

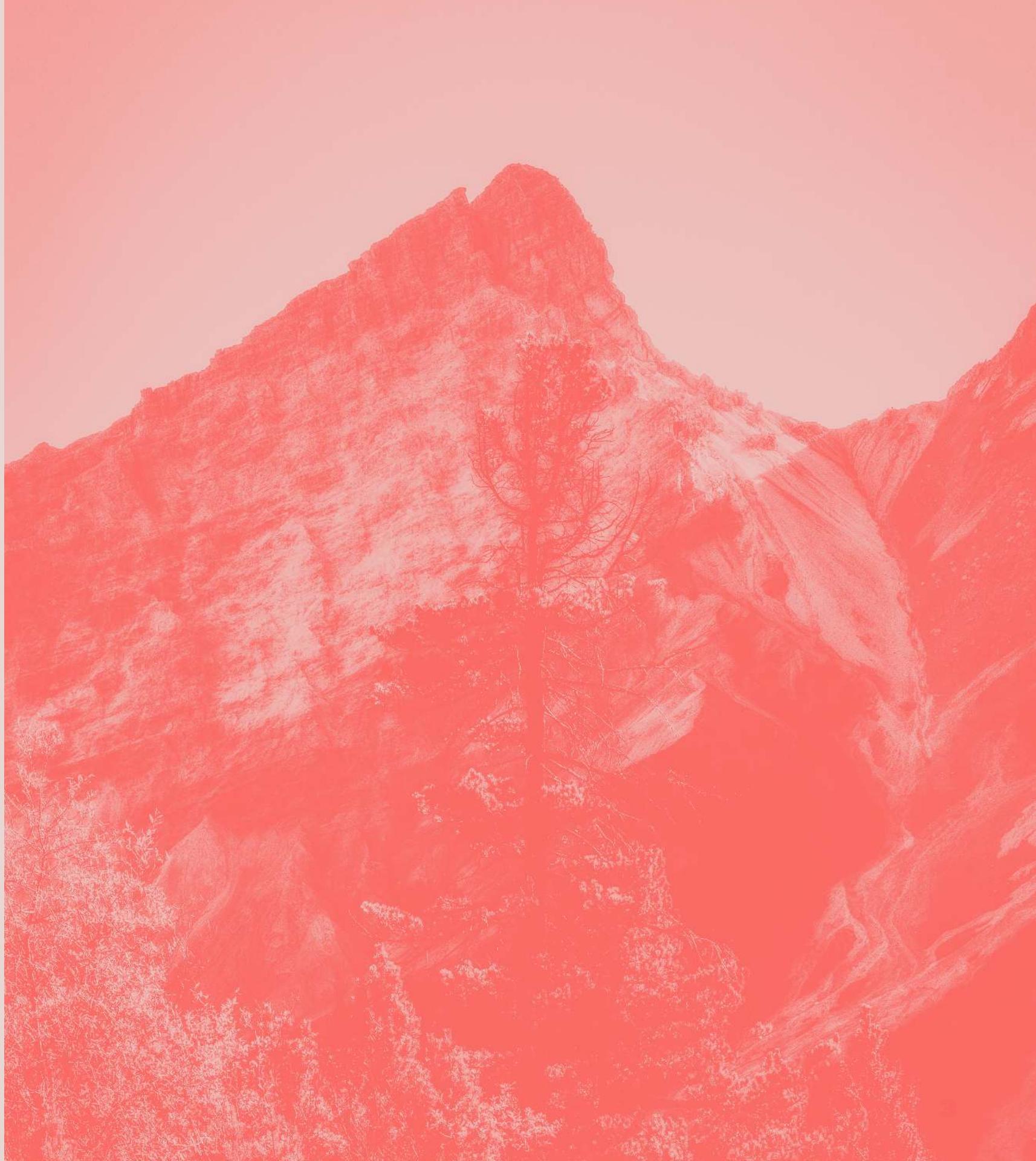
FRONTEND DEVELOPMENT

WINTERSEMESTER 2022

PERSISTING DATA IN THE BROWSER

AGENDA

- » History State
- » Session Storage
- » Local Storage
- » Indexed DB



HISTORY STATE

HISTORY STATE RECAP

“Each browser tab has a “browsing context”. The browsing context maintains a “session history”, which is essentially an array of location entries. [^2]”



HISTORY STATE RECAP PUSHSTATE

```
// history.pushState(<state>, <title>, <url>)

history.pushState(null, 'page 1', '/page1')
history.pushState({ page: 2 }, 'page 2', '/page2')
// 1)                                     ^^^^^^
// 1) add some state to the session history

history.state // => { page: 2 }
history.back(-1)
history.state // => null
```

HISTORY STATE WHEN TO USE PUSH STATE [^4]

- » data can be added to the current session history entry
- » data does not need to be synced between tabs
- » data will get lost when page session ends
 - » data will get lost when tab was closed [^3]
- » size is limited to 2MiB
- » data is not shared between tabs

HISTORY STATE CAN I USE [^6]

IE	Edge *	Firefox	Chrome	Safari	Opera	Safari on * iOS	Opera Mini *	Chrome for Android	UC Browser for Android	Samsung Internet
				13.1		12.5				
				14.1		14.4				
			94	15		14.8				
	95	94	95	15.1	80	15.1				
11	96	95	96	15.2	82	15.2	all	96	12.12	15.0
	96	97	TP							
	97	98								
		99								

SESSION STORAGE

SESSION STORAGE [^5]

- » temporary storage which expires when the page session ends
- » session storage is only available to the current origin and tab
 - » 2 tabs don't share the same session storage
- » when tab gets duplicated
 - » session storage gets copied

SESSION STORAGE PERSISTING VALUES

```
window.sessionStorage.setItem('someKey1', 'some important value')
//                                         1) ^^^^^^
//                                         2) ^^^^^^
// 1) the key where the value is stored
// 2) the value to be stored
```

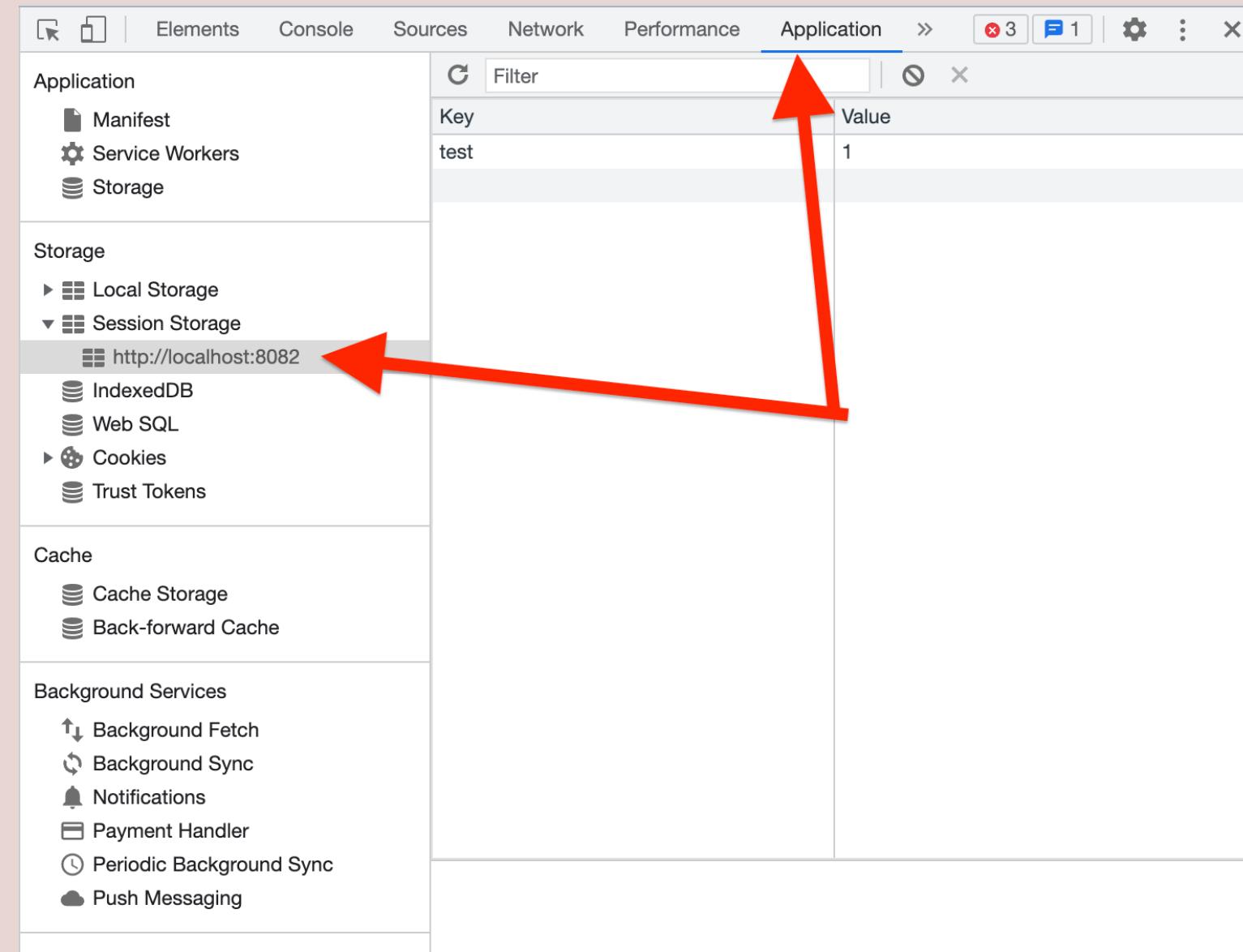
```
window.sessionStorage.setItem('someKey2', JSON.stringify({ test: 1 }))
//                                         3) ^^^^^^
// 3) stringify the object
```

SESSION STORAGE READING VALUES

```
window.sessionStorage.setItem('someKey1', 'some value')
window.sessionStorage.getItem('someKey1') // => 'some value'
```

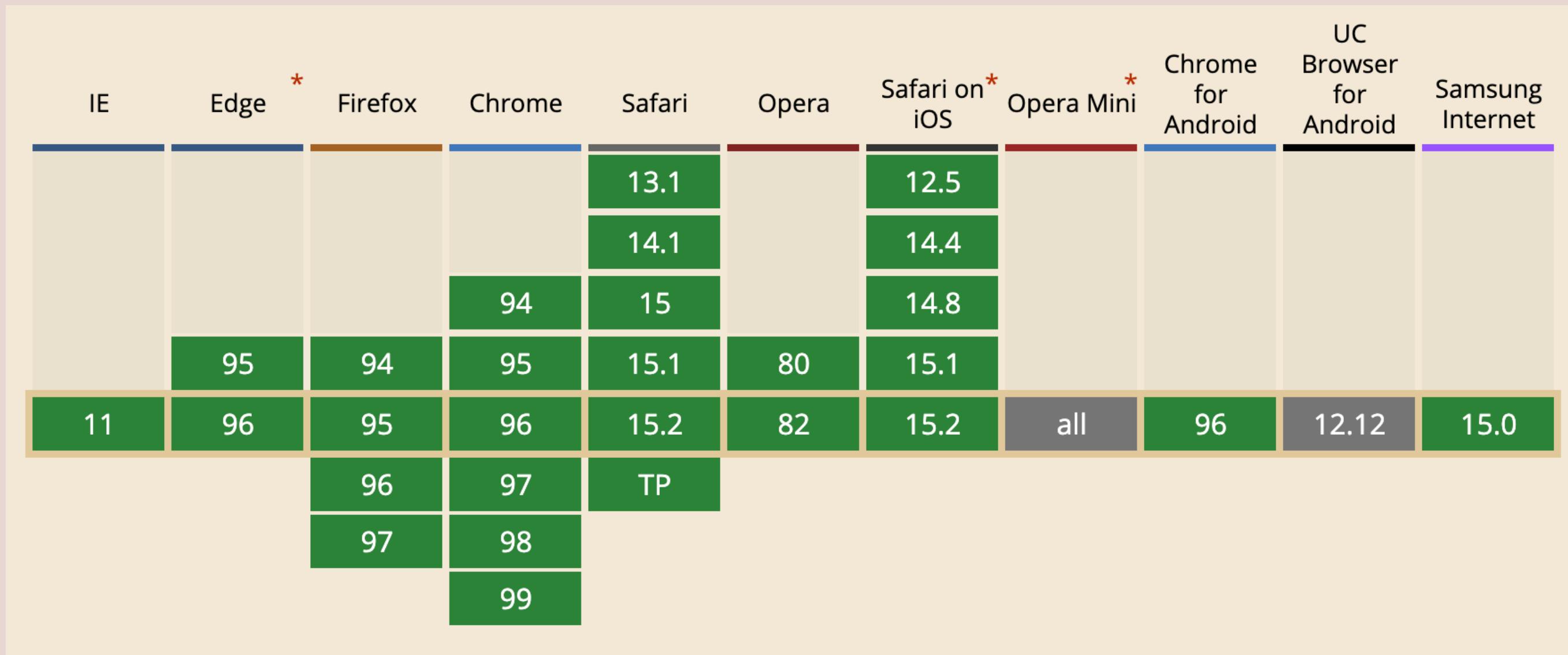
```
window.sessionStorage.setItem('someKey2', JSON.stringify({ test: 1 }))
window.sessionStorage.getItem('someKey1') // => '{ "test": 1 }'
//                                                 ^^^^^^
// this is returned as string and needs to be serialized again
```

SESSION STORAGE IN CHROME DEV TOOLS



The screenshot shows the Chrome DevTools Application panel. The tab bar at the top has tabs for Elements, Console, Sources, Network, Performance, and Application, with Application being the active tab. Below the tabs is a toolbar with icons for Refresh, Stop, and other developer tools. The main area is divided into sections: Application (Manifest, Service Workers, Storage), Storage (Local Storage, Session Storage, IndexedDB, Web SQL, Cookies, Trust Tokens), Cache (Cache Storage, Back-forward Cache), and Background Services (Background Fetch, Background Sync, Notifications, Payment Handler, Periodic Background Sync, Push Messaging). In the Storage section, 'Session Storage' is expanded, showing an entry for 'http://localhost:8082'. The 'Value' column for this entry shows a single item with key 'test' and value '1'. A red arrow points from the text 'Session Storage' in the title to the 'Session Storage' section in the panel. Another red arrow points from the 'Value' column header to the '1' value in the table.

SESSION STORAGE CAN I USE [^6]



SESSIONSTORAGE

EXERCISE TIME (15 MINUTES)

- » Open your quiz application on a new branch
- » try to store the selected answer in the sessionStorage

LOCAL STORAGE



LOCAL STORAGE

- » persistent storage which does not expire
- » key/values can be stored
 - » only supports strings as data types
- » max size roughly 5MB (depending on the browser)
- » blocks the event loop (for read and writes)
- » should be avoided for large datasets

LOCAL STORAGE PERSISTING VALUES

```
window.localStorage.setItem('someKey1', 'some important value')
//                                         1) ^^^^^^
//                                         2) ^^^^^^^^^^^^^^^^^^
// 1) the key where the value is stored
// 2) the value to be stored
```

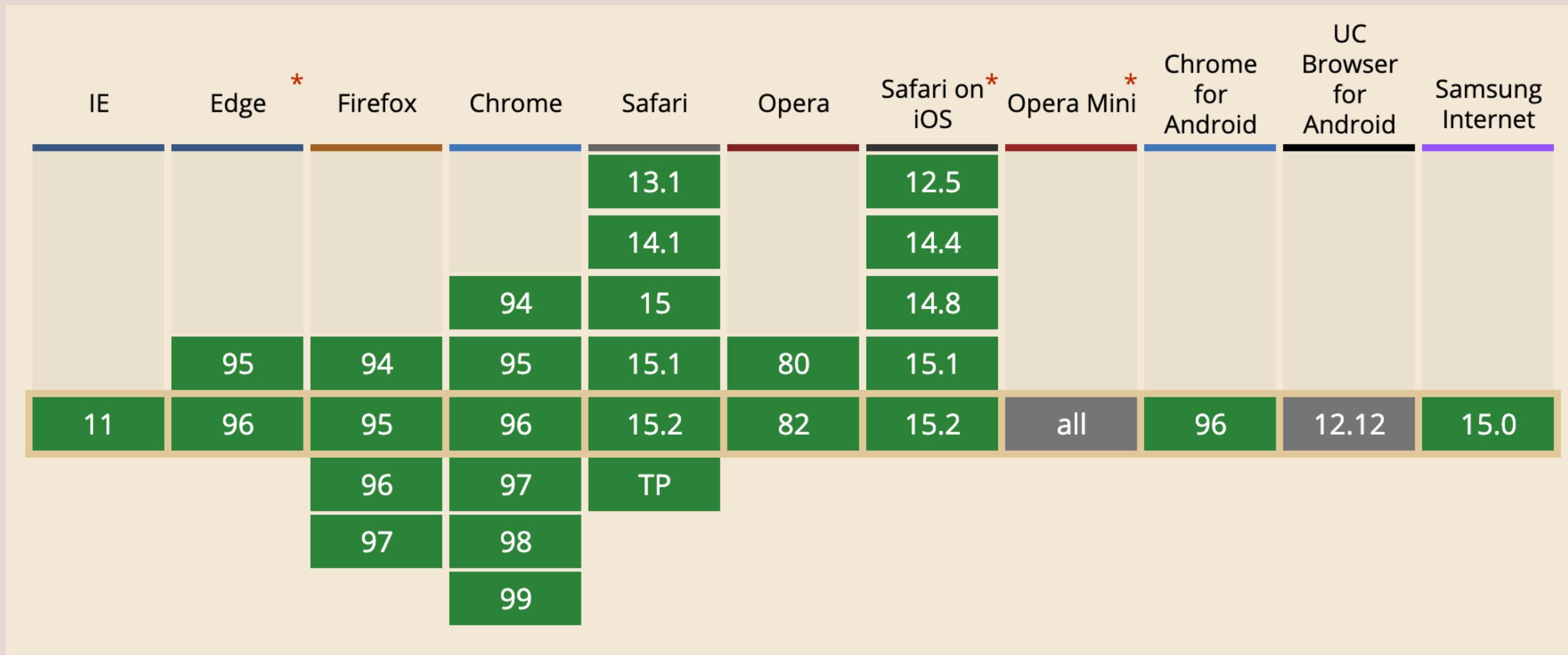
```
window.localStorage.setItem('someKey2', JSON.stringify({ test: 1 }))
//                                         3) ^^^^^^^^^^
// 3) stringify the object
```

LOCAL STORAGE READING VALUES

```
window.localStorage.setItem('someKey1', 'some value')
window.localStorage.getItem('someKey1') // => 'some value'
```

```
window.localStorage.setItem('someKey2', JSON.stringify({ test: 1 }))
window.localStorage.getItem('someKey1') // => '{ "test": 1 }'
//                                                 ^^^^^^
// this is returned as string and needs to be serialized again
```

SESSION STORAGE CAN I USE [^6]



INDEXEDDB

INDEXEDDB

- » Adds possibility to store data
- » non-relational database
 - » does not use SQL
- » supported in many browsers

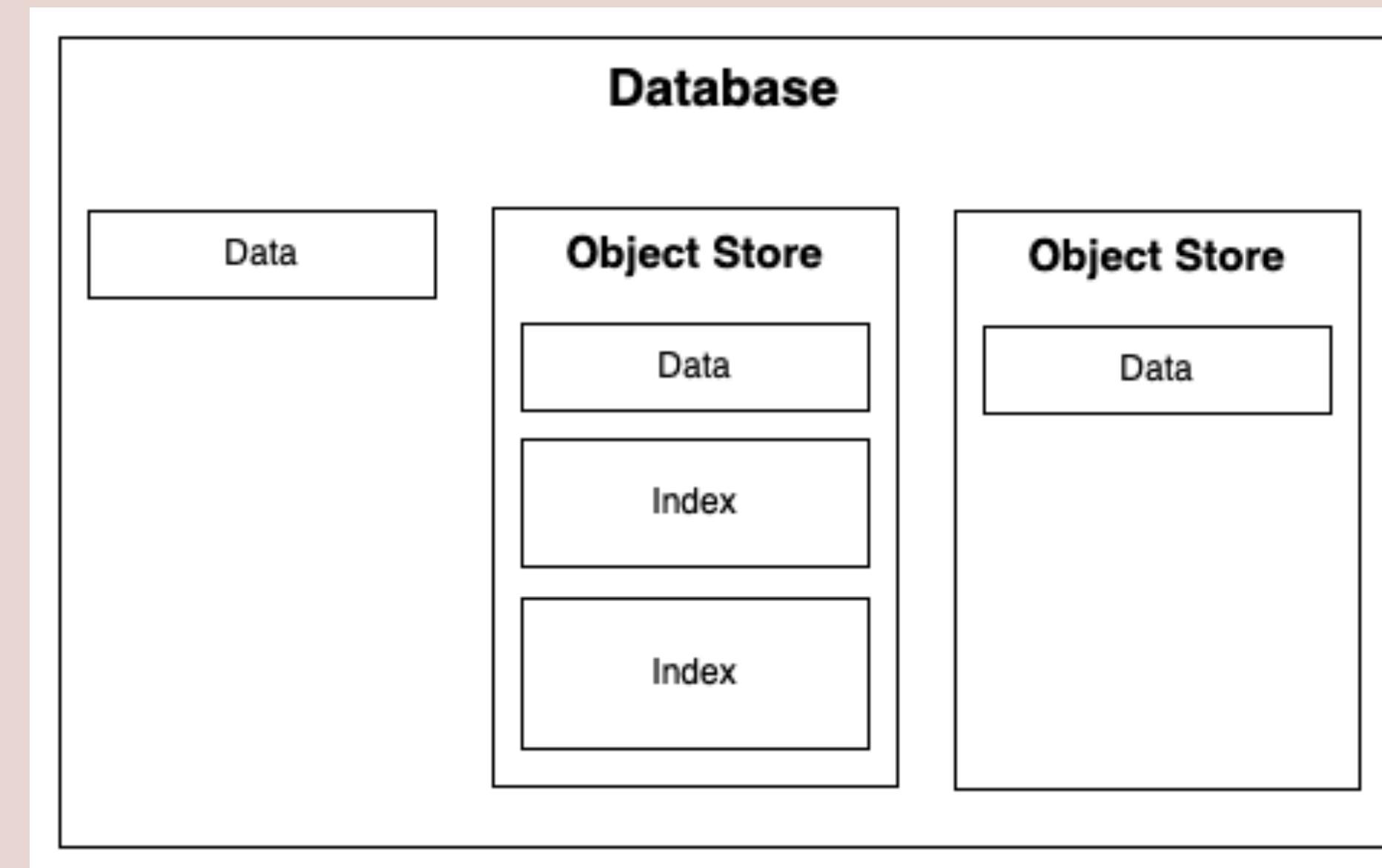
WHAT IS INDEXEDDB

IndexedDB provides an object store in the browser

- » non relational database
- » Stores: JS objects, files, blobs, ...
- » Supports: basic searching, sorting and transactions

INDEXEDDB STRUCTURE

CAN I USE [^6]



INDEXEDDB STRUCTURE

- » Database (a group of related data)
 - » each database can have multiple object stores
- » Object Store
 - » similar to a table in relational DBs
 - » contains data
 - » eg. user profile object store
 - » contains index

USAGE WITH IDB INSTALLATION

- » IDB is a small wrapper around indexedDB
 - » original implementation was not promise based
- » helps with data migration
- » installation via NPM

```
npm i idb
```
- » via CDN

```
import idb from 'https://cdn.jsdelivr.net/npm/
```

USAGE WITH IDB CREATING A DATABASE

```
const db = await openDB('test-db', 1, {
//           1) ^^^^^^
//           2) ^^^^^^^^
//           3) ^
// 1) open/connect to the database
// 2) name of the database
// 3) version number

    upgrade(db, currentVersion) {
// ^^^^^^^^^^^^^^ define database migrations

        if (currentVersion === 0) {
            db.createObjectStore('users', { keyPath: 'email' })
//           4) ^^^^^^^^^^^^^^^^^^^^^^
//           5) ^^^^^^
//           6) ^^^^^^
// 4) create an objectStore
// 5) the name of the ObjectStore
// 6) define the path to the key (value should be unique)
        }
    },
})
```

USAGE WITH IDB INSERTING/UPDATING DATA

```
await db.put('users', { name: 'Mike', email: 'mike@test.com', age: 14 })  
//           1) ^^^^^^  
//           2)          ^^^^^^  
// 1) the name of the ObjectStore  
// 2) the value to persist
```

USAGE WITH IDB DELETING DATA

```
await db.delete('users', 'mike@test.com')
//           1)      ^^^^^^
//           2)          ^^^^^^
// 1) the name of the ObjectStore
// 2) the key to delete from the ObjectStore
```

USAGE WITH IDB REMOVE ALL ENTRIES

```
await db.clear('users')
//           1)      ^^^^^^
// 1) the name of the ObjectStore to be cleared
```

USAGE WITH IDB CREATING AN INDEX

```
const db = await openDB('test-db', 2, {
  // 1) ^
  upgrade(db, currentVersion) {
    if (currentVersion === 0) {
      // ... don't touch existing migrations
    }

    if (currentVersion === 1) {
      store.createIndex('nameIdx', 'name');
      // 2) ^^^^^^
      // 3)           ^^^^
    }
  },
})

// 1) increase the version number
// 2) define a name for the index
// 3) define the property to be indexed
```

USAGE WITH IDB MULTIPLE VERSION ISSUE

- » indexedDBs might not be up to date with your code
- » data migrations need to be written
- » a user might be behind several db versions

USAGE WITH IDB MIGRATE SEVERAL VERSIONS

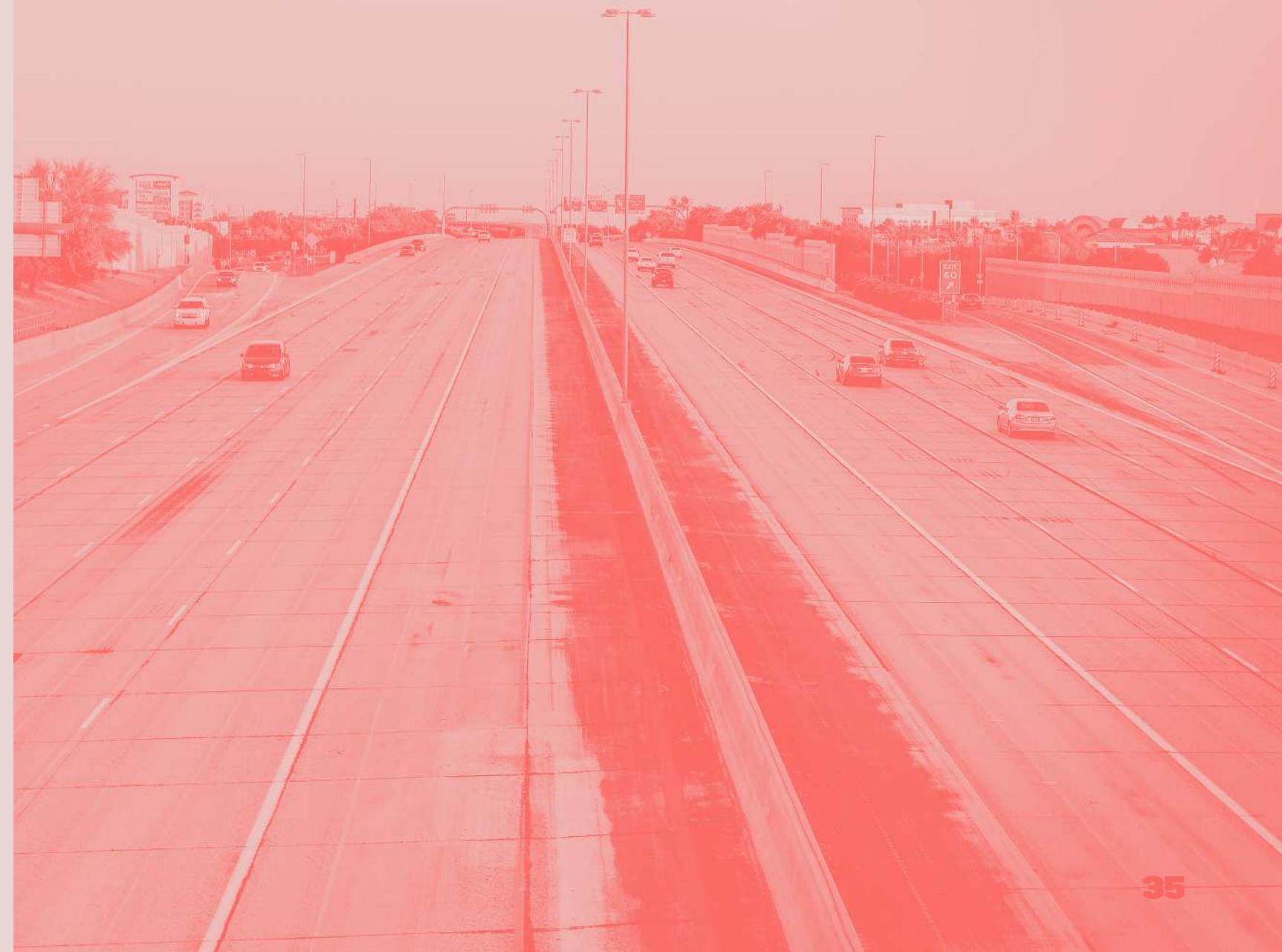
```
const db = await openDB('test-db', 10, {
  upgrade(db, currentVersion, nextVersion) {
    for (let version = currentVersion; version <= nextVersion; version++) {
      // ^^^^^^
      // iterate through all versions which hadn't been executed yet
      if (currentVersion === 0) {
        // first migration
      }
      if (currentVersion === 1) {
        // second migration
      }
      // ...
    }
  },
});
```

INDEXEDDB [^6]

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1 11	96	95	96	15.2	82	15.2	all	96	12.12	15.0
	96	97	TP							
	97	98								
		99								

INDEXEDDB EXERCISE TIME

- » Open your quiz application on a new branch
 - » try to store your questions in the indexed db
- » try to read the questions from there



FEEDBACK

- » Questions:
tmayrhofer.lba@fh-salzburg.ac.at
- » Feedback Link

