

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");
  }
}

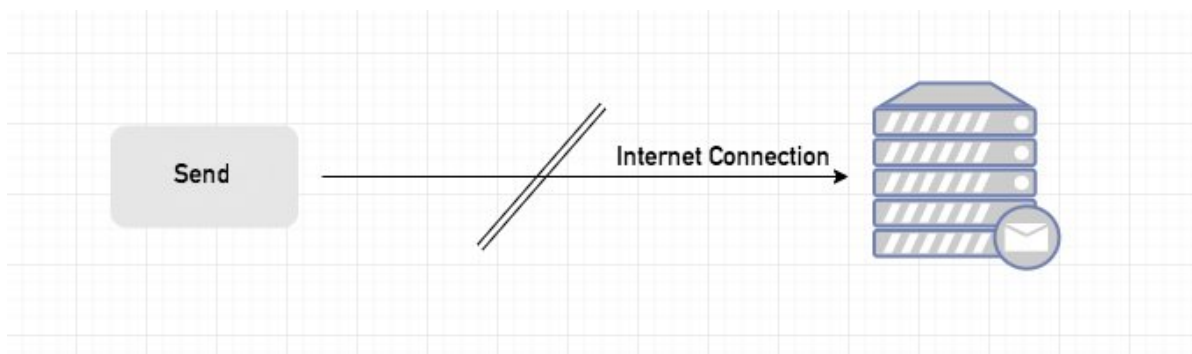
```

Sync Event

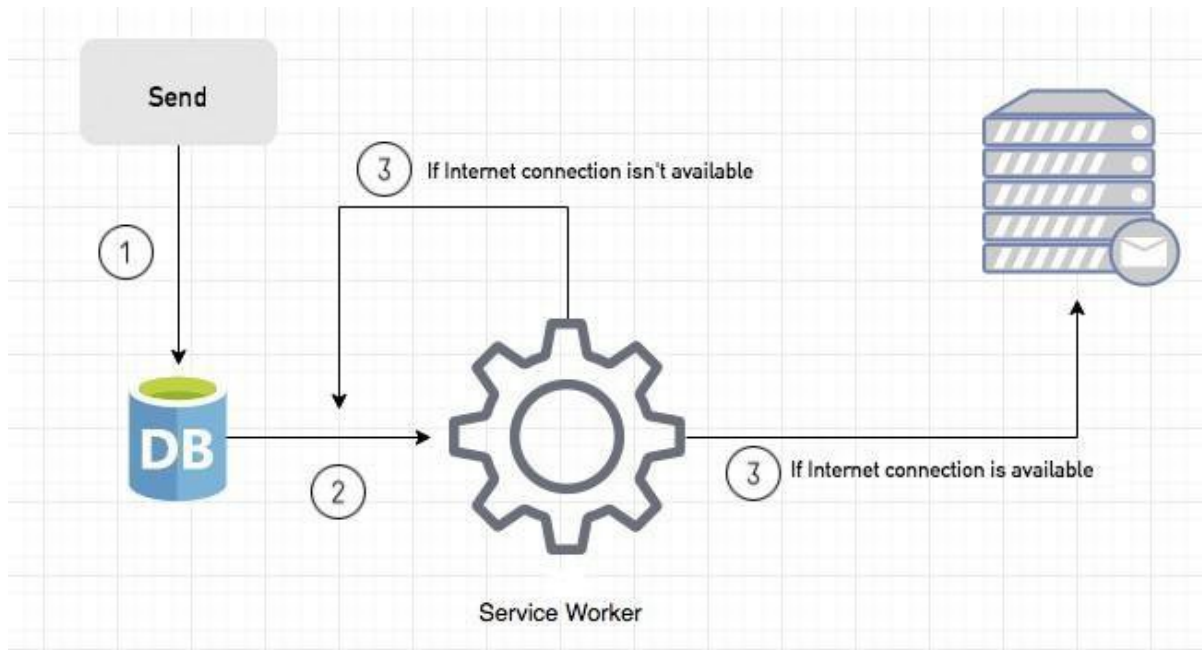
Background Sync is a Web API that is used to delay a process until the Internet connection is stable. We can adapt this definition to the real world; there is an e-mail client application that works on the browser and we want to send an email with this tool. Internet connection is broken while we are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

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:

service-worker.js :

```
const CACHE_NAME = 'static-pwa-cache-v1';
const urlsToCache = [
  'index.html',
  'styles.css',
  'manifest.json',
  'pwa-banner.png',
];

// Install event - Cache essential assets
self.addEventListener('install', (event) => {
  console.log('[Service Worker] Install event triggered');
  event.waitUntil(
    caches.open(CACHE_NAME).then(cache => {
      console.log('[Service Worker] Caching essential assets');
      return Promise.all(
        urlsToCache.map(url =>
          cache.add(url).then(() =>
            console.log(`[Service Worker] Cached successfully: ${url}`)
          ).catch(error =>
            console.error(`[Service Worker] Failed to cache: ${url}`, error)
          )
        )
      );
    })
  ).then(() => {
    console.log('[Service Worker] Caching process completed');
    return self.skipWaiting();
  })
  .catch(error => console.error('[Service Worker] Caching failed:', error))
);
});

// Activate event - Cleanup old caches
self.addEventListener('activate', (event) => {
  console.log('[Service Worker] Activate event triggered');
  event.waitUntil(
    caches.keys().then(cacheNames => {
      return Promise.all(
        cacheNames.map(cacheName => {
          if (cacheName !== CACHE_NAME) {
            console.log('[Service Worker] Deleting old cache:', cacheName);
            return caches.delete(cacheName);
          }
        })
      );
    })
  ).then(() => {
    console.log('[Service Worker] Activation complete');
    return self.clients.claim();
  })
);
});

// Fetch event - Serve cached assets or fetch from network
```

```

self.addEventListener('fetch', (event) => {
  console.log(`[Service Worker] Fetch event triggered for: ${event.request.url}`);
  if (event.request.method !== 'GET') return;

  event.respondWith(
    fetch(event.request).then(networkResponse => {
      console.log(`[Service Worker] Network response for ${event.request.url}`);
      return caches.open(CACHE_NAME).then(cache => {
        cache.put(event.request, networkResponse.clone());
        return networkResponse;
      });
    }).catch(error => {
      console.log(`[Service Worker] Network failed, trying cache for ${event.request.url}`);
      return caches.match(event.request).then(cachedResponse => {
        if (cachedResponse) {
          console.log(`[Service Worker] Serving from cache: ${event.request.url}`);
          return cachedResponse;
        }
        if (event.request.mode === 'navigate') {
          return caches.match(OFFLINE_URL);
        }
        return new Response('Offline', { status: 503, statusText: 'Service Unavailable' });
      });
    })
  );
});

// Sync event - Handle background sync
self.addEventListener('sync', (event) => {
  console.log(`[Service Worker] Sync event triggered: ${event.tag}`);
  if (event.tag === 'sync-demo') {
    event.waitUntil(
      handleSync().catch(error => {
        console.error('[Service Worker] Sync failed:', error);
      })
    );
  }
});

async function handleSync() {
  console.log('[Service Worker] Starting sync...');
  await new Promise(resolve => setTimeout(resolve, 2000));
  console.log('[Service Worker] Sync task completed successfully!');
}

// Push event - Handle push notifications
self.addEventListener('push', (event) => {
  console.log('[Service Worker] Push event received');
  const options = {
    body: event.data ? event.data.text() : 'New update available!',
    icon: 'pwa-banner.png',
    badge: 'badge.png',
    actions: [
      { action: 'open', title: 'View Now' },
      { action: 'dismiss', title: 'Dismiss' }
    ]
  }

```

```

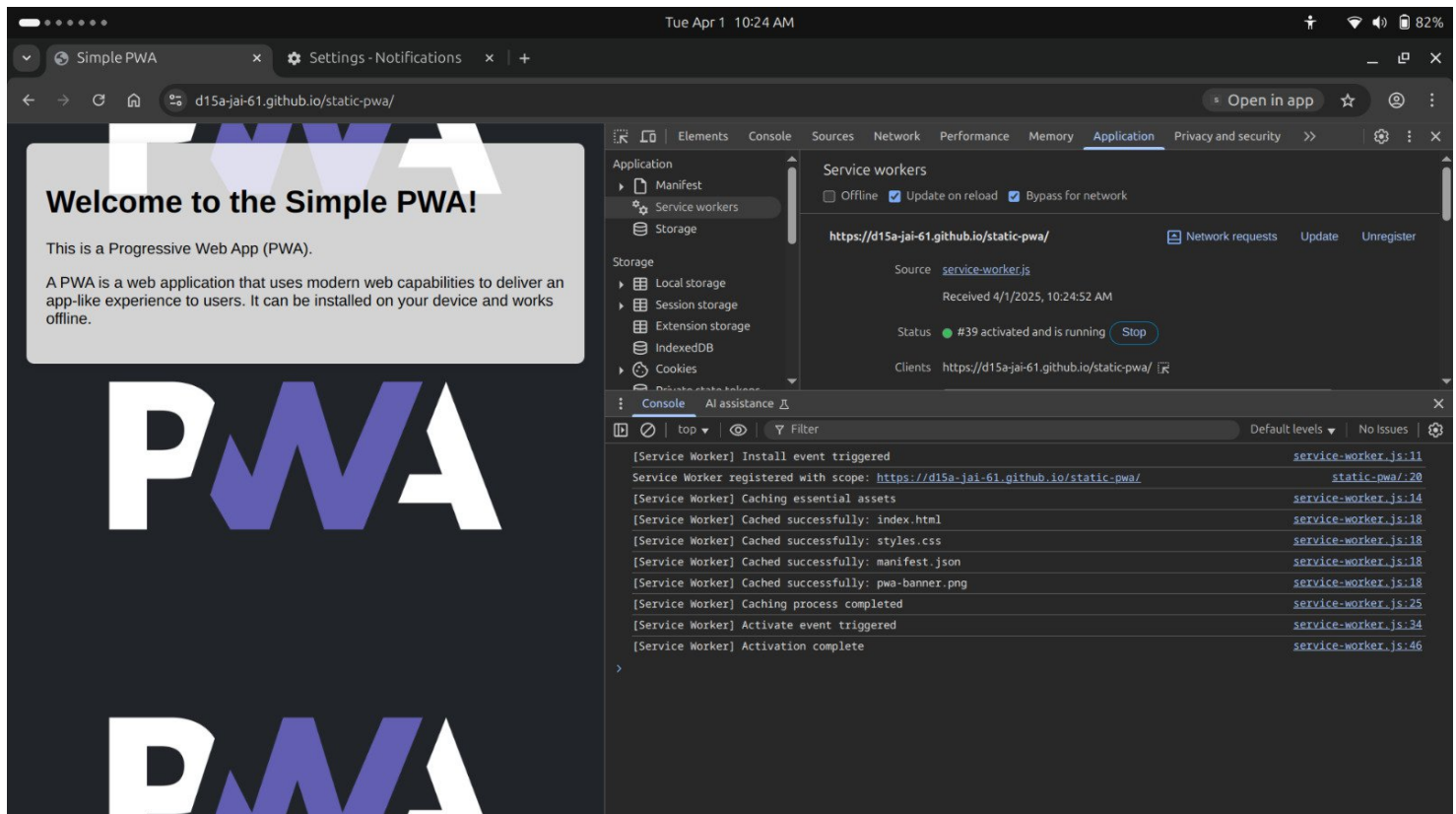
});
event.waitUntil(
  self.registration.showNotification('New Notification', options)
    .then(() => console.log('[Service Worker] Push notification displayed successfully'))
    .catch((error) => console.error('[Service Worker] Failed to display push notification:', error))
);
});

// Handle notification click
self.addEventListener('notificationclick', (event) => {
  console.log(`[Service Worker] Notification clicked: ${event.notification.title}`);
  event.notification.close();
  if (event.action === 'open') {
    console.log('[Service Worker] Opening application');
    event.waitUntil(clients.openWindow('https://your-static-site.com'));
  } else {
    console.log('[Service Worker] Notification dismissed');
  }
});

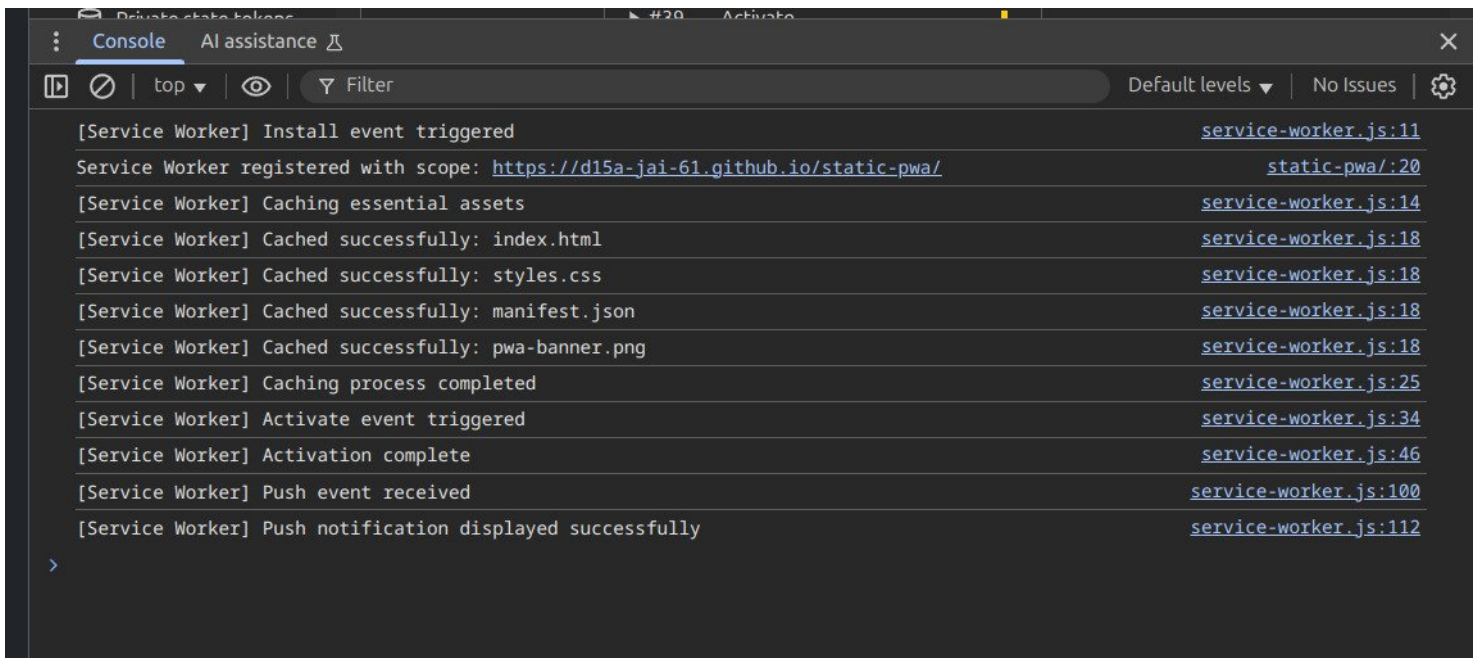
```

OUTPUT:

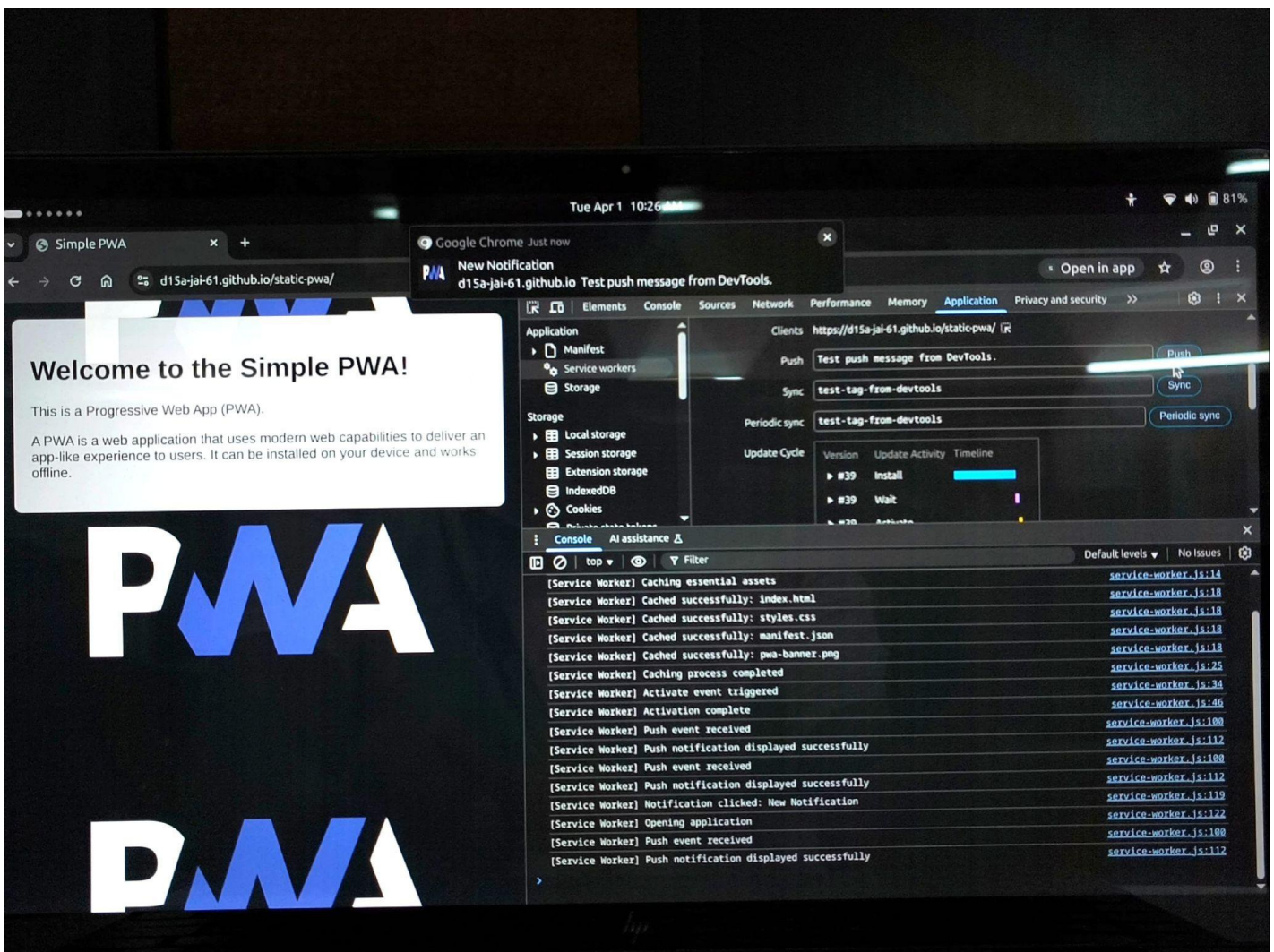
Fetch event

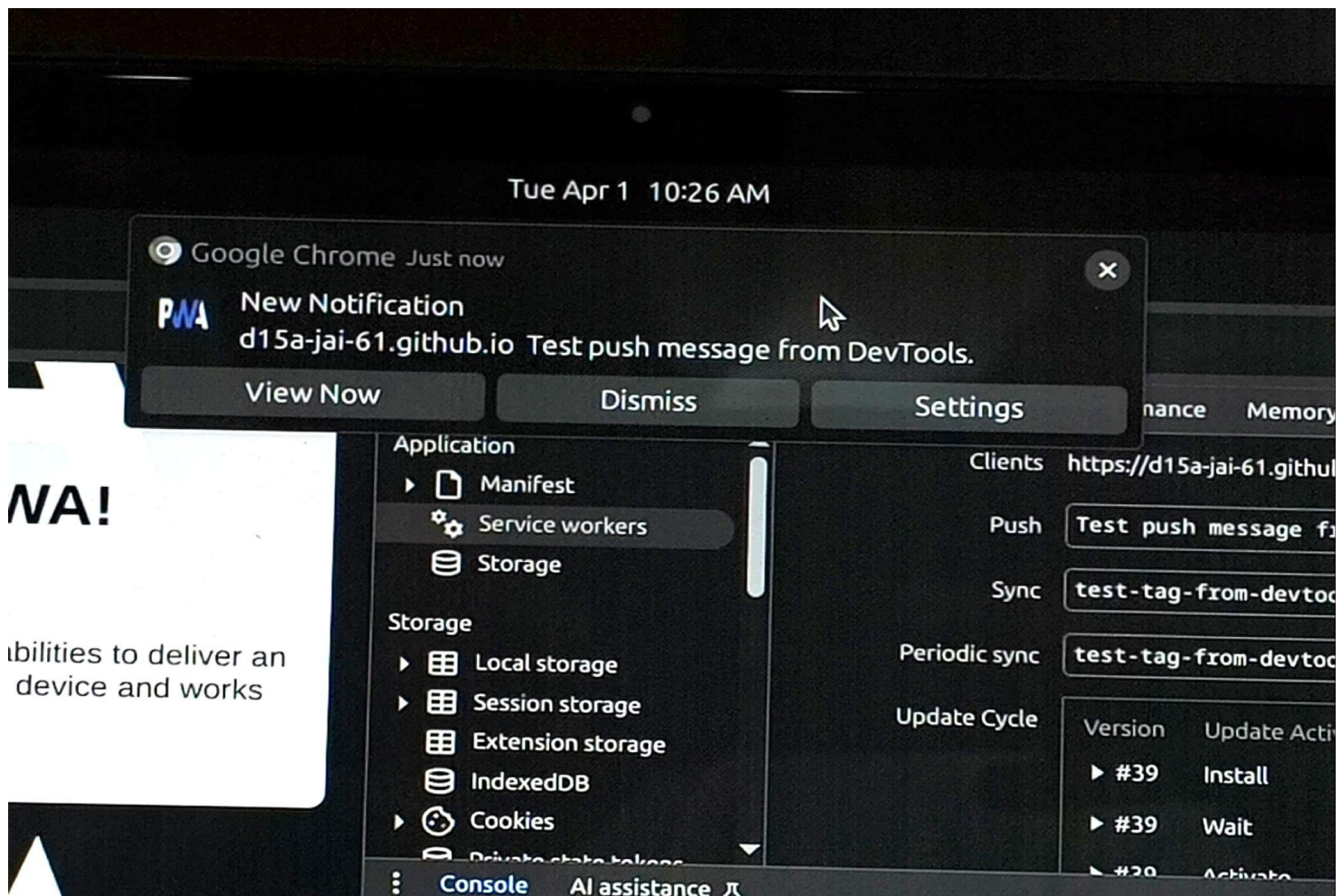


Push event

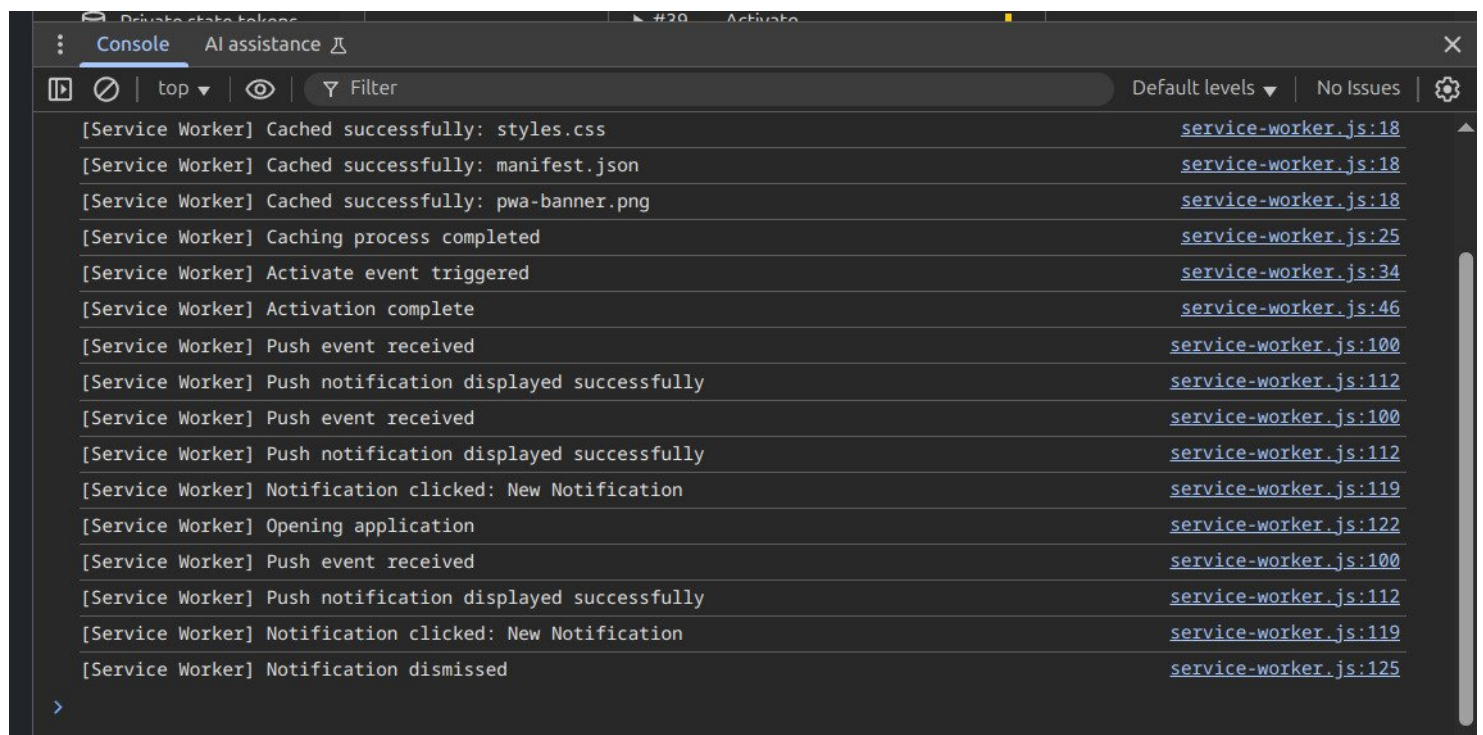


```
[Service Worker] Install event triggered
Service Worker registered with scope: https://d15a-jai-61.github.io/static-pwa/
[Service Worker] Caching essential assets
[Service Worker] Cached successfully: index.html
[Service Worker] Cached successfully: styles.css
[Service Worker] Cached successfully: manifest.json
[Service Worker] Cached successfully: pwa-banner.png
[Service Worker] Caching process completed
[Service Worker] Activate event triggered
[Service Worker] Activation complete
[Service Worker] Push event received
[Service Worker] Push notification displayed successfully
```





After dismissing the notification



Sync event

```
[Service Worker] Opening application service-worker.js:122
[Service Worker] Push event received service-worker.js:100
[Service Worker] Push notification displayed successfully service-worker.js:112
[Service Worker] Notification clicked: New Notification service-worker.js:119
[Service Worker] Notification dismissed service-worker.js:125
[Service Worker] Sync event triggered: test-tag-from-devtools service-worker.js:82
```

>