

# Development of Internet Applications

## HTML 5 API

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[www.cs.vsb.cz/radecky](http://www.cs.vsb.cz/radecky)

<https://developer.mozilla.org/en-US/docs/Web/Guide/HTML/HTML5>

<http://html5slides-1117.appspot.com>

[http://www.w3schools.com/html/html5\\_intro.asp](http://www.w3schools.com/html/html5_intro.asp)



# Storage

- Cookies replacement
  - Data is not a part of each request
  - Possible to store huge set of data
  - Accessible only by author/web page
  - Event-driven model
- Principle – couple key/value (string)
- **LocalStorage** – data stored for unlimited time
- **SessionStorage** – data stored for limited time defined by one session
- Access by interface (object) or indexes (keys)

```
if(typeof(Storage)!=="undefined")
{
  // Yes!
}
else
{
  // Sorry! No web storage support..
}
```

# Web database

- Web SQL Database
  - API for data processing on client-side based on relation DB principles (SQL)
  - No longer supported as a part of HTML 5
  - Methods: *openDatabase*, *db.transaction*, *tr.executeSQL*
- IndexedDB
  - Solution to store a huge amount of structured data
  - Fast searching based on indexing
  - Synchronous and asynchronous approach
  - Objective and transactional oriented, use couple key/value (object)
  - API interface: **indexedDB**

# Off-line applications

- Off-line operation of web pages using caching
- Decreasing of demands of speed and data size
- Cache Manifest (text/cache-manifest)
  - Stand-alone file includes cache rules
  - CACHE – cache specified files for further usage
  - NETWORK – specified files are never cached
  - FALLBACK – replacement for non-cached files
- Update of files
  - Cleaning of cache repository
  - Programmatically
  - Cache manifest update
- Deprecated, usage of Service Workers

# Web Workers

- Implementation of „Threads“ in web page environment
  - run the algorithm in the background without affecting interaction with the user
- External JS files are used for WebWorkers operation – synchronic approach
- Object **Worker**
- Worker works on global level, communication is based on events and messages (*postmessage* – *onmessage*)
- No access to native objects *window, document, parent*
- *Worklet* - independent access to the rendering thread for more complex multimedia operations
- *ServiceWorker* - independent code processing with a complex lifecycle, the primary role is as a proxy between the application and the network

# Web Sockets

- Advanced interface for bidirectional asynchronous communication (client – server), each side can send message during the time
- Both side implementation is necessary
- Effective usage together with WebWorkers
- Object **WebSocket**
- Implementation of events *onopen*, *onmessage*, *onclose* and method *send*
- Alternatives: Server Sent Event, MQTT, WebRTC, ...  
<https://ably.com/topic/websocket-alternatives>

# Drag & Drop

- One of fundamental users features from the desktop app domain
- It is possible to move any content element – **draggable=„true“**
- Implementation of events *ondragstart*, *ondrop*, *ondragover*
- Work with (transmitted within events) object *dataTransfer.SetData (GetData)*



# Drag-In (File API)

- Ability to move object (file) from local computer inside the web page content
- Based on Drag & Drop approach – event *ondrop* on specified element
- Access to moved content (file) via *DataTransfer.files* (similar to process input type „file“)
- File API offers objects **File, FileList, Blob, FileReader, URL**
- File API is suitable to work with files directly inside web page, cover also the reading of the file content (text, binary, Base64)

# FileSystem API

- Extends File API capabilities to write to file (**BlobBuilder, FileWriter**) and their organization (**DirectoryReader, FileEntry/DirectoryEntry, LocalFileSystem**)
- Based on virtual file system inside the browser sandbox – access via method *requestFileSystem*
- Suitable for Binary data (temporary or persistent) – files upload, temporary storage, file content edit, off-line working

# Geo-localization

- Possibility to obtain the GPS position of the user (latitude, longitude, altitude, accuracy, speed, timestamp)
- Necessity of user permission and secured connectivity
- Based on technical capabilities of device (GPS, Wifi, IP address)
- Object **navigator.geolocation**
- Methods *getCurrentPosition* and *watchPosition*

```
if ("geolocation" in navigator)
{
    /* geolocation is available */
}
else
{
    /* geolocation IS NOT available */
}
```

# Access to hardware

- Device orientation and position in environment
- Camera and microphone
- Voice input
- Gestures
- Full-screen mode
- Print
- Authentication
- NFC, Bluetooth
- <https://web.dev/articles/devices-introduction>

# Graphics

- **Bitmap graphics** – Canvas element
  - The context is operated over the element – method *getContext(„2d“)*
  - The context offers API for drawing, drawing is sequential
  - Animation uses methods *setTimeout* a *setInterval*. Most effective way is to use *requestAnimationFrame* – utilization of standard animation loop
- **Vector graphics** – SVG format
  - Modification of DOM – specific XML as a part of DOM
  - Ability to link visual components and CSS/JS
- **3D graphics** – WebGL technology
  - Context „webgl“
  - API is based on OpenGL approach
  - WebVR, WebAR, WebXR

# Specific data- attributes

- Possibility to store of specific, application related, data within standard HTML code
- Utilization of prefix **data-\*** (these attributes are ignored)
- Access through property *dataset* of a given element
- Suitable for storing work or state values, settings, data for analysis, etc.

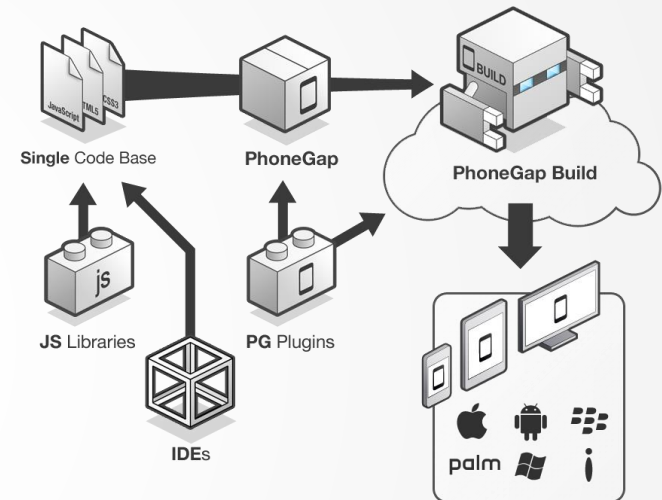
# Progressive Web Applications (PWA)

A web application (HTML, CSS, JS) that is supplemented/extended with features that allow the application to be used as mobile (native).

1. **Progressive** - does not differentiate what environment the user is working in (thin client)
  2. **Responsive** - adapt to different devices with different display options
  3. **Connection independent** - ability to work (albeit limited) even offline
  4. **App-Like** - user experience is close or equal to using a native app
  5. **Up-to-date** - the process of updating with Service workers, not only the data but also the application itself
  6. **Secure** - only on HTTPS protocol
  7. **Traceable** - they are traceable and indexable (thanks to the manifest)
  8. **Installable** - no need to download from application "stores", you just need to know the address and the "installation" process is provided by the application itself (icon on the desktop, etc.)
  9. **Available** - easily shared via URL, does not require complex installation
- <https://web.dev/pwa-checklist/>
  - <https://www.vzhurudolu.cz/prirucka/pwa>
  - <https://www.rascasone.com/cs/blog/progresivni-webova-aplikace-vyhody>

# Mobile applications

- HTML 5 is suitable for implementation of native mobile apps – thanks to middleware
- Web app based on HTML5+JS+CSS is fundamental.
- It is extended by features offered by specific API (PhoneGap, Xamarin, etc.).
- The result is native cross-platform app – web browser with extended features as environment.
- The abstract layer (middleware) is used. It offers connection between app and HW/OS level.
- Camera, Geolocation, Compass, Contacts, Media, Accelerometer, Network, Notification, Storage, Filesystem





# Others

- Webmanifest
- WebAssembly – program instruction binary format and virtual machine