

Offline First

Making Your App Awesome
When the Network Isn't

Teri Chadbourne

@EventTeri

Offline First

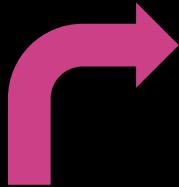
- A **development approach** that plans for the most constrained network conditions first
- A **user experience** that just works, from the developing world to the urban commute, offline or on
- A **social movement** aimed at democratizing access to data

Offline Camp



Building the Offline First community, one campfire at a time.

The Offline Camp Medium Publication



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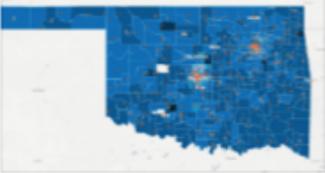
PWA & SERVICE WORKERS COUCHDB & POUCHDB UX DECENTRALIZED WEB DEVELOPING WORLD PASSION TALKS RESOURCES |

Bradley Holt and 3 others
Offline First as a Social Movement
Balancing social power, regardless of level of connectivity
 Gregor Mar 9

Latest



Bradley Holt
Blockchains: Beyond Bitcoin
A modern data structure for distributed ledgers



Bradley Holt and 3 others
Mapping the Internet
A look at income—and internet—inequality



Ray Daly and 8 others
Is the Offline First Community Ready for an Offline First Foundation?
Exploring options for pushing the movement forward

The editorial process

- Process starts while offline at camp
- Lots of back and forth with authors back home
- Multiple editors need a shared tool for collaboration
- Steps change based on type of article and availability of resources

@EventTeri

The screenshot shows a Trello card interface. At the top, the title is "TEMPLATE - PASSION TALK <Name> Session Title". Below the title, there are sections for "Members" (one member listed) and "Labels" (Passion Talk, Oregon). A "Checklist" section is present with several items, some of which are checked. An "Add" sidebar on the right lists options like Members, Labels, Checklist, Due Date, and Attachment. Below the checklist is an "Add Comment" section with a text input field and a "Save" button. The "Activity" section shows a recent update from Teri Chadbourne. At the bottom, there is a summary of the card's details and a footer with a "5" icon.

in list [List](#) [Edit](#)

Members Labels

+ Passion Talk Oregon +

[Edit the description...](#)

Checklist [Delete...](#)

0%

Added as writer
 Sent rough draft of passion talk video
 Confirmed name for slide
 Confirmed talk title for slide and updated here
 Confirmed twitter handle for slide

Add an item...

[Add Comment](#)

Write a comment... [@](#) [@](#) [@](#) [@](#) [Archive](#)

[Save](#)

[Activity](#) [Hide Details](#)

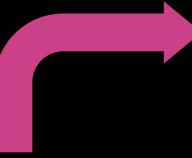
Teri Chadbourne copied this card from [TEMPLATE - SESSION RECAP <Name> Session Title](#) in list [List](#) Nov 29, 2017 at 3:09 PM

<TBD> Governance of Decentralized / P2P Networks

Feb 23 5 33

5 SCHOOL Offline First for

A custom-built project management tool



Blog Tracker

Add an Article

View Articles
Select an article below to view or edit.

P2P Networks
Fabulous Article (Authorlicious)
Amazing Article (Super Author)

Filtered By: All Articles

All	Editor:
Status: Completed In progress Needs Author	Bradley Gregor Steven Teri

Sync Status: Currently syncing to remote database.

This app works Offline First! The first time you load the page, a service worker caches the resources necessary for you to work offline in the future. The app saves data locally first using PouchDB, then syncs to a remote CouchDB database (in this case, Cloudant) whenever you have a connection. Using multiple devices or browsers? It will all sync up automatically!

Created by [Teri Chadbourne](#)

Blog Tracker

Go Back (Discard)

Edit Article

Article Title
P2P Networks

Article Type
Passion Talk

Presenter(s)
Joe

Event
Offline Camp Oregon, November 2017

Author Detail:

Author

Session Resources Available

Rough Cut Video

Session Notes

Pictures of session in Progress

Publication & Sharing Status:

Target Date:
mm/dd/yyyy

Draft Received

Save & Close

Getting Started on Your Blog Post

Way to be awesome, Super Author!

Thanks so much for volunteering to write up a recap of our unconference session on Amazing Article (and for all your great contributions at camp!).

Here's how to get started (and finished):

- Please send us your Medium username so that we can add you as a writer to the [Offline Camp Medium publication](#). If you haven't used Medium before, note that you can sign in with another social media account to [get started](#). (Try clicking the extra Sign in button for more social media network options.)
- Below you'll find links to any session audio, video, notes, or pics available, which you can use to [jog your memory](#) as needed.
- Feel free to write as short or as long a story as you'd like.
- You can find [examples of other session recap posts](#) in our [Medium publication](#).
- If you're working on an Offline First project, feel free to mention it in your story. You might also want to link to relevant resources that provided added background on the topic at hand.
- Please add the tag "Offline First," as well as any other relevant tags for your topic, to your story using [these instructions](#).
- Every Medium story needs at least one **featured image** (which cannot be a video), and you may add additional images if you'd like. Please be sure to add captions and credit the source of each image. If you can't think of what to use for a featured image, just reach out and we can help brainstorm.
- Once we've added you as writer, you'll be able to [add your draft post to the Offline Camp publication](#) using [these instructions](#) when you're ready. (Don't worry, that won't actually publish your article, just make it available to our editorial team for review.)
- Please let me know when you expect to be able to submit your draft. We've found that it's easiest to write within the first couple of weeks after Offline Camp while things are fresh in your memory.

Here are the resources you can use to jog your memory:

- Rough Cut Video: <http://www.d.com>
- Session Notes: www.session.com

Thank you so much in advance for taking the time to work on this. Feel free to reach out with any questions, either by email or on Slack!

The Offline Camp Team



@EventTeri

A beginner's guide to...

- Enabling offline data storage, sync, and sharing with PouchDB and CouchDB
- Ensuring quick page loads—offline or not—with a service worker
- Avoiding gotchas

...all with only client-side (front-end) code

“Stop treating offline as an error condition.

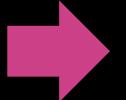
With Offline First, we make offline the baseline and work up from there.”

John Kleinschmidt,
GitHub

Progressive enhancement

- The **data and resources** we choose to cache locally determine the **baseline functionality** that our app will have while offline
- Everything that requires a network connection is icing on the cake

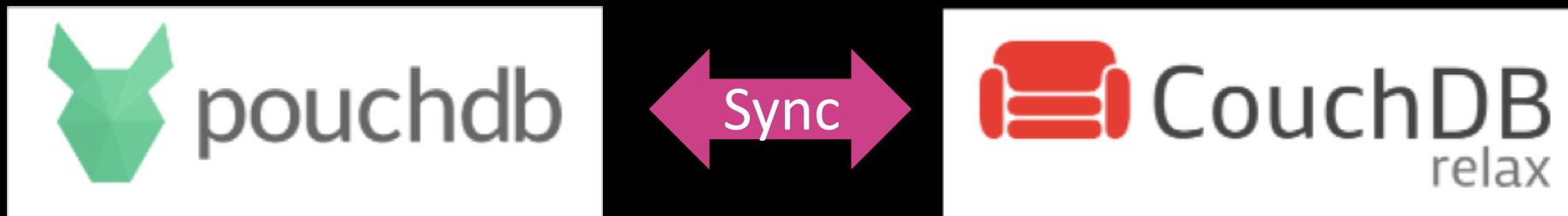
A beginner's guide to...

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Data Storage, Sync, and Sharing

- Data stored **locally** is available **offline**
- Data stored **remotely** can be **shared** by multiple browsers, devices, or users



Demo: Data Storage, Sync, and Sharing

PouchDB

- In-browser database inspired by **Apache CouchDB™**
- Open source
- Has an asynchronous API (can use either promises or callbacks)
- Cross-browser
- JavaScript library



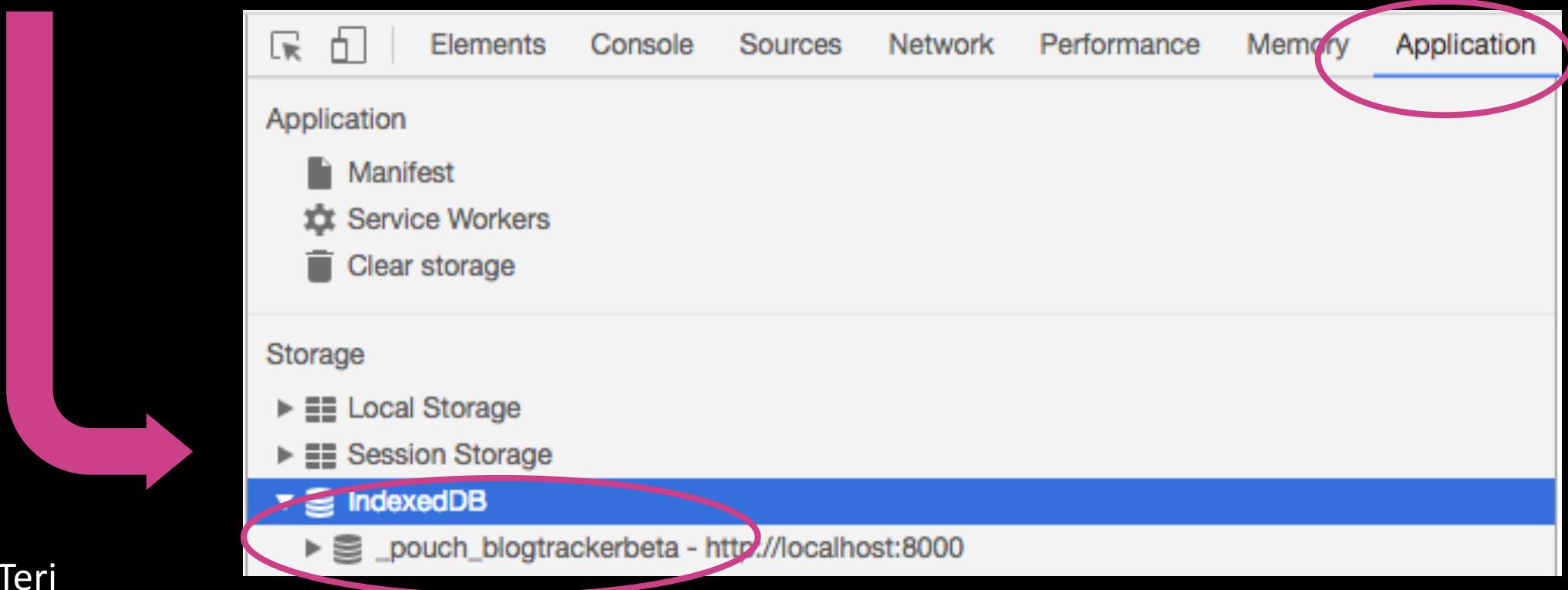
Using the PouchDB library

- Reference the PouchDB script in your HTML, before the other JavaScript files that depend on it

```
<script src="js/pouchdb-6.3.4.js"></script>
<script src="js/jquery-3.2.1.js"></script>
<script src="js/project-manager.js"></script>
```

Creating a local PouchDB database

```
var db = new PouchDB('blogtrackerbeta');
```



Apache CouchDB™

- NoSQL document store
- Stores documents in JSON format
- Developer-friendly query language called Mango
- Couch Replication Protocol well-suited for offline applications



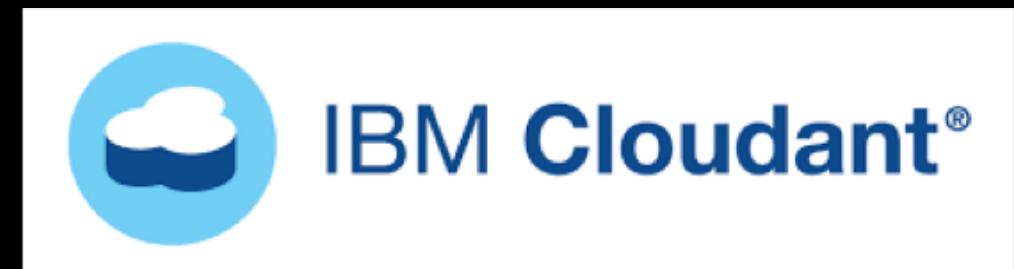
Creating a remote Apache CouchDB™ database

- Generate an API key
- Enable Cross-Origin Resource Sharing (CORS)
- Note the URL used to access your database

Open Source



Fully-Managed



A Cloudant database

The screenshot shows the Cloudant NoSQL Database interface. On the left is a sidebar with icons for different database operations: back, forward, refresh, All Documents (selected), Query, Permissions, Changes, Design Documents, and a help icon. The main area displays the 'All Documents' view for the database 'blogtrackerbeta'. At the top right are buttons for Document ID dropdown, settings gear, JSON, table view, and a bell. A green 'Create Document' button is also present. The table view shows columns: id, key, and value. Three documents are listed:

	id	key	value
<input type="checkbox"/>	2017-12-13T23:43:54.775Z	2017-12-13T23:43:54.775Z	{ "rev": "8-f53c54ccf7c54..."}
<input type="checkbox"/>	2017-12-13T23:48:10.552Z	2017-12-13T23:48:10.552Z	{ "rev": "2-384fd11b7117..."}
<input type="checkbox"/>	2017-12-13T23:49:13.837Z	2017-12-13T23:49:13.837Z	{ "rev": "2-76cecc54b338..."}

A large black bar at the bottom contains the URL: <https://username:password@username-bluemix.cloudant.com>

Connecting to your CouchDB database

```
var remoteCouch = "YOUR_REMOTE_COUCHDB_URL_HERE";
```

```
if (remoteCouch) {  
    sync();  
}
```

Syncing between PouchDB and CouchDB

- Set up continuous sync
- Listen for changes

```
function sync() {  
  var opts = {live: true};  
  db.sync(remoteCouch, opts, syncError)  
    .on('change', updateArticles);  
}
```

Alerting the user to a sync error

- Offline status is a heads up, not an error
- Reassure the user that their data is safe offline

Sync Status: Error syncing to remote database. Data will continue saving locally until connection is re-established.

Creating a JSON object

```
{  
  "_id": "mittens",  
  "name": "Mittens",  
  "occupation": "kitten",  
  "age": 3,  
  "hobbies": [  
    "playing with balls of yarn",  
    "chasing laser pointers",  
    "lookin' hella cute"  
  ]  
}
```

From the PouchDB guide

Assigning a unique ID

- The `_id` must be **unique** and stay **consistent** across all updates
- Common practice is to use a timestamp

```
var ID = new Date().toISOString();
```

Managing revision markers

- The `_rev` is generated by PouchDB and can't exist on first write
- On subsequent updates, you need to pass in the same `_rev` most recently assigned by PouchDB

```
if (location.hash !== "#new") {  
    var ID = $("#_id").val();  
    var REV = $("#_rev").val();  
} else if (location.hash == "#new") {  
    var ID = new Date().toISOString();  
    var REV = null;  
}
```

Saving form entries as a JSON object

```
var article = {  
  
    //fields created and updated without user input  
    _id: ID,  
    _rev: REV,  
  
    //fields copied from form entries  
    title: $("#title").val(),  
    author: $("#author").val(),  
    completed: $("#completed").prop("checked"),  
};
```

Writing documents with db.put()

```
db.put(article
  ).then(function (response) {
    //...stuff to do if save succeeds...
  }).catch(function (err) {
    //...stuff to do if save fails...
});
```

Fetching all documents with db.allDocs()

```
db.allDocs([options, callback])
```

```
function updateArticles() {
  db.allDocs({
    include_docs: true,
    descending: true
  }, function(err, doc) {
    redrawArticleList(doc.rows);
  });
}
```

Data returned by db.allDocs()

```
{  
  "total_rows": 24,  
  "offset": 0,  
  "rows": [  
    {  
      "id": "2017-12-07T06:06:55.303Z",  
      "key": "2017-12-07T06:06:55.303Z",  
      "value": {  
        "rev": "1-3d5ae7e898a64e85a4d2f166e7472abc"  
      },  
      "doc": {  
        "_id": "2017-12-07T06:06:55.303Z",  
        "_rev": "1-3d5ae7e898a64e85a4d2f166e7472abc",  
        "objectType": "article",  
        "title": "added while offline but the page was already loaded",  
        "articleType": "session_recap",  
        "author": "teri",  
        "event": "teri"  
      }  
    },  
    {  
      "id": "2017-12-07T06:05:22.384Z",  
      "key": "2017-12-07T06:05:22.384Z",  
      "value": {  
        "rev": "1-3d5ae7e898a64e85a4d2f166e7472abc"  
      },  
      "doc": {  
        "_id": "2017-12-07T06:05:22.384Z",  
        "_rev": "1-3d5ae7e898a64e85a4d2f166e7472abc",  
        "objectType": "article",  
        "title": "added while offline but the page was already loaded",  
        "articleType": "session_recap",  
        "author": "teri",  
        "event": "teri"  
      }  
    }  
  ]  
}
```

Using the data returned

```
function redrawArticleList(articles) {  
  articles.forEach(function(currentArticle) {  
    $('#article-list').append("<li> " + currentArticle.doc.title  
      + " (" + currentArticle.doc.author + ")</li>");  
  });  
}
```

The list of articles

View Articles

Select an article below to view or edit.

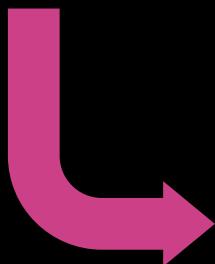
-  [P2P Networks](#)
-  [Fabulous Article](#) (Authorlicious)
-  [Amazing Article](#) (Super Author)

Filtered By: All Articles

All	Editor:
All	Bradley
Status:	Gregor
Completed	Steven
In progress	Teri
Needs Author	

Fetching individual documents with db.get()

```
db.get(_id).then(function(doc) {  
    //write data to page  
});
```



```
for (var d in doc){  
    if ($("#" + d).attr('type') == 'checkbox'){  
        $("#" + d).prop("checked", doc[d]);  
    } else {  
        $("#" + d).val(doc[d]);  
    }  
}
```

The edit screen

Nothing to See Edit Here

Author's Page: [writer.html#2017-12-13T23:43:54.775Z](#)
Unique ID: 2017-12-13T23:43:54.775Z
Last Revision: 3-886baa4b55f6497eb4f50e1ac856e9ad

This data is auto-generated/updated as needed for top secret database-y reasons. You may not edit these fields manually.

Delete this record permanently <<< You probably shouldn't click this button.

Run away!
Oh, bother!

@EventTeri

Edit Article

Article Title

Article Type

Presenter(s)

Event

Author Detail:

Author

Medium Username:

Added as writer on Medium

Session Resources Available

Rough Cut Video available at:

Session Notes available at:

Deleting a record with db.remove()

```
db.get('mydoc').then(function(doc) {  
  return db.remove(doc._id, doc._rev);  
});
```

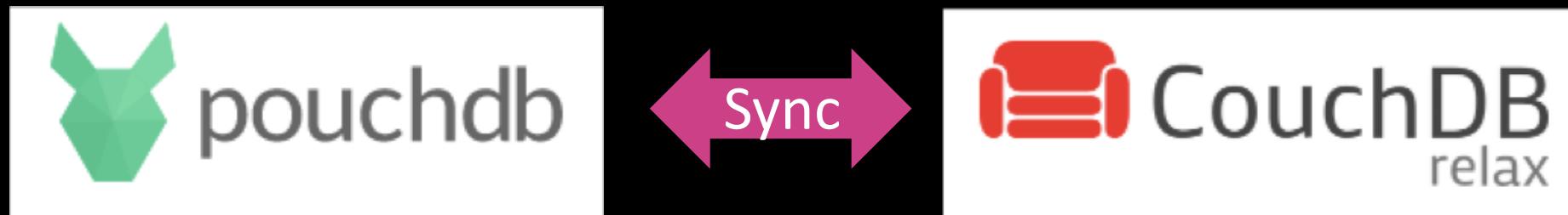


_deleted: true

```
db.get($("#_id").val()).then(function(doc) {  
  return db.remove($("#_id").val(), $("#_rev").val());  
});
```

Sync is the Offline First superpower

- Store and edit data locally while offline
- Sync data to the cloud when a network connection is available
- Share data from CouchDB across multiple users or devices, each with their own local PouchDB database



A beginner's guide to...

- Enabling offline data storage, sync, and sharing with PouchDB and CouchDB
- **Ensuring quick page loads—offline or not—with a service worker**
- Avoiding gotchas

...all with only client-side (front-end) code

Caching resources for quick page loads

- The **vital resources** that make a page functional (JavaScript, HTML, CSS) need to be available **offline**

Service Workers

Demo: Caching Resources for Quick Page Loads

No app can work offline on a first visit.

The “first” in Offline First means that we
prioritize user experience
on subsequent visits by
loading cached resources first
before trying to reach the network.

Service Workers

- Run in the background, separate from a web page
- Enable modern web features like **push notifications, background sync, and caching**
- Cache resources on a first visit to enable **lightning-fast** and **offline-capable** page loads on subsequent visits

The Service Worker Lifecycle

- **Register**
- **Install** (defining what to cache)
- **Activate**
- **Be incredible** (though also incredibly frustrating to debug)

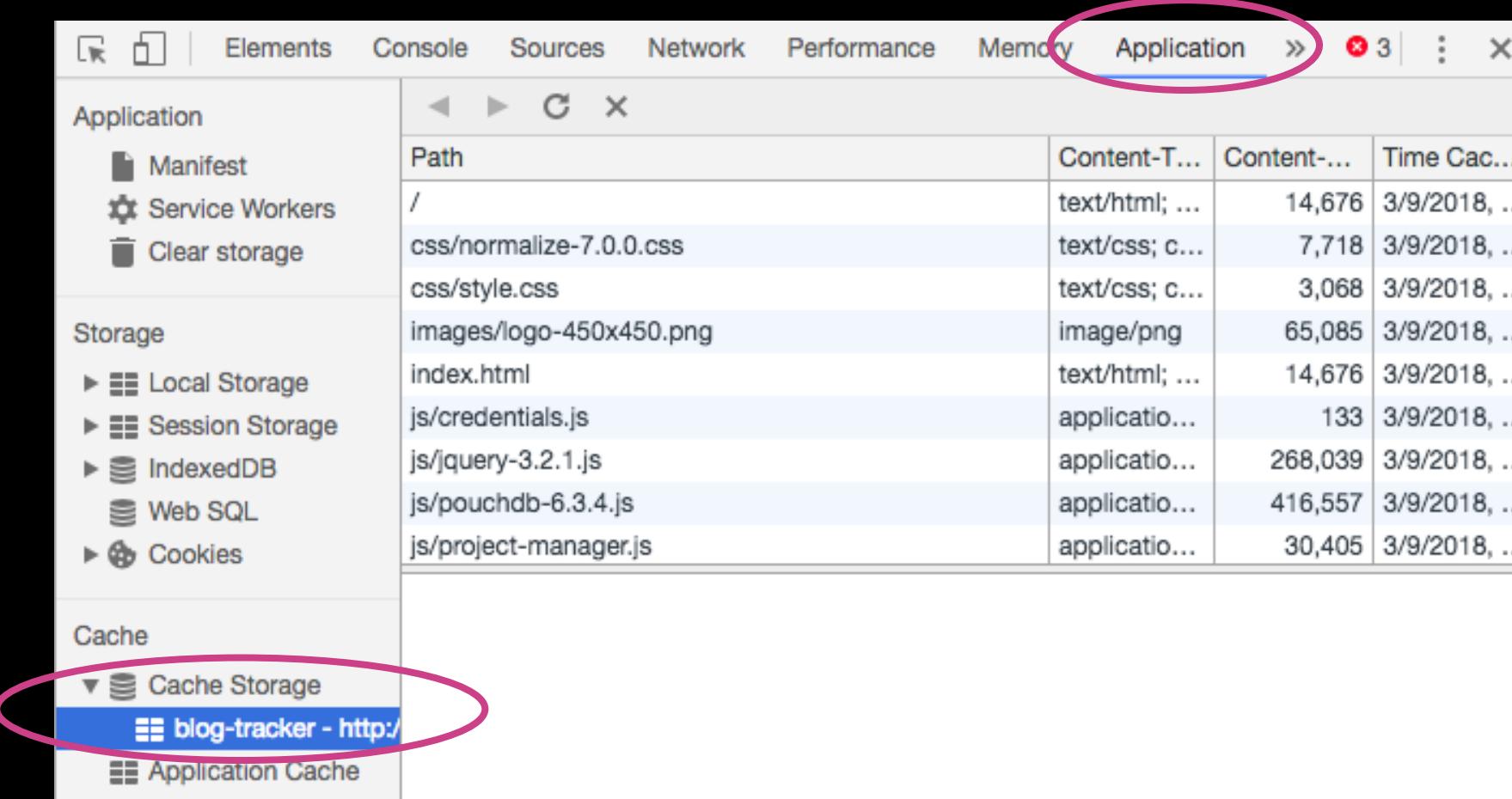
Registering a service worker

```
<script>
  if('serviceWorker' in navigator) {
    navigator.serviceWorker.register('sw.js')
      .then(function() {
        console.log("Service Worker Registered");
      });
  }
</script>
```

Installing a service worker

```
self.addEventListener('install', function(e) {  
  e.waitUntil(  
    caches.open('blog-tracker').then(function(cache) {  
      return cache.addAll([  
        '/',  
        'index.html',  
        'css/style.css',  
        'js/project-manager.js',  
        'js/pouchdb-6.3.4.js'  
      ]);  
    })  
  );  
});
```

Cached resources



The screenshot shows the Chrome DevTools interface with the "Application" tab selected, indicated by a pink oval at the top. The left sidebar lists sections: "Application" (Manifest, Service Workers, Clear storage), "Storage" (Local Storage, Session Storage, IndexedDB, Web SQL, Cookies), and "Cache". Under "Cache", "Cache Storage" is expanded, showing a list of items including "blog-tracker - http://". The main table displays cached resources with columns: Path, Content-Type, Content-Length, and Time Cached. The table data is as follows:

Path	Content-T...	Content...	Time Cac...
/	text/html; ...	14,676	3/9/2018, ...
css/normalize-7.0.0.css	text/css; c...	7,718	3/9/2018, ...
css/style.css	text/css; c...	3,068	3/9/2018, ...
images/logo-450x450.png	image/png	65,085	3/9/2018, ...
index.html	text/html; ...	14,676	3/9/2018, ...
js/credentials.js	application/...	133	3/9/2018, ...
js/jquery-3.2.1.js	application/...	268,039	3/9/2018, ...
js/pouchdb-6.3.4.js	application/...	416,557	3/9/2018, ...
js/project-manager.js	application/...	30,405	3/9/2018, ...

Activating a service worker

The screenshot shows the Chrome DevTools interface with the Application tab selected. In the left sidebar, the Service Workers option is highlighted with a red oval. The main panel displays the Service Workers section for the localhost domain. It shows a source file named sw.js and a status message indicating that a service worker has been activated and is running. A red oval highlights this status message. Below it, there are fields for sending a push message and performing a sync operation.

Application

Service Workers

localhost

Source [sw.js](#)

Received 3/9/2018, 3:41:48 PM

Status #0 activated and is running [stop](#)

Push Push

Sync Sync

Intercepting network requests

- Access cached resources *first*, using the network as a fallback

```
self.addEventListener('fetch', function(event) {  
  event.respondWith(  
    caches.match(event.request).then(function(response) {  
      return response || fetch(event.request);  
    })  
  )  
});  
});
```

use the cached file if found

otherwise find the file on the network

“If you want to build an application that has a really just **stunningly fast user experience**, the best thing you can do is go Offline First, which is preferring a local cache... at all costs to the network.”

Nolan Lawson,
Microsoft Edge



A beginner's guide to...

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- Ensuring quick page loads—offline or not—with a service worker
- **Avoiding gotchas**

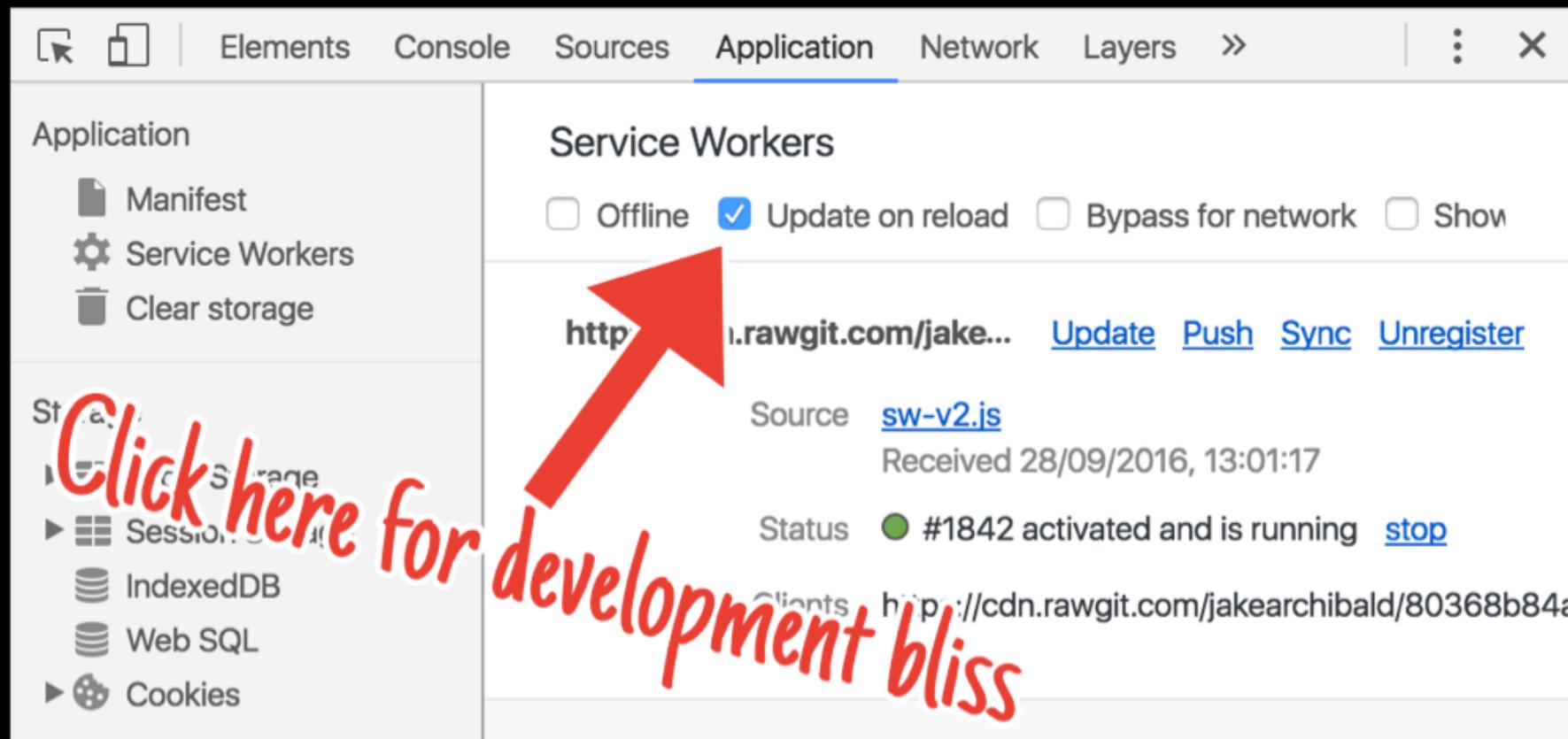
...all with only client-side (front-end) code

Service workers are sticky.

Tips for developing with service workers

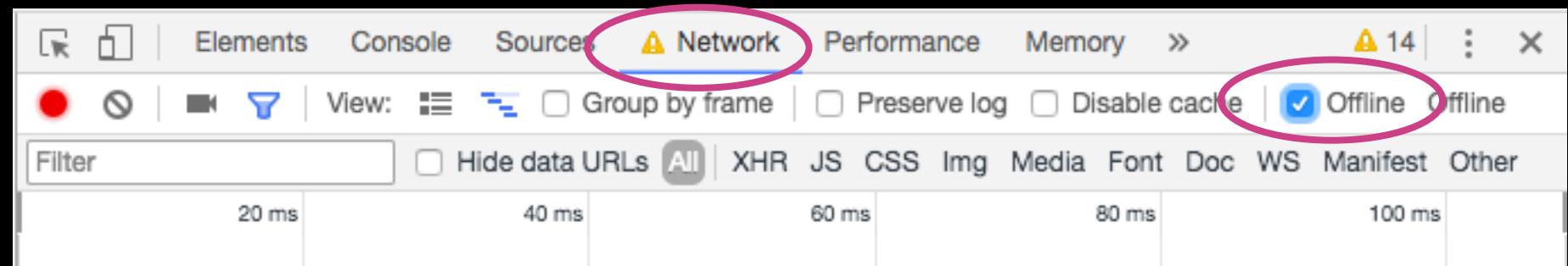
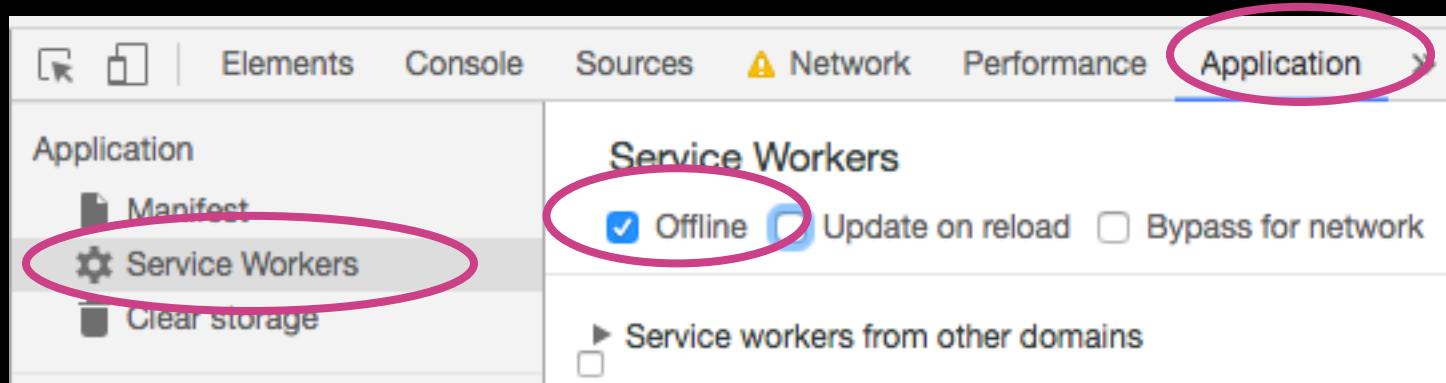
- Implement service workers last
- Learn how to do a hard refresh
- Use incognito browser windows
- Get familiar with Chrome Dev Tools
- Check out the resources at developers.google.com
- Use “Update on reload” during development

Debugging service workers

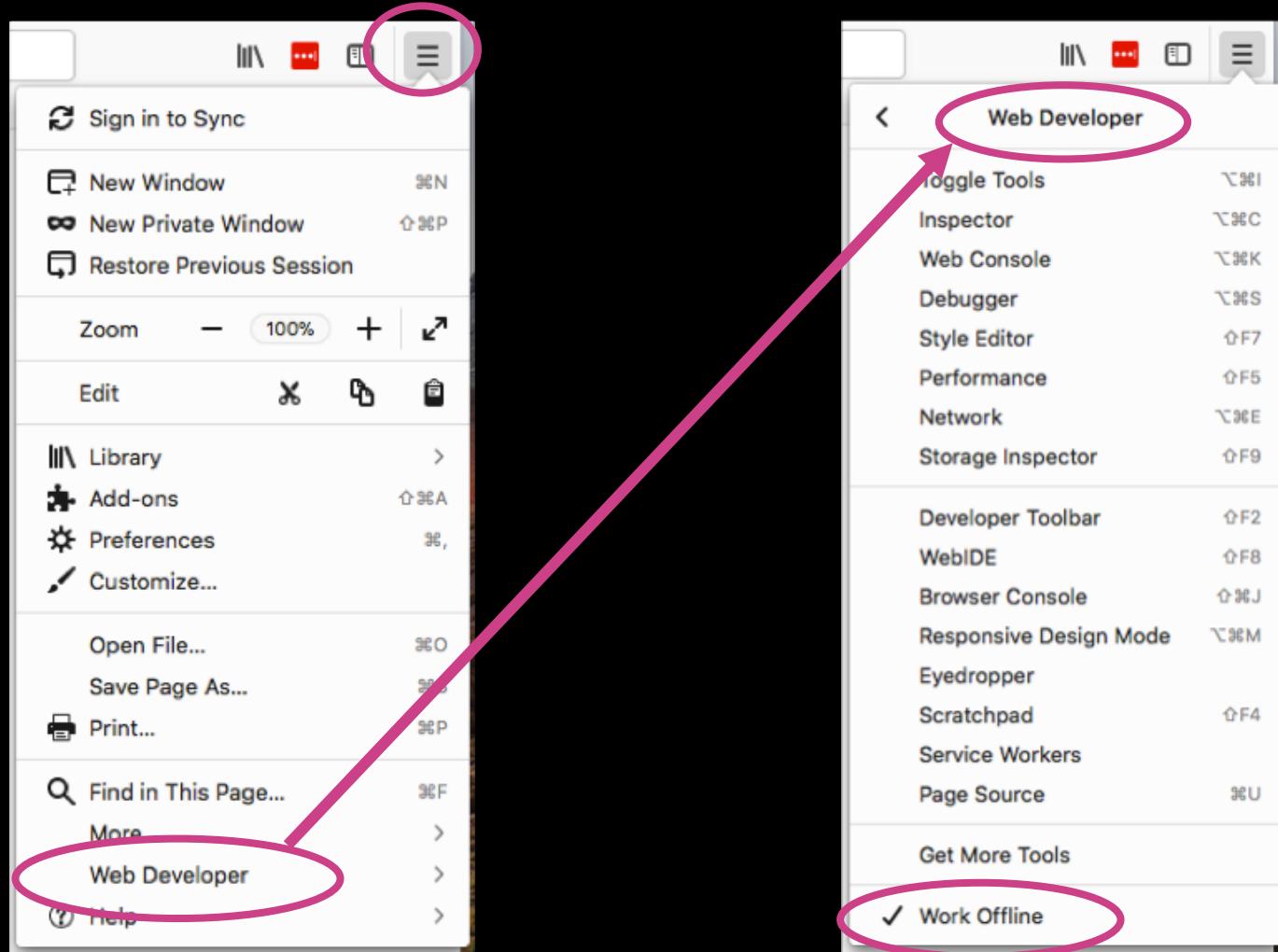


From [The Service Worker Lifecycle](#), by Jake Archibald

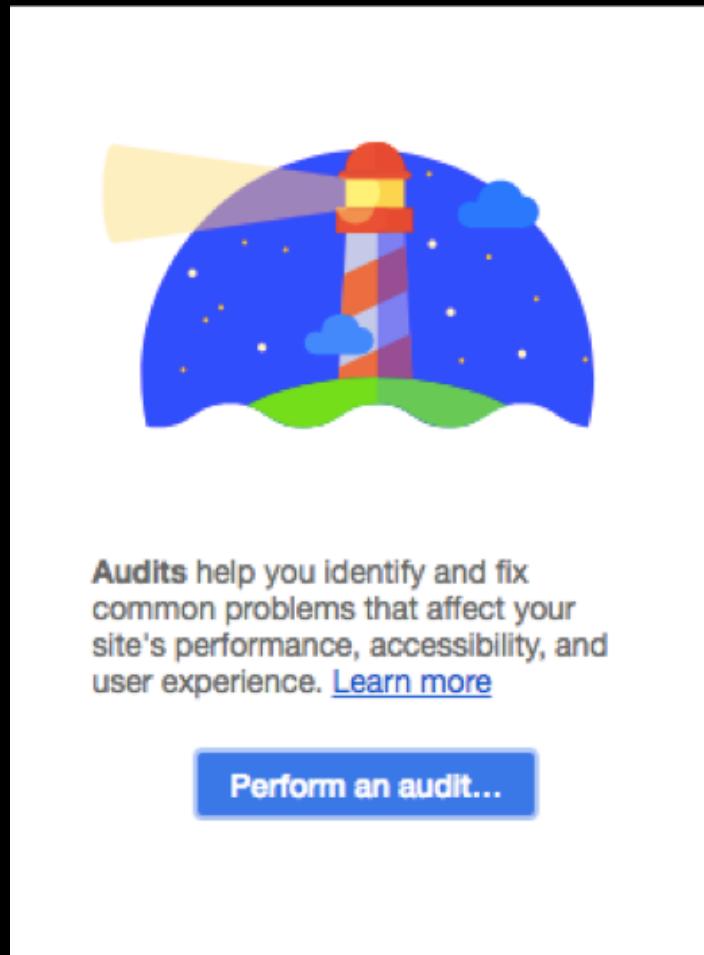
Simulating an offline experience in Chrome



Simulating an offline experience in Firefox



PWA performance audits with Lighthouse



A screenshot of a browser window titled "Home - SHOP" showing a secure connection to <https://shop.polymer-project.org>. The page displays a man's back wearing a jacket, with the text "S H O P" at the top and "Men's Outerwear" below it. A "SHOP NOW" button is visible. To the right, the Lighthouse audit results are shown in a sidebar:

Audit Category	Score
Progressive Web App	100
Performance	88
Accessibility	100
Best Practices	85

The "Progressive Web App" section details: "These audits validate the aspects of a Progressive Web App, as specified by the baseline [PWA Checklist](#). 0 failed audits, 11 Passed Audits, Manual checks to verify". The "Performance" section details: "These encapsulate your app's performance. Metrics These metrics encapsulate your app's performance across a number of dimensions.".

@EventTeri

developers.google.com/web/tools/lighthouse/

Offline First isn't a specialized approach
for low-bandwidth scenarios.

It's just a great design pattern.

Go make your app awesome.
You've got this.

Resources

- **GitHub Repo & Tutorial Articles:** bit.ly/OfflineFirstProjectManager
- **PouchDB:** pouchdb.com
- **CouchDB:** couchdb.org
- **Service Workers:** developers.google.com/web/fundamentals/primers/service-workers/
- **Offline First:** offlinefirst.org
- **Offline Camp:** offlinefirst.org/camp
- **Offline First Resources:** bit.ly/OfflineFirstResources
- **Offline Camp Medium Publication:** medium.com/offline-camp
- **Lighthouse:** developers.google.com/web/tools/lighthouse

Teri Chadbourne
@EventT^eri

bit.ly/OfflineFirstProjectManager