Failed to execute 'addAll' on 'Cache': The provided value cannot be converted to a sequence.

Push notification sent

Sync successful!

Storage

Local storage

Session storage

IndexedDB

Web SQL

Cookies

Private state tokens

Interest groups

Shared storage

Cache storage

app-storage - http://127.0

ecommerce-pwa-v1 - http

offline - http://127.0.0.1:55

Background services

Back/forward cache

Background fetch

http://127.0.0.1:5500

Origin http://127.0.0.1:5500

Bucket name default

Is persistent No

Durability relaxed

Quota 0 B

Expiration None

#	Name	Response-Type	Content-Type	Content-Length	Time Cached	Vary Header
1	images/one-512.png		image/png	31940	3/30/2024, 11:	Origin

Headers Preview

Total entries: 6

Console

Filter

Default levels 1 issue 1 1 hidden

service-worker.js:11

index.html:61

service-worker.js:11

index.js:25

service-worker.js:11

service-worker.js:7

service-worker.js:16

Sync

127.0.0.1:5500

Dimensions: Pixel 7 412 x 915 71%

Live reload enabled.

Notification permission granted

Service Worker registered with scope: http://127.0.0.1:5500/

Push notification sent

Sync successful!

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 mitigations

Notifications

Payment handler

Service workers

Offline Update on reload Bypass for network

http://127.0.0.1:5500/

Source service-worker.js

Received 3/30/2024, 1:10:38 PM

Status #2549 activated and is running stop

Clients http://127.0.0.1:5500/ focus

Push {"method":"pushMessage","message":"Hello, Sneha here!"}

Sync syncMessage

Periodic Sync test-tag-from-devtools

Update Cycle

Version	Update Activity	Timeline
#2549	Install	
#2549	Wait	
#2549	Activate	

Console

What's new

Issues

Filter

Default levels 1 issue 1 1 hidden

(index):46

index.js:25

service-worker.js:24

service-worker.js:16

Live reload enabled.

Notification permission granted

Service Worker registered with scope: <http://127.0.0.1:5500/>

Push notification sent

Sync successful!

Conclusion-

Implement fetch, push, sync operations of Service worker for PWA