Push-notifications for PWA

WEBPURPLE

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Agenda

- What is PWA
- How Web Push works
- PWA example (Node.js, React)
- Restrictions and future of PWA
- QA


WHAT IF I TOLD YOU
A WEBSITE IS ALREADY AN "APP"
made on imgur

What is PWA?

Progressive Web Apps are web apps that use emerging web browser APIs and features along with traditional progressive enhancement strategy to bring a native app-like user experience to cross-platform web applications.

Was Steve Jobs the first to introduce the concept of PWAs?

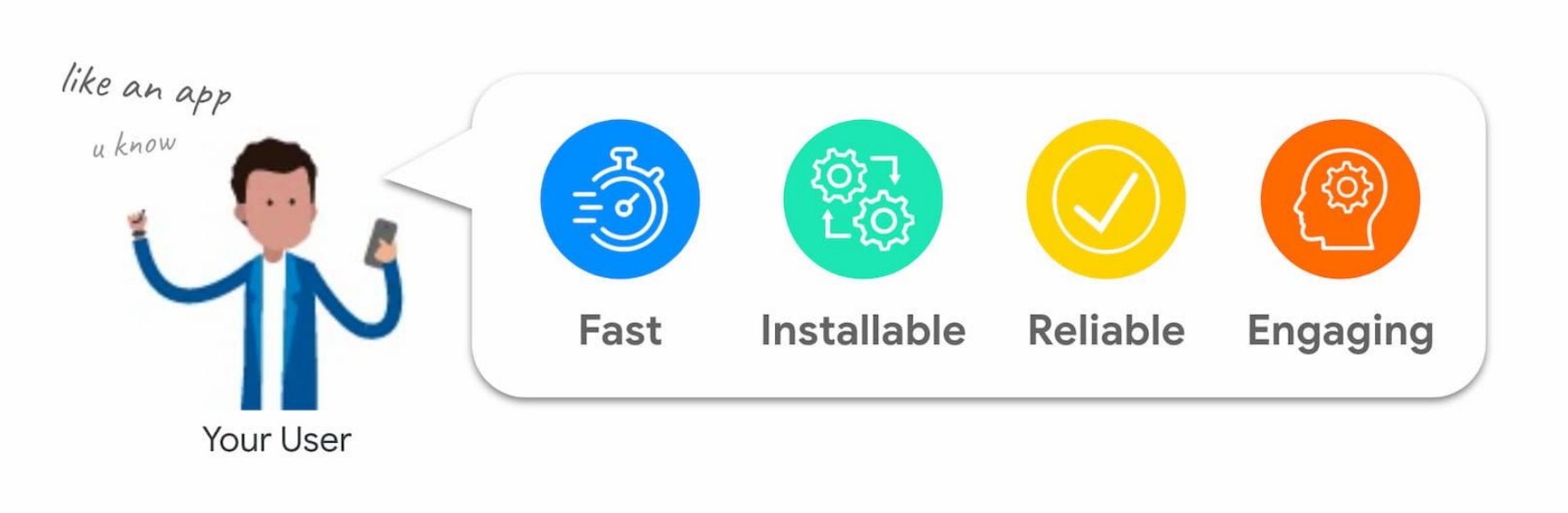
PWAs solve customer needs

Installable - installed PWA run in a standalone window instead of a browser tab.
They're launchable from on the user's home screen.

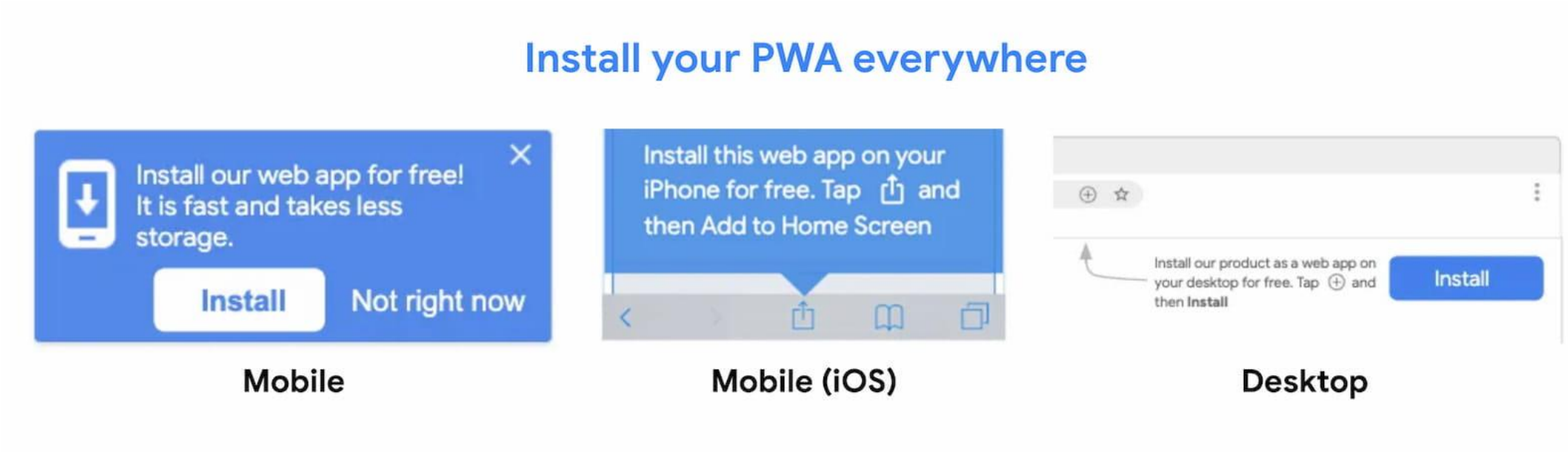
Reliable - PWA can works offline.

Engaging - Having an icon on the home screen makes it easy to get into the app and push notifications can help alert the user of important information that requires their attention.

Responsive - should be able to adapt to different screen sizes and orientations



One app, every platform



One app, every platform

- PWA are more affordable to develop and integrate than native mobile apps
- PWAs do not need to be updated

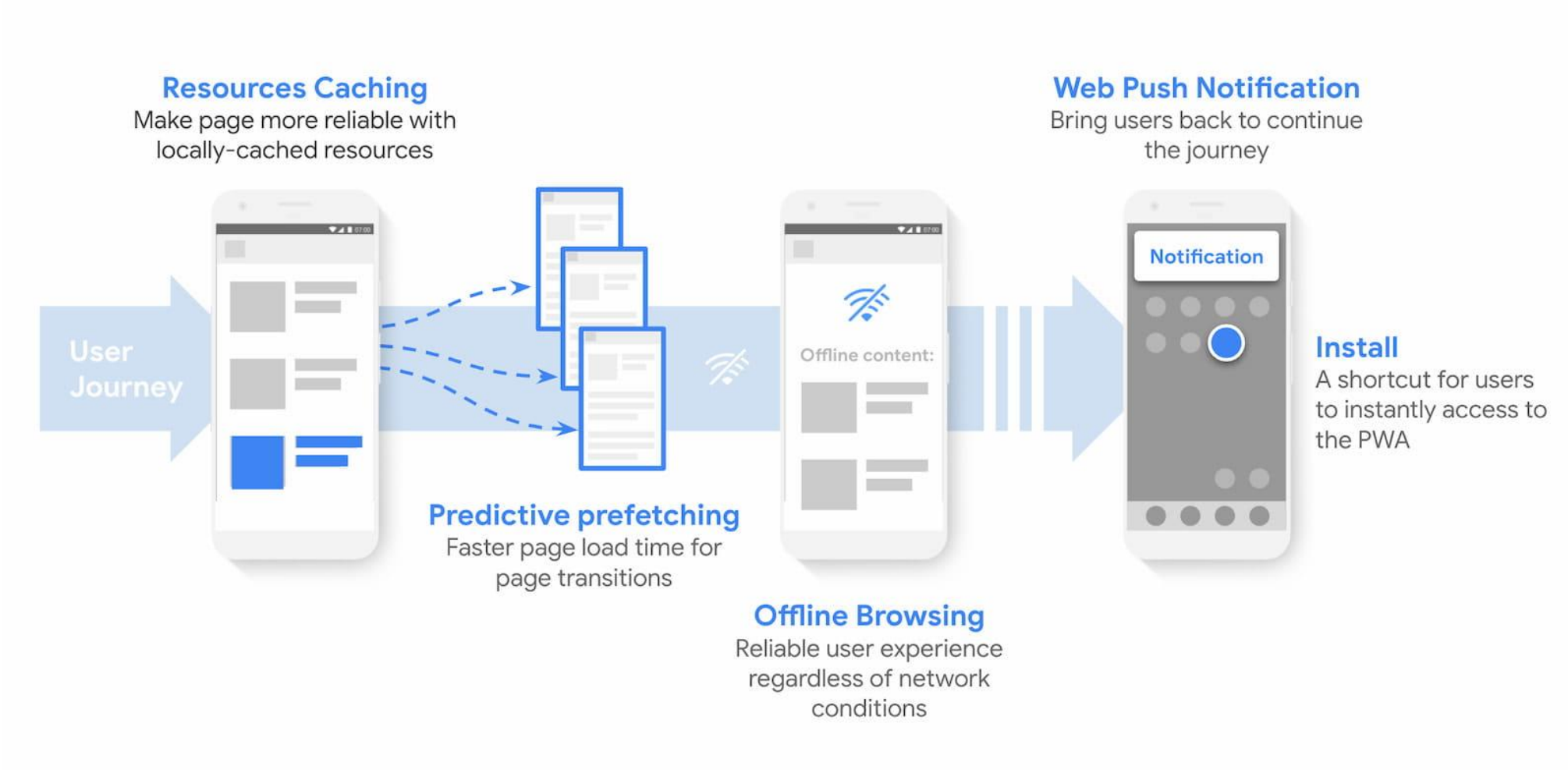
Who is already using PWA?

Twitter saw a 65% increase in pages per session, 75% more Tweets, and a 20% decrease in bounce rate, all while reducing the size of their app by over 97%.

Nikkei saw 2.3 times more organic traffic, 58% more subscriptions, and 49% more daily active users.

Hulu replaced their platform-specific desktop experience with a Progressive Web App and saw a 27% increase in return visits.

PWAs leverage modern web capabilities

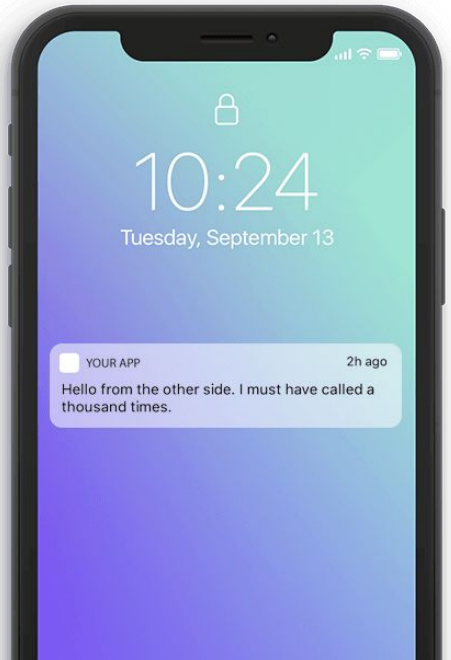


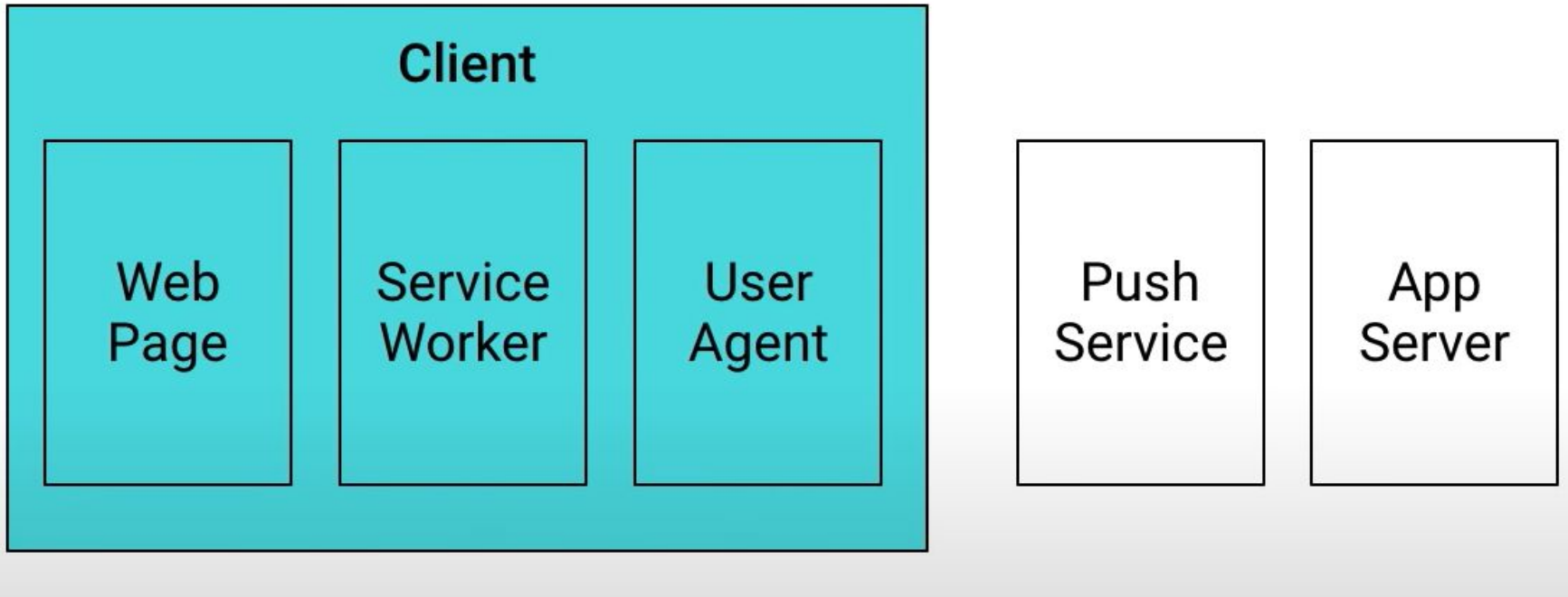
Progressive Web App checklist

- ✔ Use a secure connection (HTTPS)
- ✔ Registers a service worker
- ✔ Manifest file
- ✔ Cross browser support
- ✔ Responsive to any screen size
- ✔ Is installable
- ✔ Provides an offline experience
- ✔ Provides context for permission requests

Push Notifications

- System level notifications, like native apps
- Fresh content that engages users
- Works even when page is closed
- Push Notifications are assembled using two APIs: **the Notifications API and the Push API.**





Request permission

```
Notification.requestPermission(
function(status) {
  console.log('Notification permission
    status:', status);
});
```

```
function displayNotification() {
  if (Notification.permission === 'granted') {
    navigator.serviceWorker.getRegistration()
    .then(function(reg){
      reg.showNotification('Hello world!');
    });
  }
}
```

```
var options = {
  body: 'Here is a notification body!',
  icon: 'images/example.png',
  vibrate: [100, 50, 100],
  // allows us to identify notification
  data: { primaryKey: 1 }
};
reg.showNotification('Hell
```

```
var options = {
  body: 'First notification!',
  actions: [
    {action: 'explore', title: 'Go to the
      site', icon: 'img/check.png'},
    {action: 'close', title: 'No thank you',
      icon: 'img/x.png'},
  ]
};
reg.showNotification('Hello world!', options);
```

How Web Push works

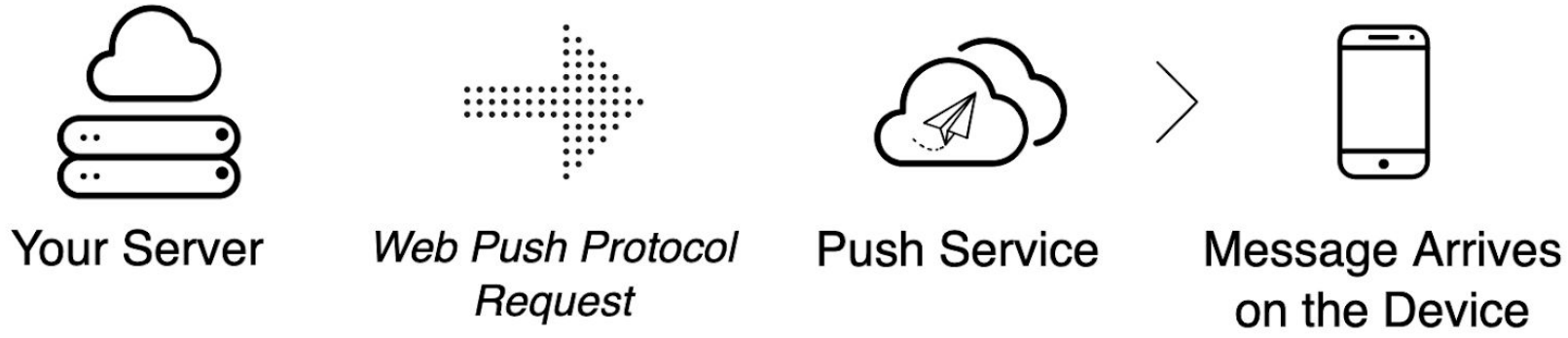
- Each browser manages push notifications through their own system, called a **"push service"**.
- This creates a special subscription object that contains the "endpoint URL" of the push service.
- You send your push messages to this URL, encrypted with the public key, and the push service sends it to the right client
- The endpoint URL contains a unique identifier


```
{
  "ref": Ref(Collection("user-subscriptions"), "264847305464611337"),
  "ts": 1588836923005000,
  "data": {
    "subscription": {
      "endpoint": "https://fcm.googleapis.com/fcm/send/dCnEWwutgGU:APA91bH6_qaSJ1K4jI
      "keys": {
        "p256dh": "BOza3v3KFfYa_iUy2ngBZdYfoCLJrmCMxBLEitqXyF3gueIuhGoTf8Tap_24iCZ1k2
        "auth": "QIxwJ_o_uwcIeFH7bBiuxQ"
      }
    },
    "userId": "0"
  }
}
```

How Web Push works

- **On the client:**
  - Subscribe to the push service
  - Send the subscription object to the server

- **On the server:**
  - Generate the data that we want to send to the user
  - Encrypt the data with the user public key
  - Send the data to the endpoint URL with a payload of encrypted data.



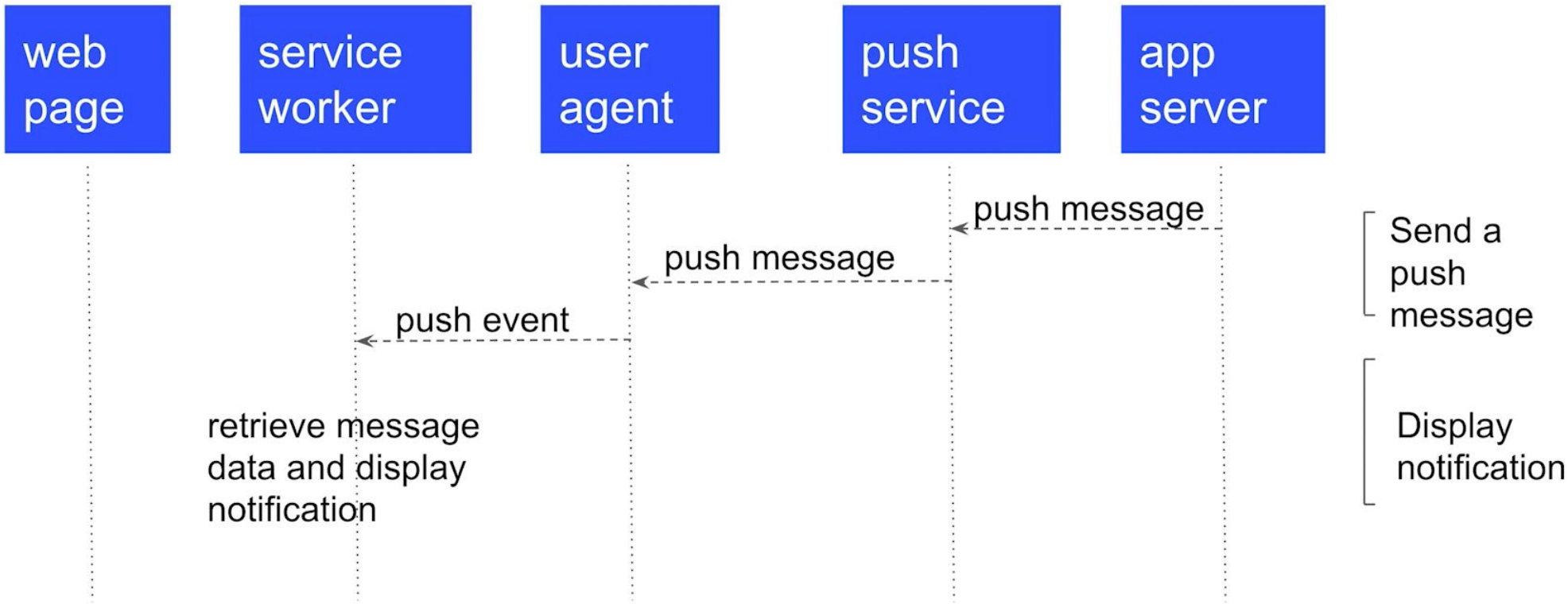
```
navigator.serviceWorker.ready
.then(function(reg) {
  reg.pushManager.getSubscription()
  .then(function(sub) {
    if (sub == undefined) {
      // ask user to register for Push
    } else {
      // You have subscription, update the
      database on your server
    }
  });
});
```

```
navigator.serviceWorker.getRegistration()
.then(function(reg) {
  reg.pushManager.subscribe({
    userVisibleOnly: true
  }).then(function(sub) {
    // send sub.toJSON() to server
  });
});
```

The subscription object

```
{
  "endpoint":
  "https://android.googleapis.com/gcm/send/
  f1LsxkKp...",
  "keys": {
    "p256dh": "BLc4xRzKlKORKWlbOQRv-1n...",
    "auth": "5I2Bu2oKdyy9CwL8QVF0NQ=="
  }
}
```

Send a push notification



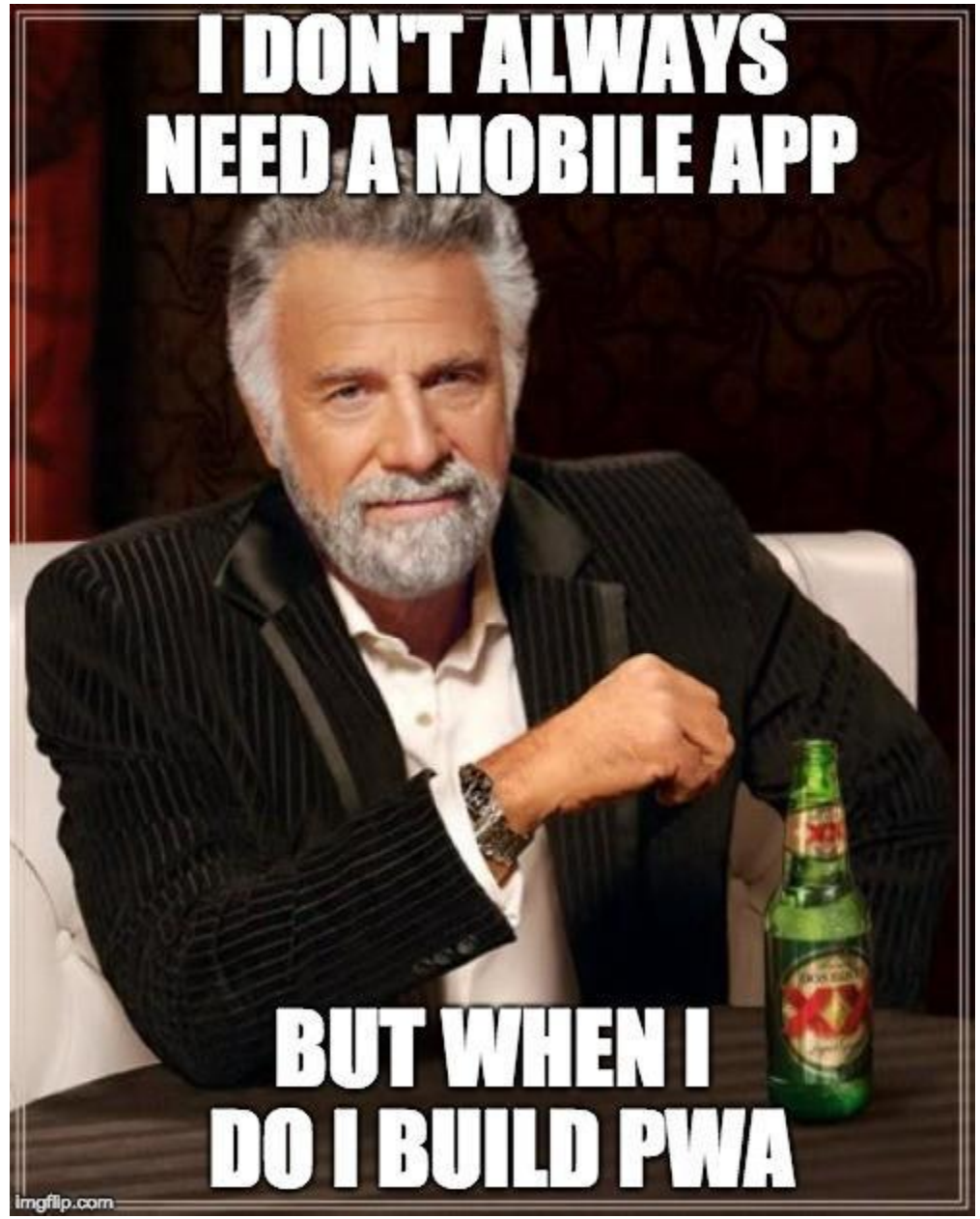
Send a push from server

```
var webPush = require('web-push');
var payload = 'Here is a payload!';
var options = {
  gcmAPIKey:
    'AIzaSyBVImB3hJJ...8J5D4xnFo2fFI',
  TTL: 60
};
webPush.sendNotification(pushSubscription,
  payload, options);
```

What is VAPID?

- Web Push Protocol not requiring strong authentication between your app and the push service
- Publisher optionally identify themselves using the Voluntary Application Server Identification for Web Push (VAPID) protocol.
- This provides a stable identity for the application serve

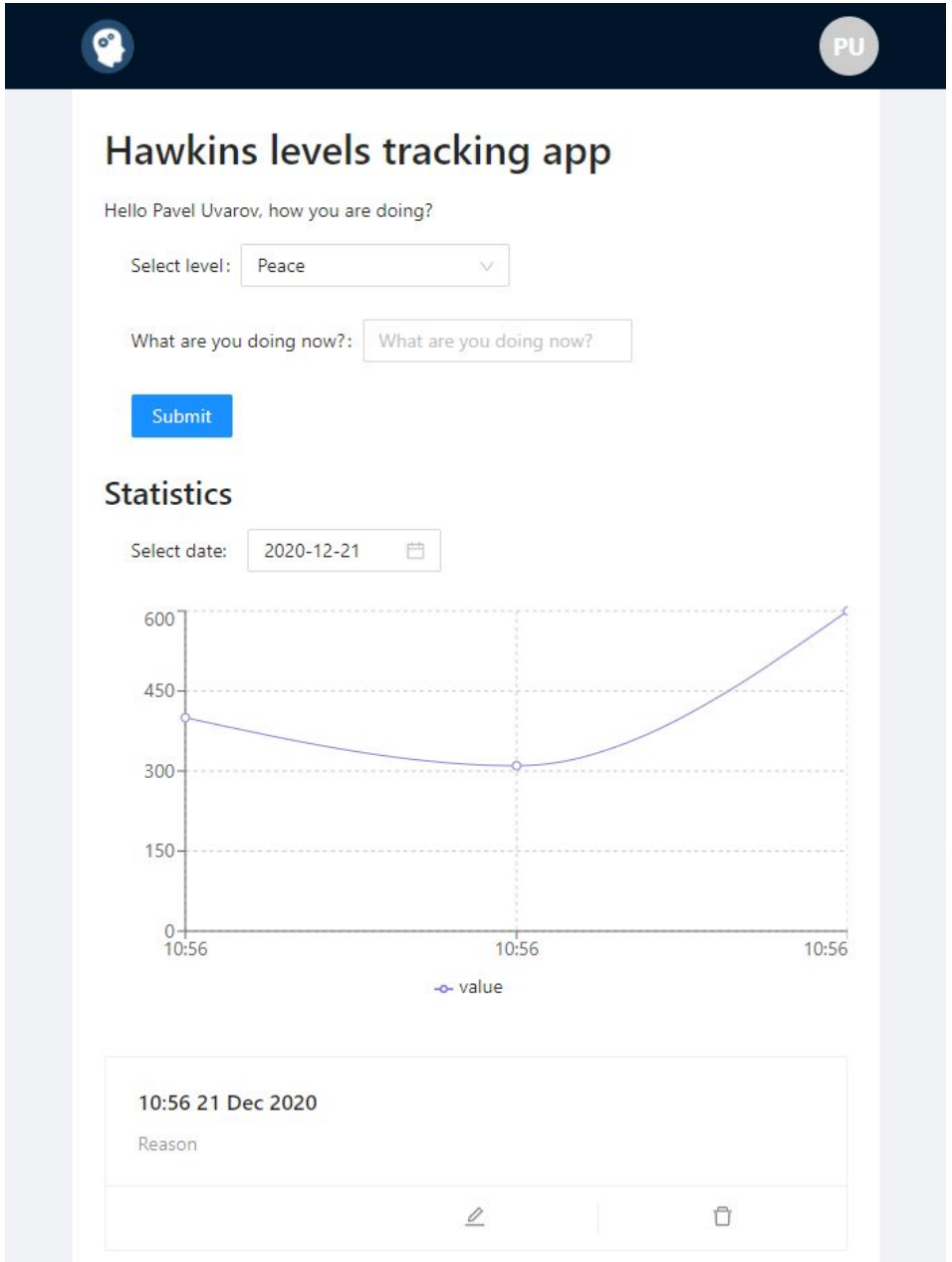
```
var webPush = require('web-push');
var payload = 'Here is a payload!';
var options = {
  vapidDetails: {
    subject: 'mailto:
      example-email@example.com',
    publicKey: vapidPublicKey,
    privateKey: vapidPrivateKey
  }
};
webPush.sendNotification(pushSubscription,
  payload, options);
```


I DON'T ALWAYS
NEED A MOBILE APP
BUT WHEN I
DO I BUILD PWA
imgflip.com

What app should do

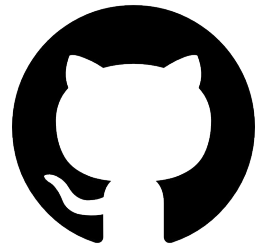
- Login/Sign in for new users
- Show notification for concrete user
- Should show notification on desktop and mobile simultaneously
- 1 hour reminder

- https://hawkins-levels-tracker.now.sh/



Tech Stack

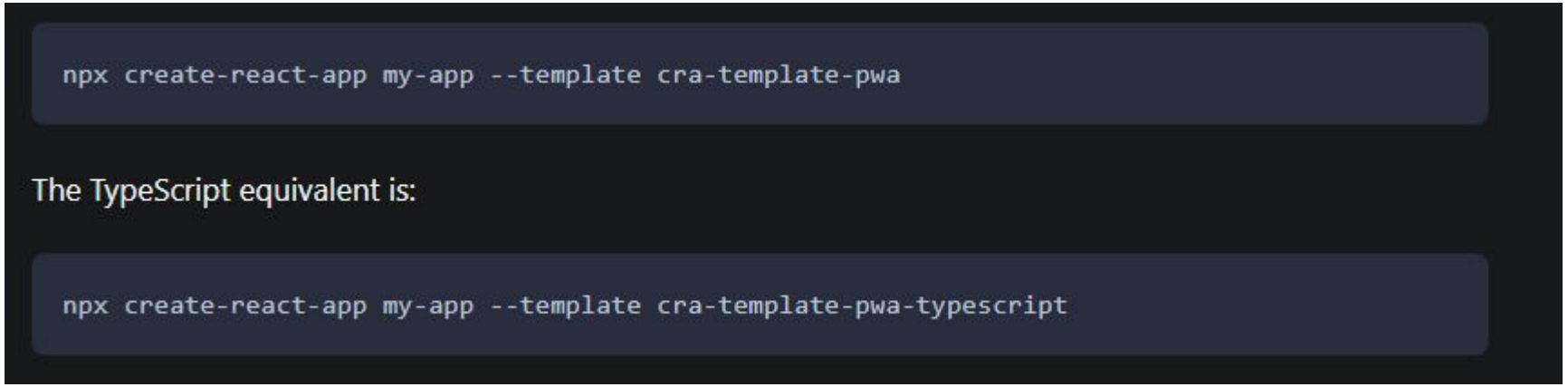
- Serverless functions
- Node.js
- FaunaDB
- CRA
- TS
- Auth verified by JWT
- SWR
- Web push
- Deployed by Vercel



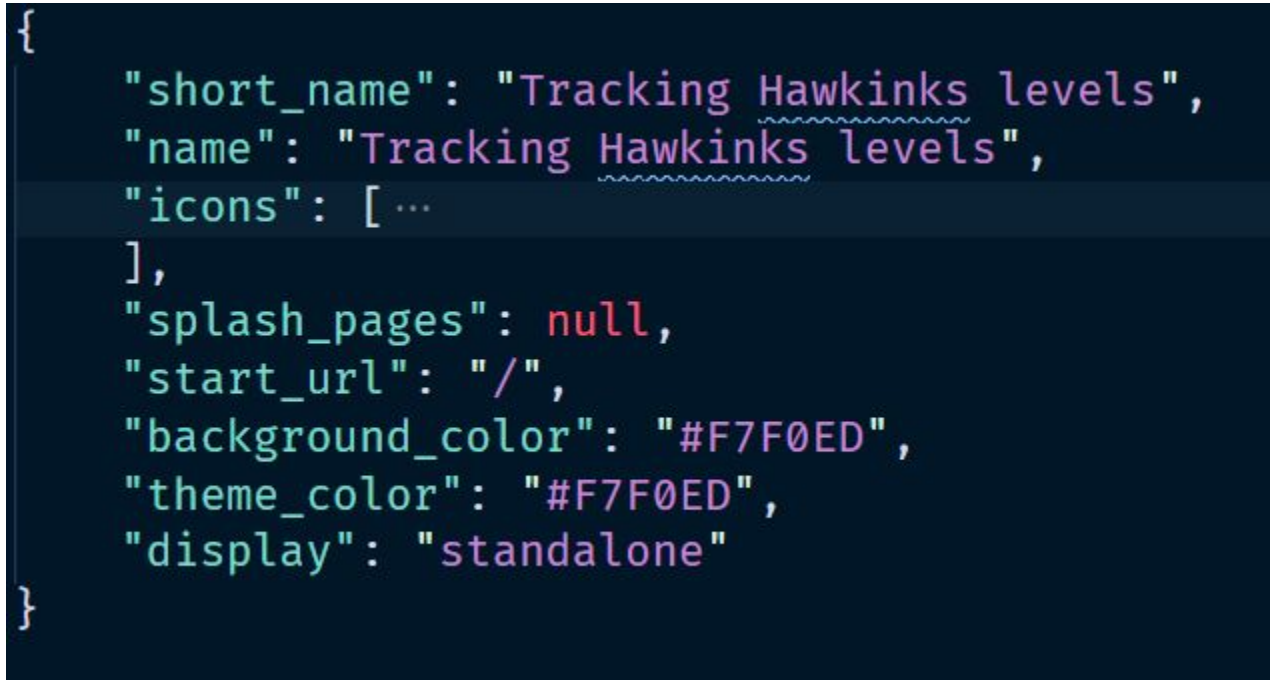
https://github.com/spiderpoul/hawkins-levels-tracker

CRA PWA

- https://create-react-app.dev/docs/making-a-progressive-web-app/



manifest.json



```
{
    "short_name": "Tracking Hawkinks levels",
    "name": "Tracking Hawkinks levels",
    "icons": [ ···
    ],
    "splash_pages": null,
    "start_url": "/",
    "background_color": "#F7F0ED",
    "theme_color": "#F7F0ED",
    "display": "standalone"
}
```

Demo

- https://hawkins-levels-tracker.now.sh/
- Show on mobile
- Notifications on both platforms
- Show project, what makes it PWA, CRA service workers, manifest.json

```
export const requestPermissionsNotifications = async () ⇒ {
    let { state } = await navigator.permissions.query({
        name: 'notifications',
    });
    if (state === 'prompt') {
        await Notification.requestPermission();
    }
    state = (await navigator.permissions.query({ name: 'notifications' }))
        .state;
    if (state !== 'granted') {
        return alert(
            'You need to grant notifications permission for this app to work.'
        );
    }
};
```

```
export const subscribePush = async (token) => {
    // Get the `registration` from service worker and create a new
    // subscription using `registration.pushManager.subscribe`. Then
    // register received new subscription by sending a POST request with
    // the subscription to the server.
    await requestPermissionsNotifications();
    const registration = await navigator.serviceWorker.getRegistration();
    // Get the server's public key
    const response = await Axios.post('/api/vapidPublicKey', { token });
    const vapidPublicKey = await response.data?.key;
    const convertedVapidKey = urlBase64ToUint8Array(vapidPublicKey);
    // Subscribe the user
    const subscription = await registration?.pushManager.subscribe({
        userVisibleOnly: true,
        applicationServerKey: convertedVapidKey,
    });
    await Axios.post('/api/subscribePush', {
        subscription,
        token,
    });
};
```

```
export const unsubscribePush = async (token) => {
    const registration = await navigator.serviceWorker.getRegistration();
    const subscription = await registration?.pushManager.getSubscription();

    if (subscription) {
        subscription.unsubscribe();
        await Axios.post('/api/unsubscribePush', {
            subscription,
            token,
        });
    }
};
```

```
const res = await Promise.all(
    subscriptions?.map((subscription) ⇒
        webPush.sendNotification(subscription)
    )
);
```

```
serviceWorkerScope.addEventListener(
    'push',
    function showPushNotification(event) {
        try {
            const options = {…
            };

            const payload = event.data ? event.data.text() : 'no payload';

            event.waitUntil(
                serviceWorkerScope.registration.showNotification(payload, {
                    tag: Math.random().toString().substr(2),
                    body: `push message`,
                    icon: options.icon,
                })
            );
```

{ "subscription": { "endpoint": "https://fcm.googleapis.com/fcm/send/dCnEWwutgGU:APA91b...

264847305464611337


```
{
  "ref": Ref(Collection("user-subscriptions"), "264847305464611337"),
  "ts": 1588836923005000,
  "data": {
    "subscription": {
      "endpoint": "https://fcm.googleapis.com/fcm/send/dCnEWwutgGU:APA91bH6_qaSJ1K4jIQjju8A9uAt2Rn67GWHBi5UjaRxWzuY1lqaKnNGFHrjc4qcfIvrB9voGQ1DqawowiDDrlvAts_3eNQykD9TXLT4le19H-X2OFRlehu2tvERTXLrXsN-Q
      "keys": {
        "p256dh": "BOza3v3KFfYa_iUy2ngBZdYfoCLJrmCMxBLEitqXyF3gueIuhGoTf8Tap_24iCZlk2u2ZTexibyPP0gQ8GRXa9s",
        "auth": "QIxwJ_o_uwcIeFH7bBiuxQ"
      }
    },
    "userId": "0"
  }
}
```


{ "subscription": { "endpoint": "https://fcm.googleapis.com/fcm/send/fv3oqsfDqzE:APA91bGJA...

264848289078182401


```
{
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  "data": {
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      "keys": {
        "p256dh": "BKou9cHW0n05Tf6LUJ1Zg8jOEiw6i1p1_fyOdT12bSzJRDe823965bVQx-NoHjZxtNv8sDU0ZwBjULo5JVE73T8",
        "auth": "P_fW79ZNl0SmjUgP3Nm5Vw"
      }
    },
    "userId": "0"
  }
}
```


{ "subscription": { "endpoint": "https://fcm.googleapis.com/fcm/send/evt19ynMlEE:APA91bGkll...

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      "keys": {
        "p256dh": "BLrC8RTOdMeiN7Jc2MJumPLXgQJUjDihukLTuoYuoljfKOhzKewojd-0EOtv2i1aoY5b3Exvl-LclBCpL3Vx3PE",
        "auth": "3bJhqdFoqY1tjQEn3Ad2Xw"
      }
    },
```


ANDROID/IOS APP
HYBRID APP
PROGRESSIVE WEB APP
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PWA limitations

- Still a new technology – all browsers don't support it fully yet
- More limited hardware access
- Limited performance for computation heavy operations – although WebAssembly is improving this
- High battery usage

Links

- https://developers.google.com/web/ilt/pwa/introduction-to-progressive-web-app-architectures
- https://web-push-book.gauntface.com/
- https://medium.com/progressivewebapps/history-of-progressive-web-apps-4c912533a531
- https://serviceworke.rs/push-simple.html
- https://web.dev/progressive-web-apps/

Спасибо за внимание!

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