Mobilni sistemi i servisi

- Mobilne Web aplikacije –

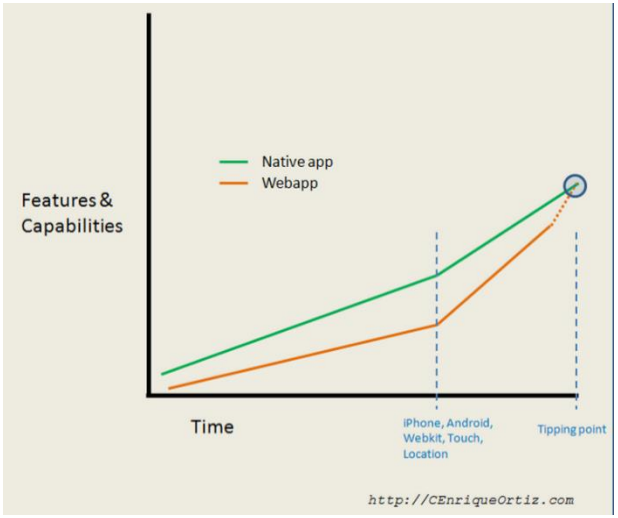
Katedra za računarstvo
Elektronski fakultet u Nišu

Literatura

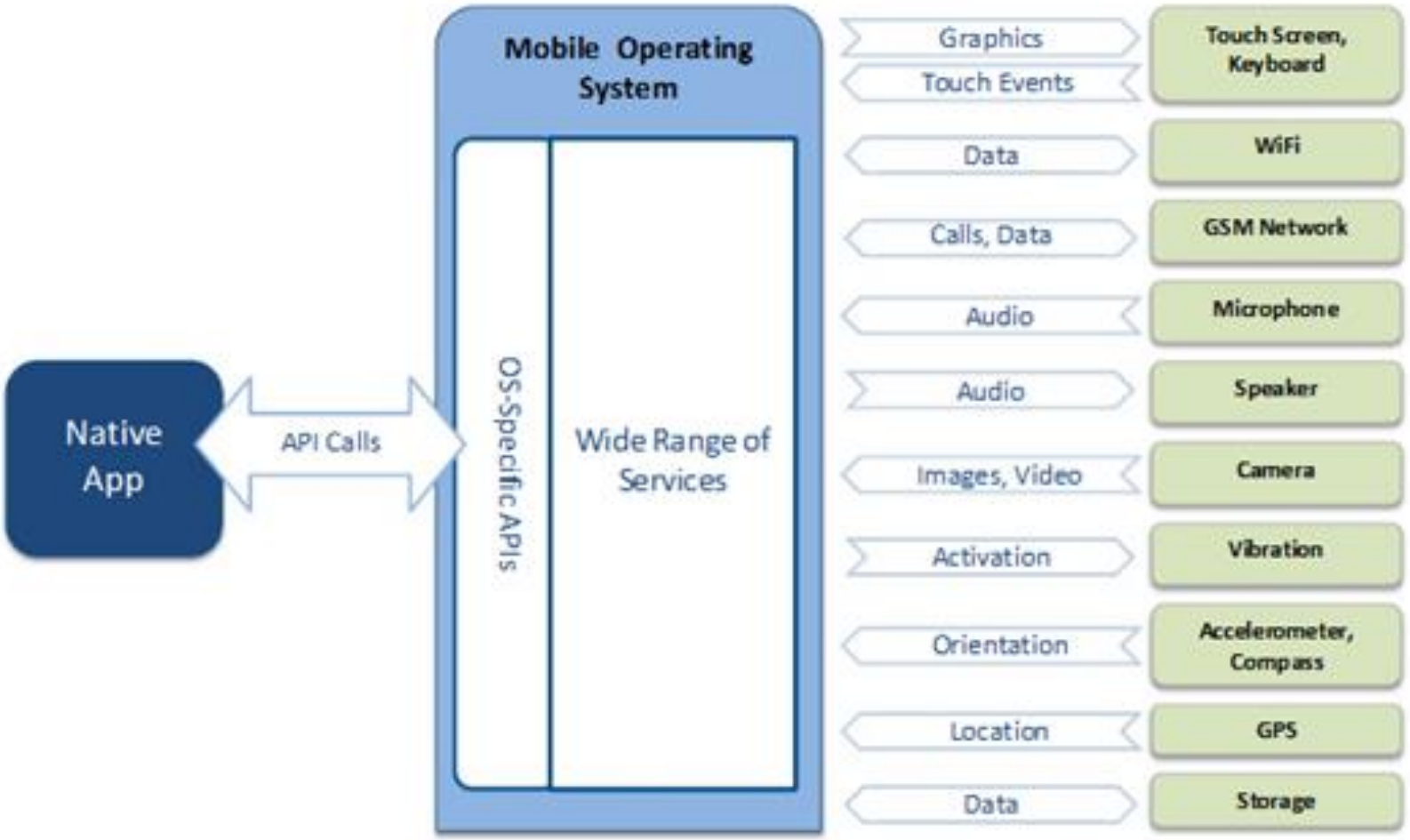
- Maximiliano Firtman, *Programming the Mobile Web*, 2nd Edition, O' Reilly Media, 2013.
- *Mobile Developer's Guide To The Galaxy*, 18th Edition, 2019
- Breaking the Mobile Web
  - http://www.mobilexweb.com/
- Raymond K. Camden, *Apache Cordova in Action*, Manning Publications; 1 edition, 2015

Mobilne Web applikacije vs. nativne aplikacije

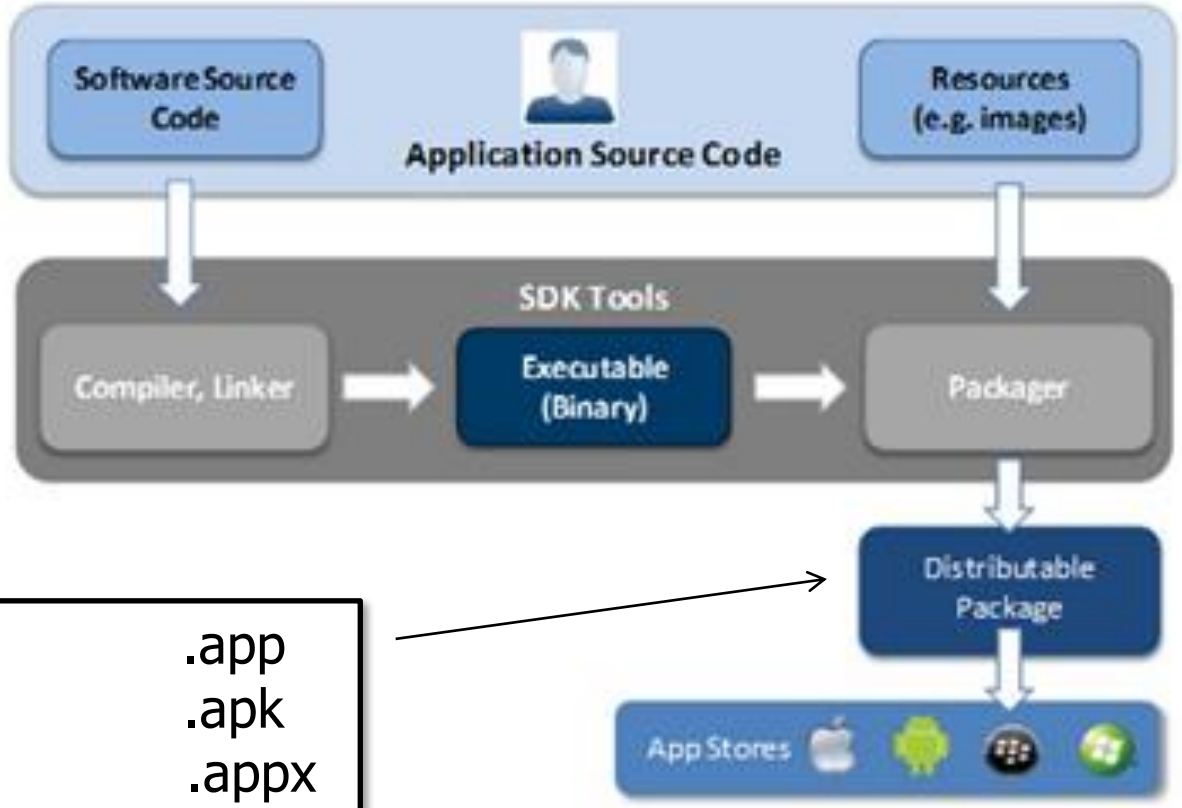
- WebKit (Blink) protiv iOS/Android/Windows
- Tehnologije i tržište se kreću prema Web-u
- Kada razviti nativnu aplikaciju:
  - Igre/ Lokacija / Sensori/ File sistem / Off-line
  - Različiti UX/UI
  - Da li download-ovati i instalirati aplikaciju?



Nativne mobilne aplikacije



Nativne mobilne aplikacije (2)



iOS	.app
Android	.apk
Windows	.appx
Blackberry	.cod

Nativne mobilne aplikacije

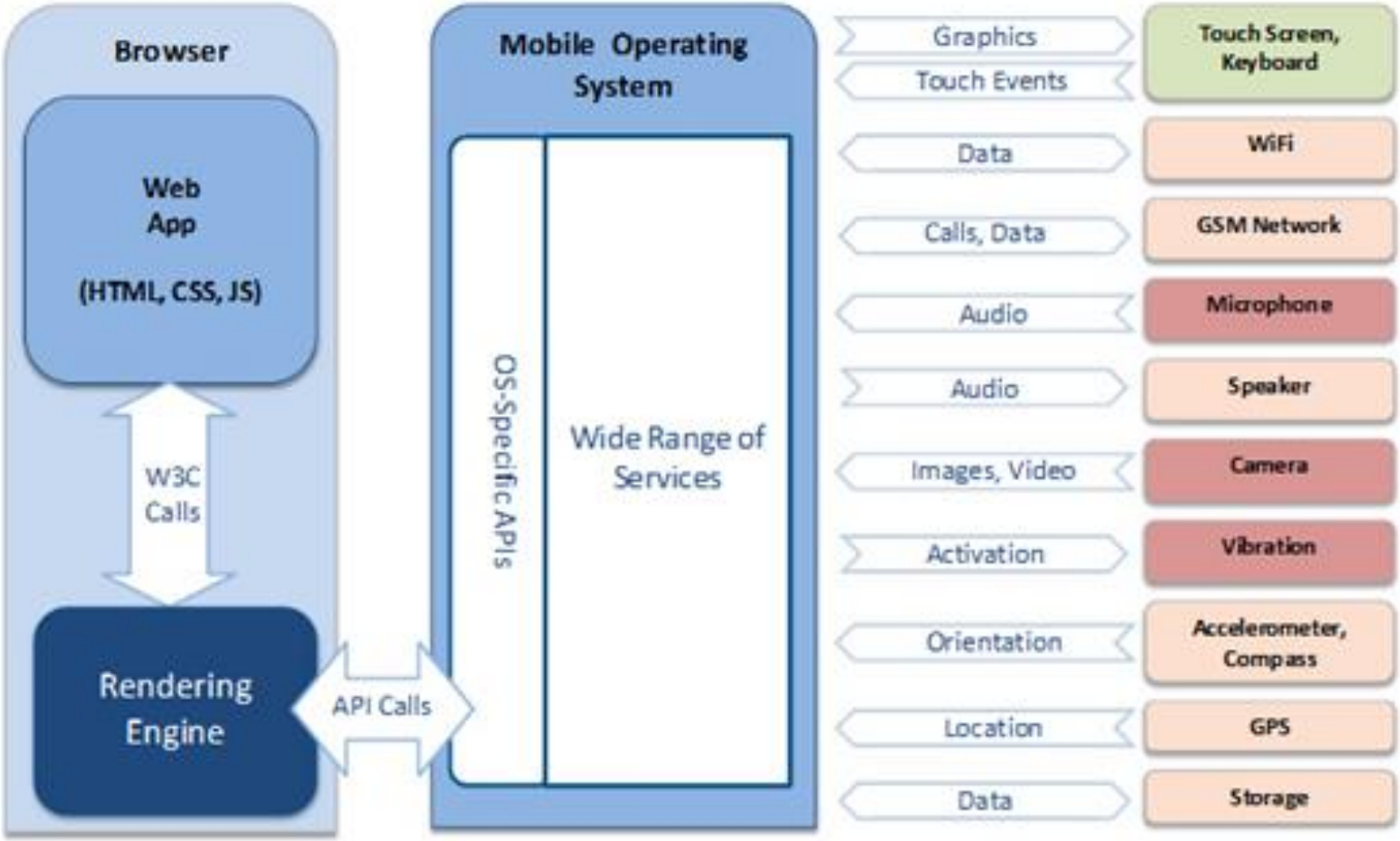
Prednosti

- Direktan pristup mobilnoj platformi preko nativnog API-a
- Visoke performanse
- Prilagođena platformi i njenoj evoluciji

Nedostaci

- Neophodno dobro poznavanje programskog (-ih) jezika i nativnog API-a
- Razvoj isključivo za jednu platformu
- Visoki troškovi i napor u razvoju aplikacije

Mobilne Web aplikacije



Mobilne Web aplikacije

Prednosti

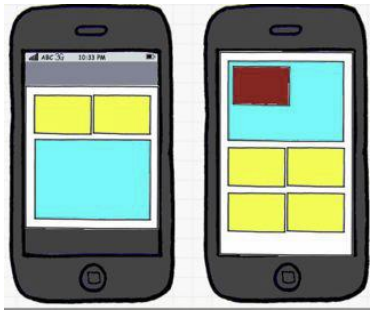
- Nema potrebe za instaliranjem aplikacije
- Lako održavanje i ažuriranje bez potrebe za novim instaliranjem
- Podrška za kros-platform na svakom uređaju koji ima browser

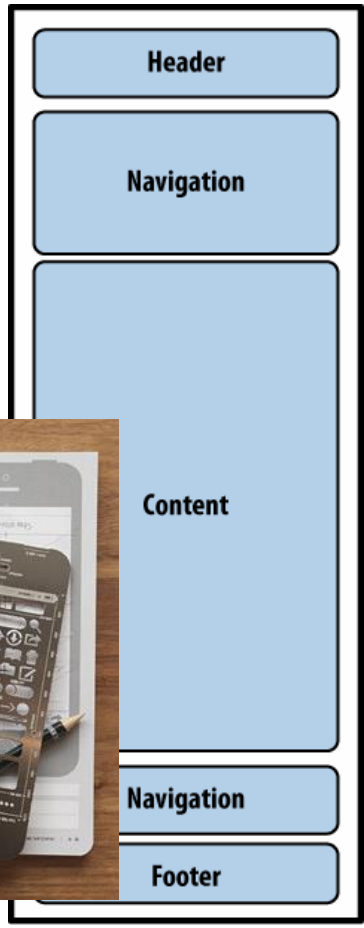
Nedostaci

- Nema mogućnosti pristupa nativnom API-u i karakteristikama uređaja/platforme
- Ograničeni UI koji nema nativni *look & feel*
- Slabije performanse zavisne od pristupa preko bežične mreže
- Ne može se distribuirati preko Play/App store-a

Dizajn mobilne Web aplikacije

- Dizajn s ciljem najboljeg mobilnog korisničkog iskustva
  - Ko su korisnici?
  - S kojim ciljem koriste aplikaciju?
  - Kada i kako interaguju s njom?
  - Gde se nalaze korisnici?
  - Zašto bi koristili baš ovu aplikaciju?
  - Kako koriste svoj mobilni uređaj?
- *Look & Feel*
- Dizajn layout
  - Boja, Tekst, Ikone, Widget-i
  - Jedan prozor/ekran ili stek prozora
  - Tab grupa koja sadrži više prozora
  - Prozori koji sadrže više pogleda





Web standardi

- HTML, XHTML, WML, XHTML Basic, XHTML-MP, itd.
  - *Standards and drafts* - http://www.w3.org/TR/
- CSS: Cascading Style Sheets
  - CSS predstavlja jezik za definisanje stila prikaza HTML dokumenta
  - http://www.w3.org/Style/CSS/
- JavaScript
  - JavaScript (JS) je *open source* programski jezik implementiran u okviru Web browser-a u cilju kreiranja kompleksnijeg korisničkog interfejsa i dinamičkih Web strana
  - JavaScript, JSON, AJAX,...
  - ECMAScript 6 (2015), ECMAScript 2017 (2018, 2019, 2020,...), TypeScript, CoffeeScript, Dart,...
  - https://developer.mozilla.org/en/JavaScript

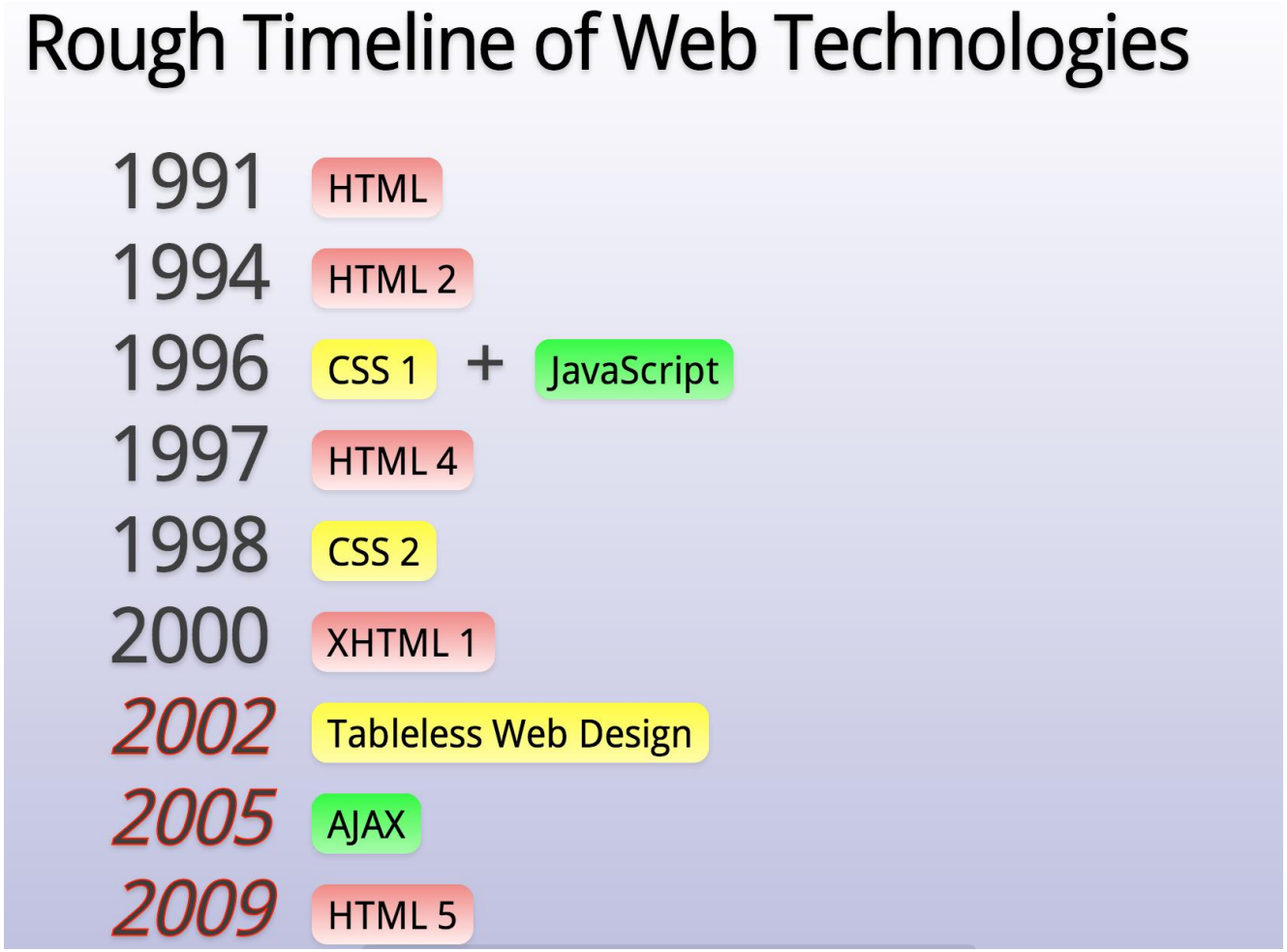
Mobilni Web – razvojni alati

- HTML5/CSS3/ JavaScript - AJAX
- W3C Mobile Web Best Practices (Application Best Practices)
  - http://www.w3.org/TR/mobile-bp/
  - http://www.w3.org/TR/mwabp/
- Wireframe/prototip alati (Wireframer, NinjaMock, ...)
- iUI - User Interface Framework for Mobile Web apps
  - http://www.iui-js.org/
- Mobilni Web aplikacioni okviri
  - Ionic - http://ionicframework.com/
  - jQuery Mobile - http://jquerymobile.com/
  - Sencha Touch - http://www.sencha.com/products/touch/
  - Dojo Mobile - http://dojotoolkit.org/features/mobile
  - ...
- Mobilni hibridni aplikacioni okviri
  - PhoneGap - Apache Cordova http://phonegap.com/ http://cordova.apache.org/

HTML5

- HTML5 predstavlja najnoviji HTML standard
  - (HTML 5.2 - W3C Recommendation, December 2018)
  - https://www.w3.org/TR/html/
  - https://developers.google.com/web/ (http://www.html5rocks.com/)
  - http://www.w3schools.com/html/html5_intro.asp
- Pravila definisana u okviru HTML5 standarda:
  - Nove karakteristike treba da budu zasnovane na HTML, CSS, DOM i JavaScript-u
  - Redukuje se potreba za eksternim plug-inovima (npr. Flash)
  - Bolje rukovanje greškama
  - Više novih markup tagova kojima se zamenjuje upotreba script koda
  - HTML5 treba da bude nezavisan od uređaja/browser-a
  - Razvojni proces treba da bude otvoren za javnost (transparentan)

Istorijat Web tehnologija



Source: html5rocks.com

HTML5 – nove karakteristike

- 2D i 3D grafika
  - <canvas> element, SVG, WebGL (3D), 3D CSS Transforms, i SMIL
- <video> i <audio> elementi za prikaz i reprodukovanje multimedijalnih sadržaja
- Podrška za lokalno smeštanje podataka
  - Aplikacioni keš (*Application cache*)
  - Web storage: localStorage, sessionStorage
  - Indexed DB API (Indexed Database API) (ranije Web SQL)
- Geolocation API
- Novi semantički i elementi za specifične sadržaje:
  - <header>, <section>, <footer>, <aside>, <nav>, <main>, <article>, <figure>,…
- Novi ulazni tipovi i kontrole na formi:
  - calendar, date, time, email, tel, url, search, datalist, keygen...
- Device API
  - Camera API, Tuch Events, Device Orientation,…
- Push API, Notifications API, Web Payments API,…
- WebRTC, Media capture and recording APIs

Osnovni HTML5

- http://www.w3schools.com/html/html5_intro.asp

```
<!DOCTYPE html>
<html>
    <meta charset="UTF-8">
    <head>
        <title>Title of the document</title>
    </head>
    <body>
        The content of the document……
    </body>
</html>
```

HTML5 – Canvas i SVG

- HTML5 <canvas> element se koristi za iscrtavanje 2D i 3D grafike korišćenjem skript koda (obično JavaScript).
- Canvas uključuje više metoda za iscrtavanje linija, *pravougaonika*, *krugova*, *teksta*, i dodavanje *slika*.
- SVG (*Scalable Vector Graphics*) je XML jezik za prikaz 2D

```
<canvas id="myCanvas" width="200" height="100"
    style="border:1px solid #000000;">
</canvas>


<script>
    var c = document.getElementById("myCanvas");
    var ctx = c.getContext("2d");
    ctx.fillStyle = "#FF0000";
    ctx.fillRect(0,0,150,75);
</script>
```

HTML5 integrisani SVG

```
<!DOCTYPE html>
<html>
   <body>
      <svg xmlns="http://www.w3.org/2000/svg" version="1.1"
   height="190">
      <polygon points="100,10 40,180 190,60 10,60 160,180"
     style="fill:lime;stroke:purple;stroke-width:5;fill-rule:evenodd;">
      </svg>
   </body>
</html>
```

HTML5 aplikacioni keš

- HTML5 uvodi aplikacioni keš, čime omogućava da se kešira kod/sadržaj u okviru Web aplikacije i da taj kod/sadržaj bude dostupan i bez Internet konekcije.
- Aplikacioni keš obezbeđuje tri prednosti za mobilne Web aplikacije:
  - *Offline* pregledanje (*browsing*) – korisnici mogu da koriste aplikaciju i kada su *offline*
  - Brzina – keširani resursi se brže učitavaju
  - Redukovano opterećenje servera - browser će *download*-ovati samo ažurirane/promenjene resurse sa servera
- *Cache Manifest* datoteka – tekst datoteka koja definiše koji sadržaj će biti keširan
  - 3 sekcije: CACHE MANIFEST, NETWORK, FALLBACK

```
<!DOCTYPE HTML>
<html manifest="demo.appcache">
    ...
</html>
```

```
CACHE MANIFEST
# 2012-02-21 v1.0.0
/theme.css
/logo.gif
/main.js

NETWORK:
login.asp

FALLBACK:
/html/ /offline.html
```

HTML5 – storage

- Local Storage & Session Storage

JS Web Storage

```
// use localStorage for persistent storage
// use sessionStorage for per tab storage
saveButton.addEventListener('click', function () {
  window.localStorage.setItem('value', area.value);
  window.localStorage.setItem('timestamp', (new Date()).getTime());
}, false);
textarea.value = window.localStorage.getItem('value');
```

- Web SQL & IndexedDB

JS Web SQL Database

```
var db = window.openDatabase("DBName", "1.0", "description", 5*1024*1024); //5MB
db.transaction(function(tx) {
  tx.executeSql("SELECT * FROM test", [], successCallback, errorCallback);
});
```

Source: html5rocks.com

HTML5 – Geolocation

Geolocation

```
if (navigator.geolocation) {
  navigator.geolocation.getCurrentPosition(function(position) {
    var latLng = new google.maps.LatLng(
        position.coords.latitude, position.coords.longitude);
    var marker = new google.maps.Marker({position: latLng, map: map});
    map.setCenter(latLng);
  }, errorHandler);
}
```

```
<script>
var x=document.getElementById("demo");
function getLocation()
  {
  if (navigator.geolocation)
    {
    navigator.geolocation.getCurrentPosition(showPosition,showError);
    }
  else{x.innerHTML="Geolocation is not supported by this browser.";}
  }

function showPosition(position)
  {
  var latlon=position.coords.latitude+","+position.coords.longitude;

  var img_url="http://maps.googleapis.com/maps/api/staticmap?center="
  +latlon+"&zoom=14&size=400x300&sensor=false";
  document.getElementById("mapholder").innerHTML="<img src='"+img_url+"'>";
  }
```

HTML5 – Geolocation

- *watchPosition()* – vraća tekuću poziciju korisnika i nastavlja da vraća ažurne pozicije kako se korisnik kreće (npr. u vozilu dok ima uključen GPS).
- *clearWatch()* – Zaustavlja *watchPosition()* metod.

```
<script>
var x=document.getElementById("demo");
function getLocation()
  {
  if (navigator.geolocation)
    {
    navigator.geolocation.watchPosition(showPosition);
    }
  else{x.innerHTML="Geolocation is not supported by this browser.";}
  }
function showPosition(position)
  {
  x.innerHTML="Latitude: " + position.coords.latitude +
  "<br>Longitude: " + position.coords.longitude;
  }
</script>
```

HTML5 – Govorni ulaz & tipovi ulaza

HTML Speech Input

```
<input type="text" x-webkit-speech />
```

HTML Form field types on mobile

type="text"	type="number"	type="email"	type="tel"
			
Android Device	Android Device	iPhone Device	iPhone Device

HTML5 – audio & video

HTML JS **Audio + Video**

```
<audio id="audio" src="sound.mp3" controls></audio>
document.getElementById("audio").muted = false;
```

```
<video id="video" src="movie.webm" autoplay controls></video>
document.getElementById("video").play();
```

HTML5 – animacija

CSS Animations

```
@-webkit-keyframes pulse {
 from {
   opacity: 0.0;
   font-size: 100%;
 }
 to {
   opacity: 1.0;
   font-size: 200%;
 }
}

div {
  -webkit-animation-name: pulse;
  -webkit-animation-duration: 2s;
  -webkit-animation-iteration-count: infinite;
  -webkit-animation-timing-function: ease-in-out;
  -webkit-animation-direction: alternate;
}
```

HTML5 Web worker-i

- Web worker je JavaScript kod koji se izvršava u pozadini, nezavisno od ostalih skript metoda, bez narušavanja performansi Web stranice.
- Kada se izvršava skript funkcija u okviru HTML stranice, stranica postaje "blokirana" za interakciju dok se skript funkcija ne završi.
- Ukoliko izvršava Web worker, korisnik je u mogućnosti da nastavi sa interakcijom: klikom, selektovanjem elemenata stranice, itd., dok se Web worker izvršava u pozadini.

HTML5 Web worker - primer

```
<!DOCTYPE html>
<html>
<body>

<p>Count numbers: <output id="result"></output></p>
<button onclick="startWorker()">Start Worker</button>
<button onclick="stopWorker()">Stop Worker</button>

<p><strong>Note:</strong> Internet Explorer 9 and earlier versions do not support Web
Workers.</p>

<script>
var w;

function startWorker() {
    if(typeof(Worker) !== "undefined") {
        if(typeof(w) == "undefined") {
            w = new Worker("demo_workers.js");
        }
        w.onmessage = function(event) {
            document.getElementById("result").innerHTML = event.data;
        };
    } else {
        document.getElementById("result").innerHTML = "Sorry, your browser does not support Web
Workers...";
    }
}

function stopWorker() {
    w.terminate();
    w = undefined;
}
</script>

</body>
</html>
```

demo_workers.js

```
var i = 0;

function timedCount() {
    i = i + 1;
    postMessage(i);
    setTimeout("timedCount()",500);
}

timedCount();
```

HTML5 Server-Sent Events

- HTML5 Server-Sent Events omogućava da Web aplikacija/stranica dobija ažurne podatke sa servera.
- Primer: Facebook/Twitter ažuriranja, ažuriranje cene akcija na berzi, tokovi vesti (*news feeds*), sportski rezultati, itd.

```
<!DOCTYPE html>
<html>
<body>

<h1>Getting server updates</h1>
<div id="result"></div>

<script>
if(typeof(EventSource) !== "undefined") {
    var source = new EventSource("demo_sse.php");
    source.onmessage = function(event) {
        document.getElementById("result").innerHTML += event.data + "<br>";
    };
} else {
    document.getElementById("result").innerHTML = "Sorry, your browser does
not support server-sent events...";
}
</script>

</body>
</html>
```

```
<?php
header('Content-Type: text/event-stream');
header('Cache-Control: no-cache');

$time = date('r');
echo "data: The server time is: {$time}\n\n";
flush();
?>
```

demo_sse.php

```
<%
Response.ContentType = "text/event-stream"
Response.Expires = -1
Response.Write("data: " & now())
Response.Flush()
%>
```

demo_sse.asp

HTML5 - WebSocket

- Otvaranje *WebSocket* konekcije postiže se jednostavnim pozivom *WebSocket* konstruktora

```
var connection = new WebSocket('ws://html5rocks.websocket.org/echo',
['soap', 'xmpp']);
```

- Dok je konekcija otvorena moguće je slati podatke na server i primati podatke sa servera.

```
connection.onopen = function () {
  connection.send('Ping'); // Send the message 'Ping' to the server
};

// Log errors
connection.onerror = function (error) {
  console.log('WebSocket Error ' + error);
};

// Log messages from the server
connection.onmessage = function (e) {
  console.log('Server: ' + e.data);
};
```

HTML5 – WebSocket (2)

- Slanje podataka na server obavlja se pozivom *send('your message')* metode *connection* objekta

```
connection.send('your message');

// Sending canvas ImageData as ArrayBuffer
var img = canvas_context.getImageData(0, 0, 400, 320);
var binary = new Uint8Array(img.data.length);
for (var i = 0; i < img.data.length; i++) {
  binary[i] = img.data[i];
}
connection.send(binary.buffer);

// Sending file as Blob
var file = document.querySelector('input[type="file"]').files[0];
connection.send(file);
```

- Takođe i server u svakom trenutku može slati poruke Web klijentu.
- Svaki put kad stigne poruka od servera, poziva se *onmessage* callback metoda, koja kao ulazni argument dobija *event* objekat, i poruci pristupa preko *data* atributa ovog objekta.

Mobile HTML5

HTML5 kompatibilnost na mobilnim i tablet browser-ima testirana na realnim uređajima http://mobilehtml5.org/

Feature	Safari iOS	Android Browser	Google Chrome	Amazon Silk	BlackBerry Browser			Nokia Browser		Internet Explorer		Opera Mobile	Opera mini	Firefox	
Platform	IPhone, IPad	Phones & Tablet	Android 4.0+	Kindle Fire	Phones		Tablet	Nokia X	Symbian	Windows Phone	Windows 8.x	Android & Symbian	Java,IOS Android	Android, Meego	Firefox OS
Versions tested	3.2 to 8.1	1.5 to 4.3	18 to 40b	1.0 to 2.0	5.0 to 7.1	10 to 10.2b	1.0 to 2.1	1.0	^3 to BelleFP2	9 to 11	10 to 11	11 to 26	5 to 7.5	6 to 34b	1.0
Application Cache W3C API Offline package installation.	✓	✓ 2.1+	✓	✓	✓ 6.0+	✓	✓	✓	✓ Belle FP2+	✓ 10+	✓	✓		✓	✓
Web storage W3C API Persistent and session storage.	✓	✓ 2.0+	✓	✓	✓ 6.0+	✓	✓	✓	✓ Belle FP2+	✓	✓	✓		✓	✓
Web SQL storage W3C API (inactive) Persistent SQLite storage.	✓	✓ 2.0+	✓	✓	✓ 6.0+	✓	✓	✓	✓ Belle FP2+			✓			
IndexedDB W3C API Agnostic database system (replacement for Web SQL)	✓ 8.0b+		✓	✓ 2.0+		✓		✓		✓ 10+	✓	✓ 14+		✓	✓
Geolocation W3C API Geolocation & tracking using GPS, cells or WI-FI.	✓	✓	✓	✓ 2.0+	✓ 6.0+	✓	✓	✓	✓ Belle+	✓	✓	✓		✓	✓
Multimedia W3C API Video & Audio Players	✓	✓ 2.3+	✓	✓	✓ 7.0+	✓	✓	✓	✓ Belle+	✓	✓	✓		✓	✓
Web Workers W3C API Threading and background process communications	✓ 5.0+		✓	✓ 2.0+	✓ 6.0+	✓	✓	✓		✓ 10+	✓	✓		✓	✓
Viewport definition W3C API Meta tag support.	✓	✓ dpi	✓ dpi	✓	✓ dpi 7.0+	✓ dpi	✓	✓	✓ dpi Anna+	✓ also css	✓ also css	✓ also css	✓ 6+	✓	✓

Mobile HTML5

http://mobilehtml5.org/

Feature	Safari iOS	Android Browser	Google Chrome	Amazon Silk	BlackBerry Browser			Nokia Browser		Internet Explorer		Opera Mobile	Opera mini	Firefox	
Platform	IPhone, IPad	Phones & Tablet	Android 4.0+	Kindle Fire	Phones	BB10	Tablet	Nokia X	Symbian	Windows Phone	Windows 8.x	Android & Symbian	Java,IOS Android	Android, MeeGo	Firefox OS
Canvas API W3C API 2D Drawing API	✓	✓	✓	✓	✓	✓	✓	✓	✓ Anna+	✓	✓	✓	✓	✓	✓
SVG W3C Working Group Scalable Vector Graphics	✓	✓ 3.0+	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Motion Sensors W3C Standard Accelerometer, Gyroscope, Magnetometer	✓ 4.2	✓ 3.0+	✓ 30+	✓ 2.0+		✓	✓	✓		✓ 11+	✓ 11+	✓ 12+		✓	✓
Form Virtual Keyboards W3C Standard Text inputs with different keyboards	✓	✓ 4.0+	✓	✓	✓	✓	✓	✓	✓ Anna+	✓ 10+	✓	✓		✓	✓
Form New Controls W3C API At least: Date, Time, Month, Range	✓ 5.0+		✓		✓ 6.0+	✓	✓ 2.0+	✓		✓ 10+ only range	✓ only range	✓		✓	✓ no range
Touch Events W3C API touchstart, touchend, touchmove, touchcancel	✓	✓ 2.1+	✓	✓	✓ 6.1+	✓	✓	✓	✓ Belle FP2+			✓ (android)		✓	✓
Pointer Events W3C API pointerdown, pointerup, pointermove, etc.										✓ 10+	✓				

JavaScript

- JavaScript je skript programski jezik za razvoj programskog koda koji se može uključiti u HTML stranice, i može biti izvršavan od strane svih savremenih Web browser-a, pa samim tim i mobilnih Web browser-a.
- JavaScript funkcije:
  - Upis u HTML Output
  - Odgovor na događaje
  - Promena HTML sadržaja
  - Promena HTML stilova
  - Validacija ulaza

JavaScript

- JavaScript How To - http://www.w3schools.com/js/js_howto.asp
- Skripte u okviru HTML moraju biti uključene između <script> i </script> tagova.
- Skripte se mogu postaviti u <body> ili <head> sekcije HTML stranice.
- Eksterne JavaScript datoteke.

- Primer: Odgovor na događaj

```
<button type="button"
    onclick="alert('Welcome!')">Click Me!</button>
```

JavaScript primer: Događaji

```
<!DOCTYPE html>
<html>
   <body>
        <h1>My First JavaScript</h1>
        <p>
              JavaScript can react to events. Like the click of a
              button:
        </p>
        <button type="button”
        onclick="alert('Welcome!')">Click Me!</button>
   </body>
</html>
```

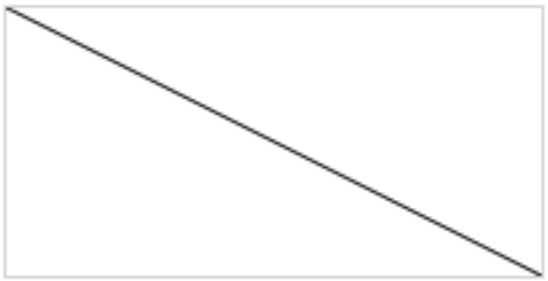
JavaScript primer: Date

```
<!DOCTYPE html>
<html>
<head>
    <script>
        function displayDate()
        {
            document.getElementById("demo").innerHTML=Date();
        }
    </script>
</head>
<body>
    <h1>My First JavaScript</h1>
    <p id="demo">This is a paragraph.</p>
    <button type="button" onclick="displayDate()">Display Date</button>
</body>
</html>
```

http://www.w3schools.com/js/tryit.asp?filename=tryjs_events

JavaScripts primer: Canvas

```
<!DOCTYPE html>
<html>
<body>
<canvas id="myCanvas" width="200" height="100" style="border:1px
solid #d3d3d3;“>Your browser does not support the HTML5 canvas tag.
</canvas>
<script>
    var c=document.getElementById("myCanvas");
    var ctx=c.getContext("2d");
    ctx.moveTo(0,0);
    ctx.lineTo(200,100);
    ctx.stroke();
</script>
</body>
</html>
```



jQuery Mobile http://jquerymobile.com/

- jQuery Mobile je mobilni web framework za JavaScript optimizovan za *touch* uređaje:
  - Kompatibilan sa svim glavnim mobilnim platformama i glavnim browser-ima
  - Razvijen nad jQuery core-a, tako da je blaga kriva učenja za one koji poznaju jQuery i njegovu sintaksu.
  - Framework omogućava kreiranje prilagođenih tema.
  - Ograničena zavisnost od eksternih biblioteka, male veličine i optimizovane brzine učitavanja i izvršavanja.
  - HTML5-zasnovana konfiguracija za definisanje layout-a stranice sa minimalnim korišćenjem skript koda
  - Navigacija između stranica korišćenjem Ajax-a sa animiranim prelaskom između stranica, kao i mogućnost menjanja URL-a putem *pushState*.
  - UI widget-i su optimizovani za dodir i nezavisni od platforme.

jQuery Mobile

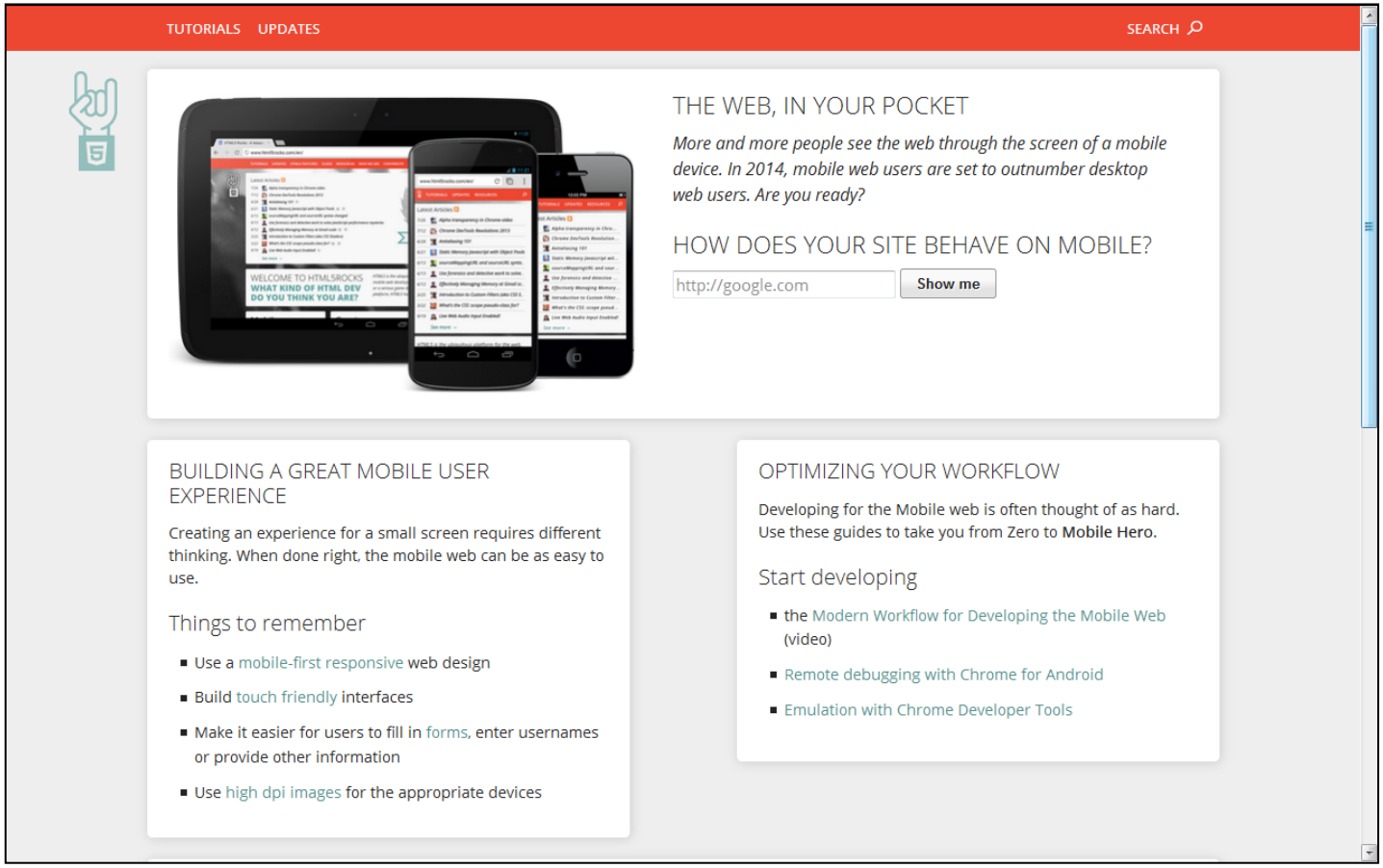
```
<html>
<head>
    <title>MOSIS</title>
    <link rel="stylesheet"
    href="http://code.jquery.com/mobile/1.4.2/jquery.mobile-1.4.5.min.css">
    <script src="http://code.jquery.com/jquery-1.11.2.min.js"></script>
    <script src="http://code.jquery.com/mobile/1.4.2/jquery.mobile-
    1.4.5.min.js"></script>
</head>
<body>
   ...

</body>
</html>
```

jQuery Mobile primer: Liste

```
<html>
<head>
    <title>Page Title</title>
    <meta name="viewport" content="width=device-width, initial-scale=1">
    <link rel="stylesheet"href="http://code.jquery.com/mobile/1.4.5/jquery.mobile-
    1.4.5.min.css">
    <script src="http://code.jquery.com/jquery-1.11.2.min.js"></script>
    <script src="http://code.jquery.com/mobile/1.4.5/jquery.mobile-1.4.5.min.js"></script>
</head>
<ul data-role="listview">
    <li><a href="index.html">Acura</a></li>
    <li><a href="index.html">Audi</a></li>
    <li><a href="index.html">BMW</a></li>
    <li><a href="index.html">Cadillac</a></li>
    <li><a href="index.html">Chrysler</a></li>
    <li><a href="index.html">Dodge</a></li>
    <li><a href="index.html">Ferrari</a></li>
    <li><a href="index.html">Ford</a></li>
    <li><a href="index.html">GMC</a></li>
    <li><a href="index.html">Honda</a></li>
<ul>
</html>
```

Mobilne Web aplikacije

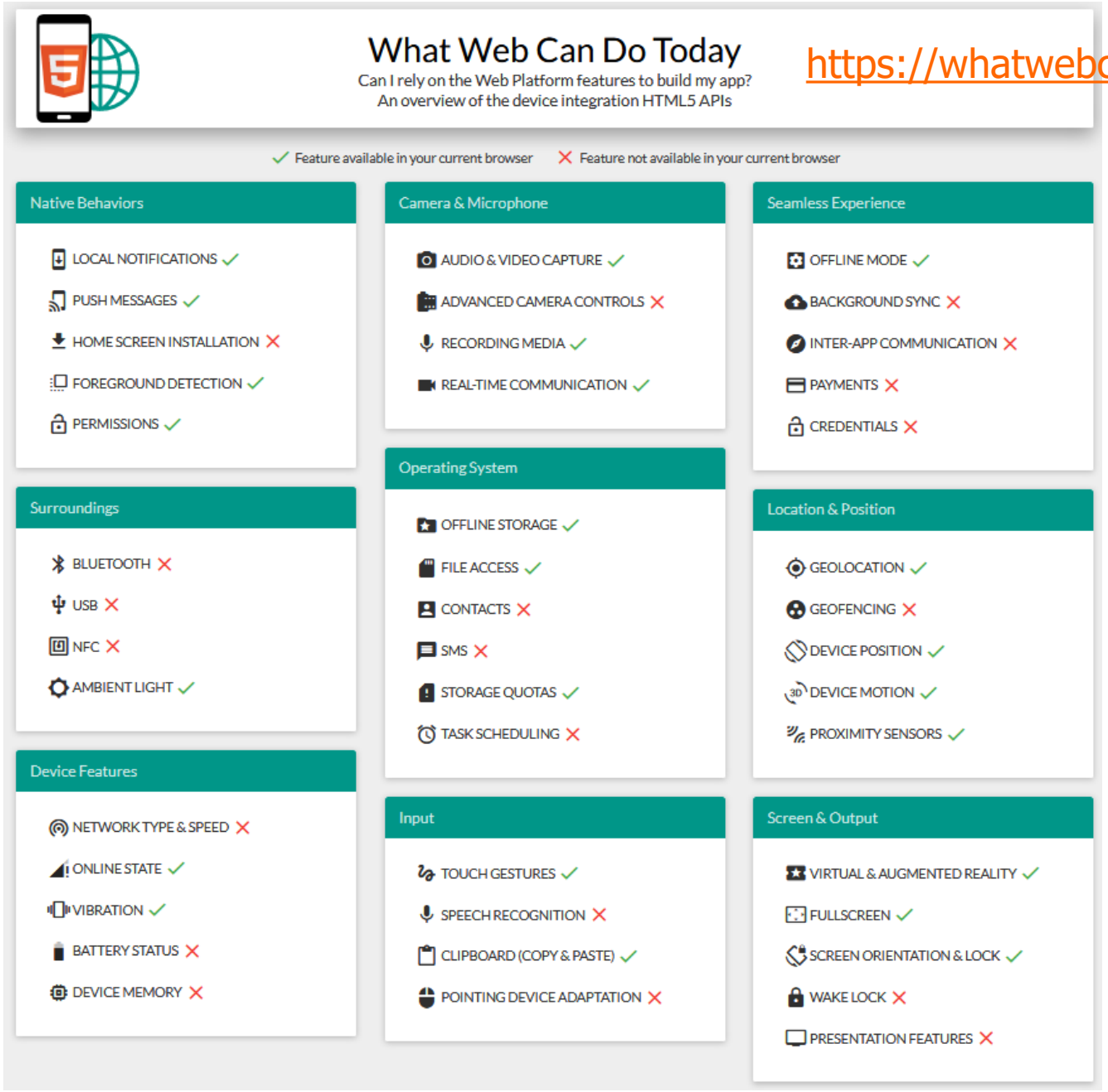
- Mobile Web aplikacije - resursi za razvoj aplikacija
  http://www.html5rocks.com/en/mobile



Mobilni emulatori i simulatori

- http://www.mobilexweb.com/emulators

- Online mobilni emulatori (*Remote labs*):
  - http://www.keynote.com/solutions/testing/mobile-testing
  - http://developer.samsung.com/remotetestlab/rtlAboutRTL.action
  - http://opendevicelab.com/


What Web Can Do Today
Can I rely on the Web Platform features to build my app?
An overview of the device integration HTML5 APIs
https://whatwebcando.today/
✓ Feature available in your current browser
✗ Feature not available in your current browser
Native Behaviors
LOCAL NOTIFICATIONS ✓
PUSH MESSAGES ✓
HOME SCREEN INSTALLATION ✗
FOREGROUND DETECTION ✓
PERMISSIONS ✓
Camera & Microphone
AUDIO & VIDEO CAPTURE ✓
ADVANCED CAMERA CONTROLS ✗
RECORDING MEDIA ✓
REAL-TIME COMMUNICATION ✓
Seamless Experience
OFFLINE MODE ✓
BACKGROUND SYNC ✗
INTER-APP COMMUNICATION ✗
PAYMENTS ✗
CREDENTIALS ✗
Surroundings
BLUETOOTH ✗
USB ✗
NFC ✗
AMBIENT LIGHT ✓
Operating System
OFFLINE STORAGE ✓
FILE ACCESS ✓
CONTACTS ✗
SMS ✗
STORAGE QUOTAS ✓
TASK SCHEDULING ✗
Location & Position
GEOLOCATION ✓
GEOFENCING ✗
DEVICE POSITION ✓
DEVICE MOTION ✓
PROXIMITY SENSORS ✓
Device Features
NETWORK TYPE & SPEED ✗
ONLINE STATE ✓
VIBRATION ✓
BATTERY STATUS ✗
DEVICE MEMORY ✗
Input
TOUCH GESTURES ✓
SPEECH RECOGNITION ✗
CLIPBOARD (COPY & PASTE) ✓
POINTING DEVICE ADAPTATION ✗
Screen & Output
VIRTUAL & AUGMENTED REALITY ✓
FULLSCREEN ✓
SCREEN ORIENTATION & LOCK ✓
WAKE LOCK ✗
PRESENTATION FEATURES ✗

Savremene Web tehnologije

- Responsive Web design (RWD)
  - Mobile-First Responsive Design
- Progressive Web Apps (PWA)
- The Physical Web
  - https://google.github.io/physical-web/
- Web performance
  - RAIL: Response, Animation, Idle, Load
  - developers.google.com/web/fundamentals/performance/rail
- Web Analytics
  - Google Analytics, KISSMetrics, Matomo, wao.io,…
- Testiranje i debugging mobilnih Web aplikacija
  - Selenium WebDriver, WebPagetest, mobiReady, Lighthouse, PageSpeed Insights, Device Labs, AWS Device Farm, BrowserStack,…
- Monetizacija

Progresivne Web aplikacije

- *Progressive Web Applications*
  - https://developers.google.com/web/progressive-web-apps/
  - https://developers.google.com/web/fundamentals/codelabs/your-first-pwapp/#what_is_a_progressive_web_app
- Karakteristike PWA
  - *Progressive* - Work for every user, regardless of browser choice because they're built with progressive enhancement as a core tenet.
  - *Responsive* - Fit any form factor: desktop, mobile, tablet, or forms yet to emerge.
  - *Connectivity independent* - Service workers allow work offline, or on low quality networks.
  - *App-like* - Feel like an app to the user with app-style interactions and navigation.
  - *Fresh* - Always up-to-date thanks to the service worker update process.
  - ...

Progresivne Web aplikacije (2)

- Karakteristike PWA (nastavak)
  - *Safe* - Served via HTTPS to prevent snooping and ensure content hasn't been tampered with.
  - *Discoverable* - Are identifiable as "applications" thanks to W3C manifests[6] and service worker registration scope allowing search engines to find them.
  - *Re-engageable -* Make re-engagement easy through features like push notifications.
  - *Installable* - Allow users to "keep" apps they find most useful on their home screen without the hassle of an app store.
  - *Linkable* - Easily shared via a URL and do not require installation.
- Korisni linkovi
  - ReactPWA – https://www.reactpwa.com/
  - Angular PWA - https://angular-university.io/course/angular-pwa-course
  - What PWA Can Do Today - https://whatpwacando.today/

Pitanja i komentari