Various Topics in Client-Side Web Development

IF3110 – Web-based Application Development
School of Electical Engineering and Informatics
Institut Teknologi Bandung

Objectives

- Students understand foundations on various techniques on Client-Side
  - Responsive Web Design
  - Progressive Web App
  - Web Accessibility

Responsive Web Design

Meaning of Responsive

Responsive means to provide

“responses or adaptiveness quickly and positively”

to the users.

Responsive Web Design

RWD is the concept of developing a website in a way that **allows the layout to adjust** according to the user’s screen resolution (view port) using media queries

Why do you need a responsive web app?

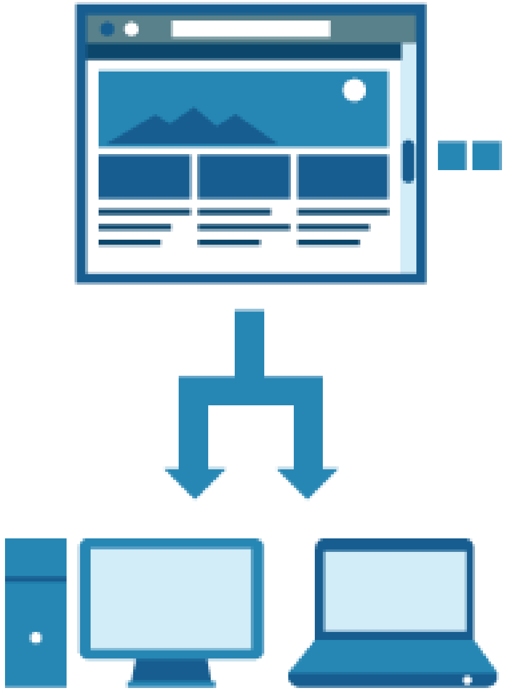
- Growing demand for smartphones
- Multiple screen sizes and mobile browsers
- Permits wider browser support
- Compulsory for getting good business

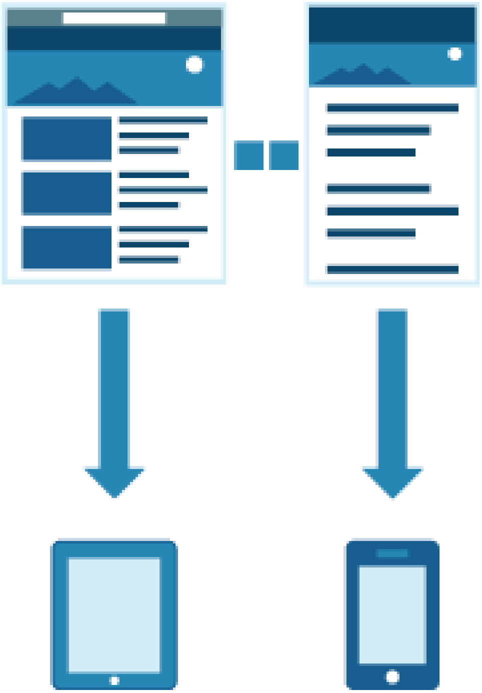
How can we better serve our increasingly mobile users?

Design: Build responsiveness into your websites and applications

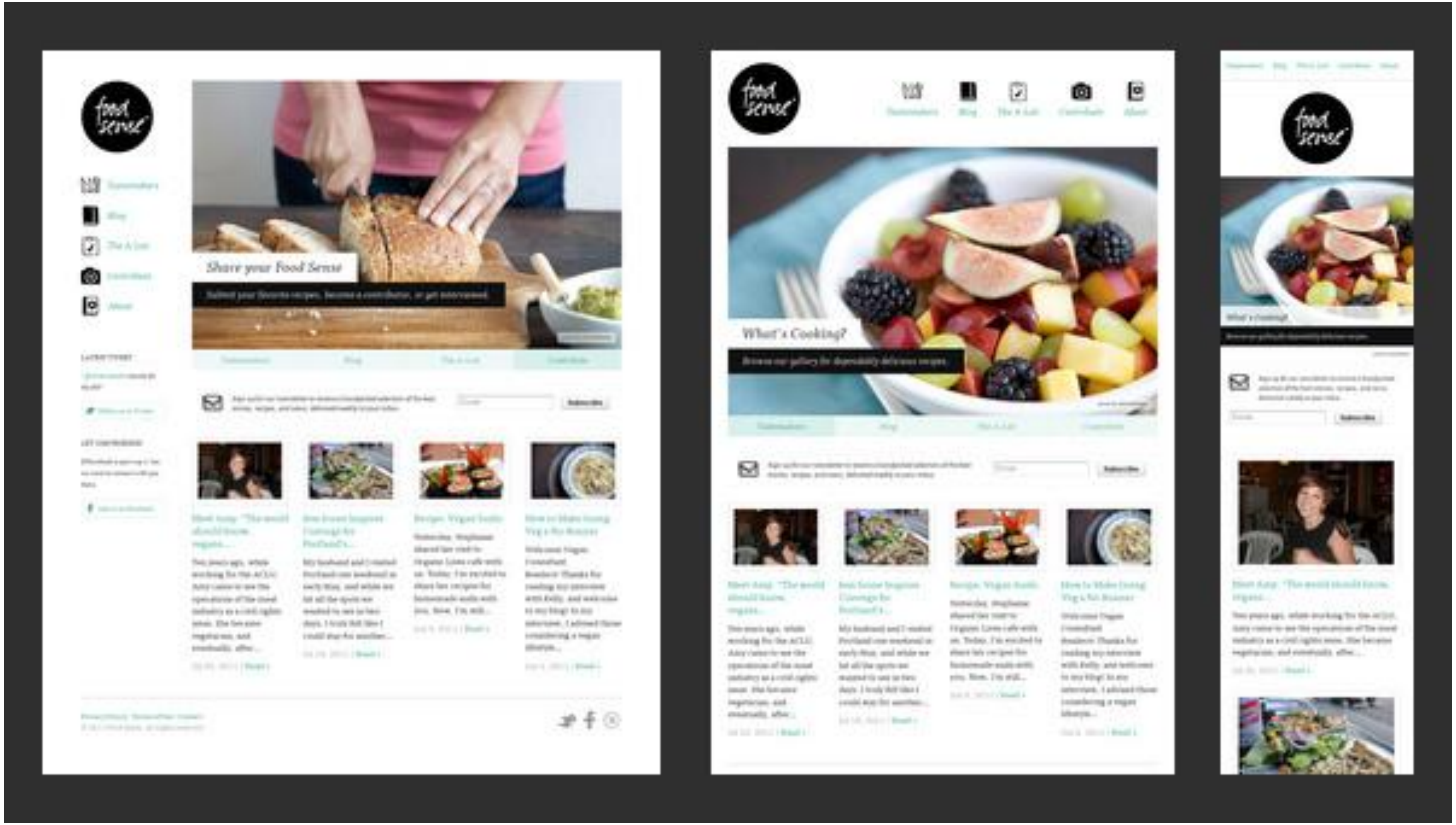
Content: Think about content from a mobile first perspective

Design: Build responsiveness into your web applications





Food Sense


food sense
Share your Food Sense
food sense
What's Cooking?
food sense

Content: a mobile first perspective

- A responsive website does not make responsive content
- Curate your content down to its essential points
- Consider the needs of the mobile user first

How do we design for RWD

Simple:

Use the ***Mobile First Approach*** and favor ***Progressive Enhancement*** instead of the traditional ***Graceful Degradation***

Understanding the Mobile Web and its Content

Web designers should consider the following questions while mobilizing the content

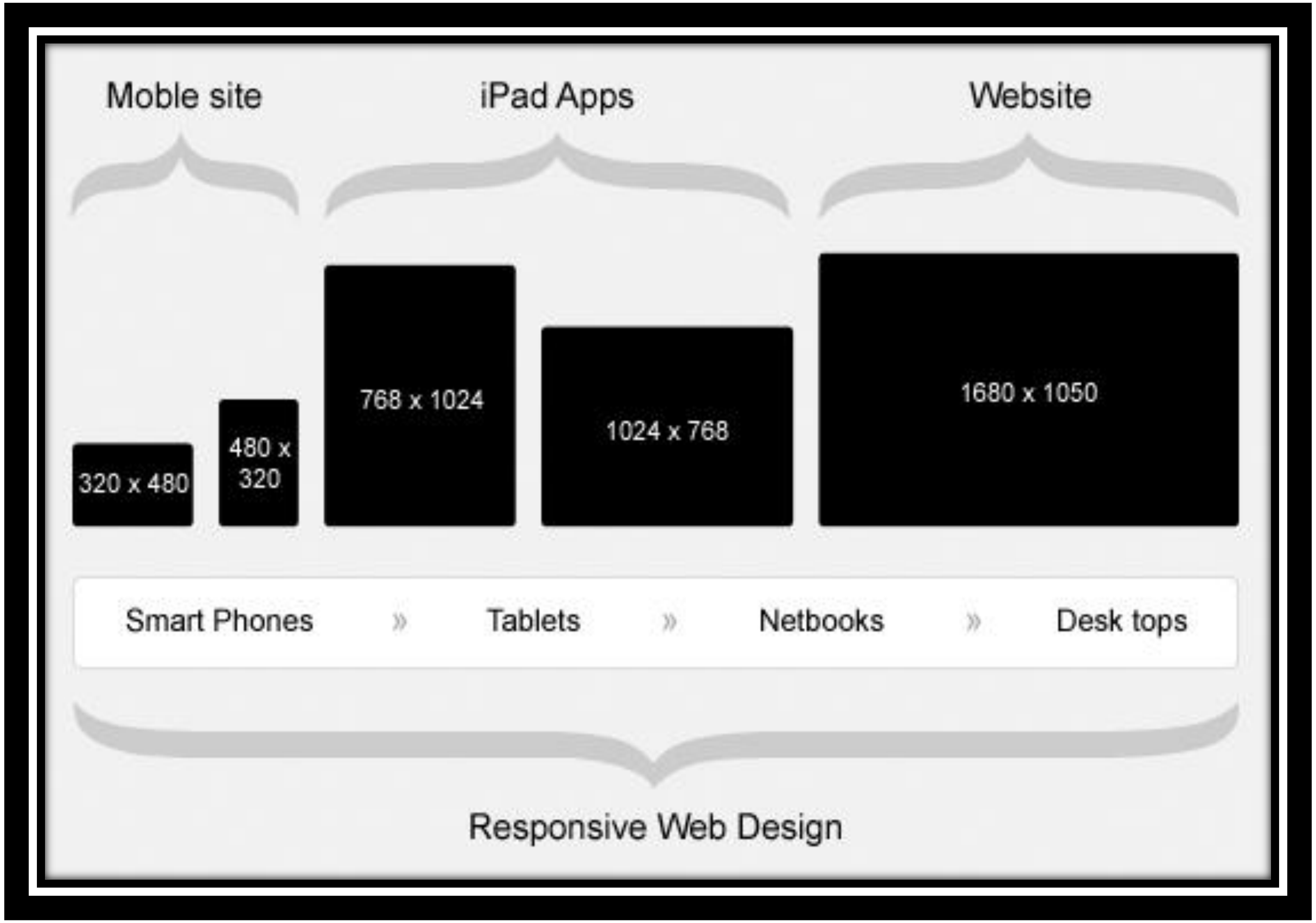
Q. What is the purpose of the site?

Q. Who are the users?

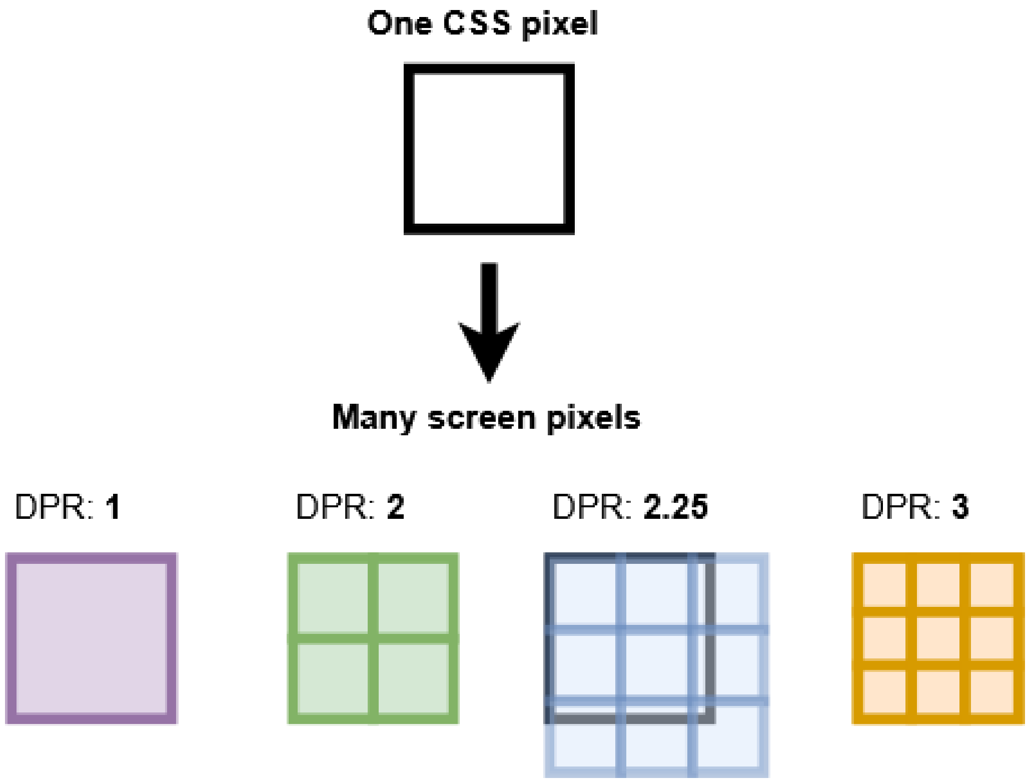
Q. What sort of data is being accessed by them?

Q. User’s locations ?

Q. What’s the capacity of the devices and screen information such as size, resolution, pixel density, and color information from which information is being accessed?


Moble site
iPad Apps
Website
320 x 480
480 x 320
768 x 1024
1024 x 768
1680 x 1050
Smart Phones » Tablets » Netbooks » Desk tops
Responsive Web Design

Viewport



One CSS pixel

Many screen pixels

DPR: **1**

DPR: **2**

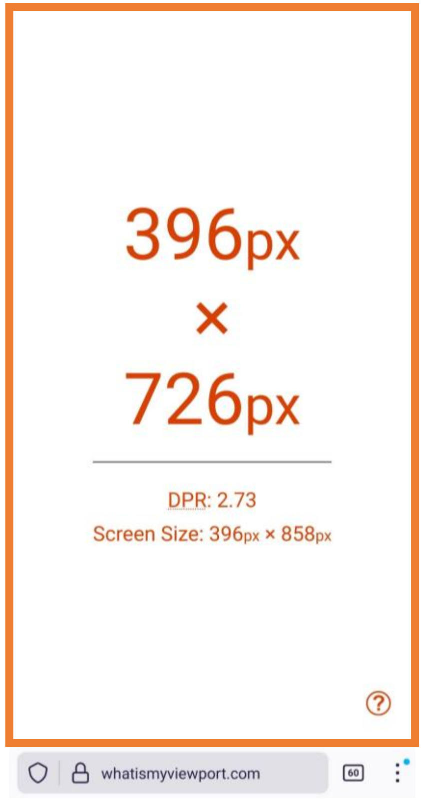
DPR: **2.25**

DPR: **3**

DPR: Device Pixel Ratio

https://tomroth.com.au/dpr/

CSS width = 396



396px

×

726px

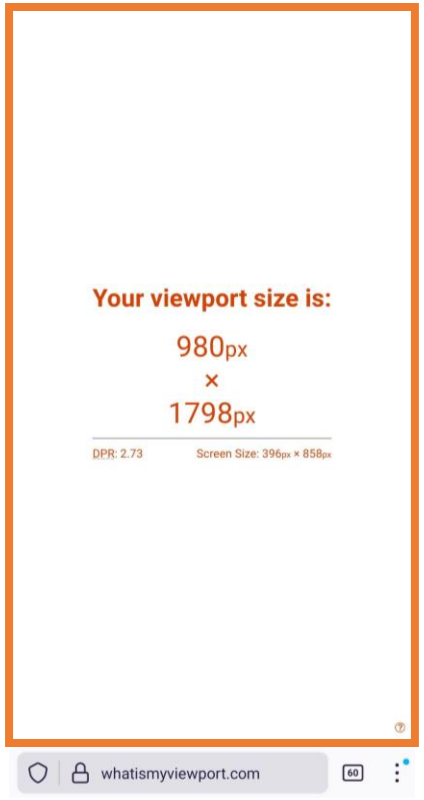
DPR: 2.73

Screen Size: 396px × 858px

whatismyviewport.com

Viewport enabled
(mobile mode)

CSS width = 980



Your viewport size is:

980px

×

1798px

DPR: 2.73

Screen Size: 396px × 858px

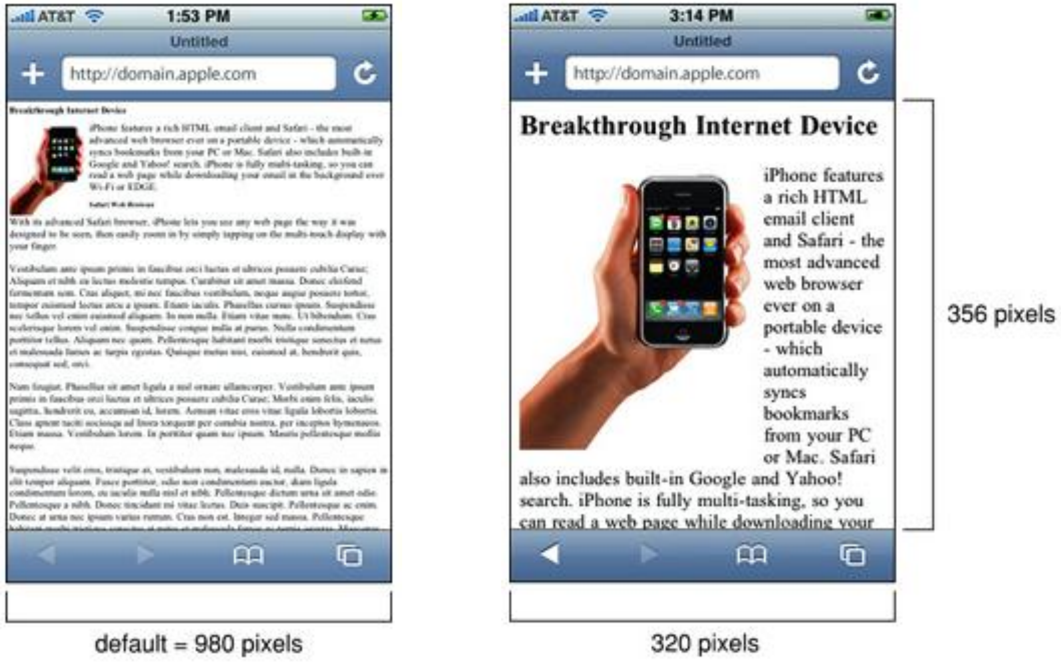
whatismyviewport.com

Desktop mode

Controlling viewport

- Narrow screen devices (e.g., mobiles) render pages in a virtual window or viewport.

- Apple introduced the "viewport meta tag" in Safari iOS to let web developers control the viewport’s size, shape, and behavior.



Breakthrough Internet Device

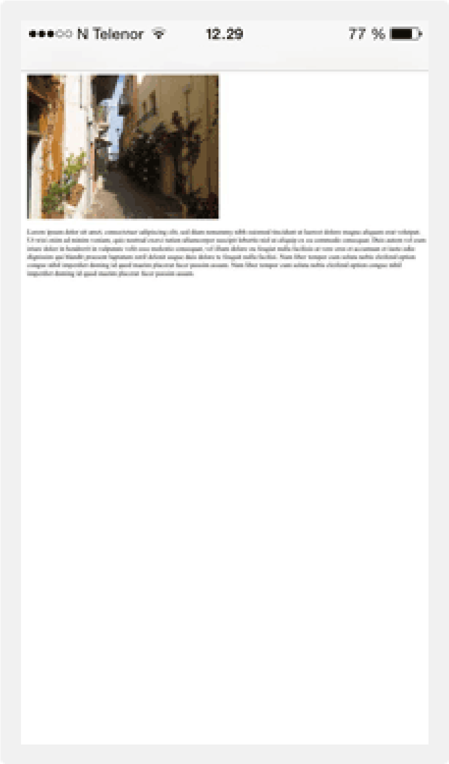
iPhone features a rich HTML email client and Safari - the most advanced web browser ever on a portable device - which automatically syncs bookmarks from your PC or Mac. Safari also includes built-in Google and Yahoo! search. iPhone is fully multi-tasking, so you can read a web page while downloading your

Examples:

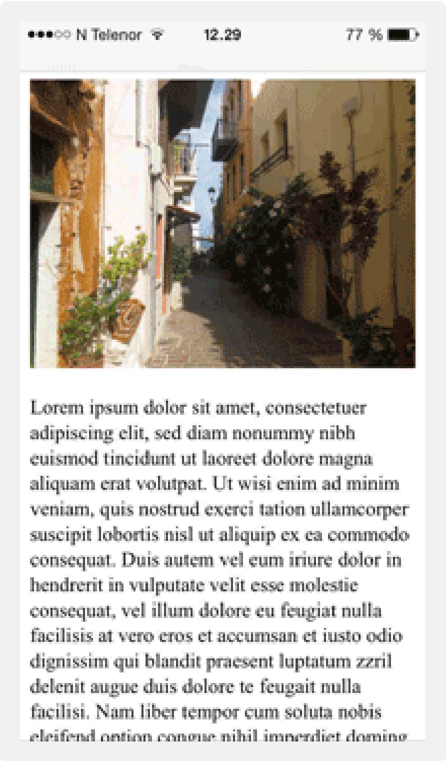
```
<meta name="viewport" content="width=device-width, initial-scale=1">
<meta name="viewport" content="width=500, initial-scale=1">
<meta name="viewport" content="width=device-width, initial-scale=0.86, maximum-scale=5.0,
      minimum-scale=0.86">
<meta name="viewport" content="user-scalable=no, width=device-width">
```

https://developer.mozilla.org/en-US/docs/Web/HTML/Viewport_meta_tag
https://developer.apple.com/library/archive/documentation/AppleApplications/Reference/SafariWebContent/UsingtheViewport/UsingtheViewport.html

Viewport Example

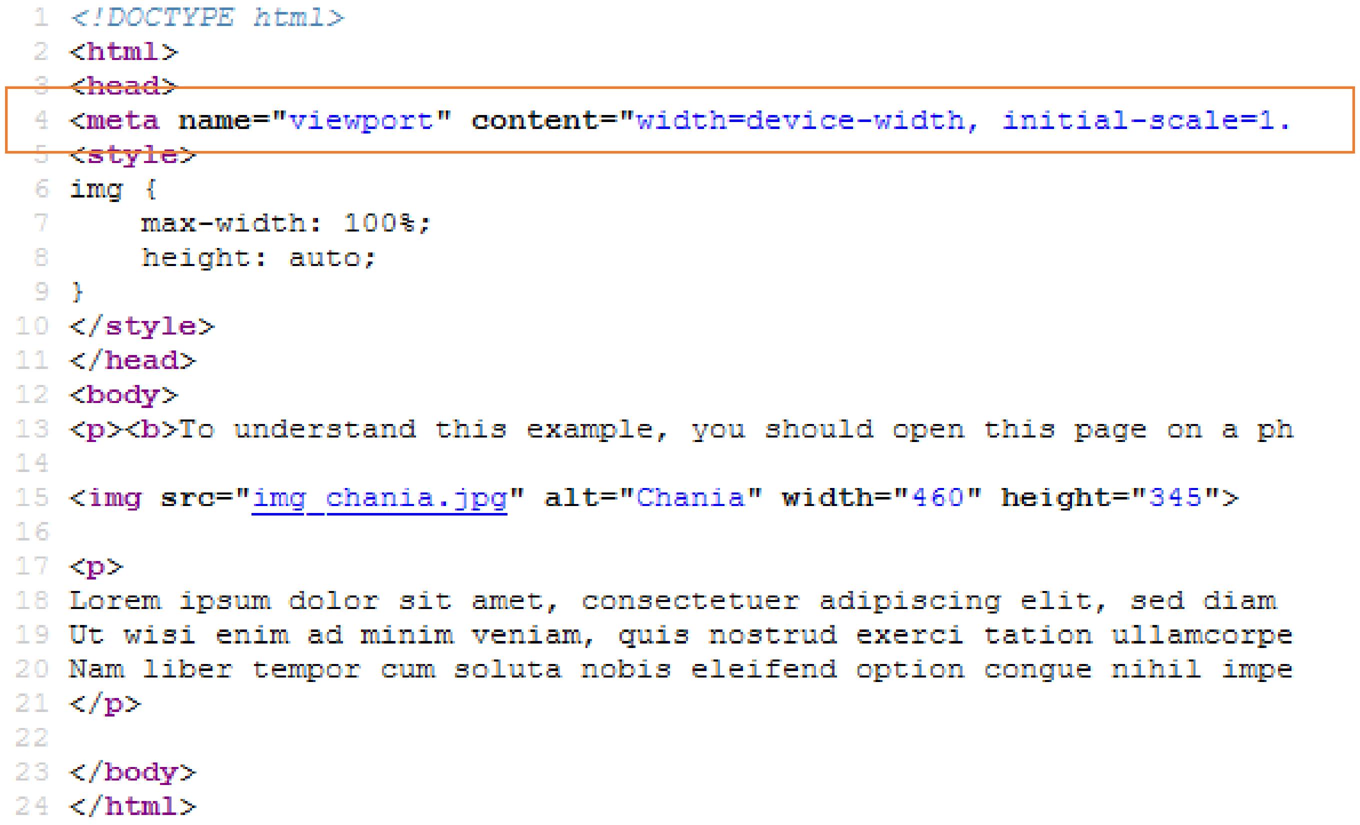


Without viewport meta tag



Lorem ipsum dolor sit amet, consectetuer adipiscing elit, sed diam nonummy nibh euismod tincidunt ut laoreet dolore magna aliquam erat volutpat. Ut wisi enim ad minim veniam, quis nostrud exerci tation ullamcorper suscipit lobortis nisl ut aliquip ex ea commodo consequat. Duis autem vel eum iriure dolor in hendrerit in vulputate velit esse molestie consequat, vel illum dolore eu feugiat nulla facilisis at vero eros et accumsan et iusto odio dignissim qui blandit praesent luptatum zzril delenit augue duis dolore te feugait nulla facilisi. Nam liber tempor cum soluta nobis eleifend option congue nihil imperdiet doming

With viewport meta tag



```html
<!DOCTYPE html>
<html>
<head>
<meta name="viewport" content="width=device-width, initial-scale=1.
<style>
img {
    max-width: 100%;
    height: auto;
}
</style>
</head>
<body>
<p><b>To understand this example, you should open this page on a ph

<img src="img_chania.jpg" alt="Chania" width="460" height="345">

<p>
Lorem ipsum dolor sit amet, consectetuer adipiscing elit, sed diam
Ut wisi enim ad minim veniam, quis nostrud exerci tation ullamcorpe
Nam liber tempor cum soluta nobis eleifend option congue nihil impe
</p>

</body>
</html>
```

https://www.w3schools.com/css/css_rwd_viewport.asp

Strategies to implement a responsive design

1. CSS Media Queries
   - W3C Recommendation, 19/06/2012
   - A simple example: https://www.w3schools.com/css/css3_mediaqueries_ex.asp
   - Typical implementation: a responsive grid system
     - https://getbootstrap.com/docs/3.4/css/#grid
2. CSS Flex Box
   - W3C Candidate Recommendation, 19/11/2018
   - A complete guide: https://css-tricks.com/snippets/css/a-guide-to-flexbox/
   - Example: https://alistapart.com/
3. CSS Grid (not to be confused with bootstrap grid system above)
   - W3C Candidate Recommendation, 18/12/2020
   - Flex is one dimensional (horizontal/vertical) while Grid is two dimensional.
   - Complete guide: https://css-tricks.com/snippets/css/complete-guide-grid/

Deciding what to do and when to do it

What can you do right now?

- Test your website, e.g., Chrome Developer Tools
- Use Google Analytics
- CSS/HTML skills are needed to make a site responsive
- Change what is not mobile friendly: Flash, hover states
- Decide if you really need all those API bells and whistles
- Read-up mobile content strategy, mobile first

Progressive Web App

What is a Progressive Web App ?

Experiences that combine the best of web with the best of app and becomes useful to users from the very first visit in a tab.

“A PWA is a web application that camouflage itself as a native mobile application with a home screen app icon, responsive design, fast load speed, offline functionality, and more”
https://clevertap.com/blog/progressive-web-apps/

Objectives

Reliable - Load instantly and never show the downasaur, even in uncertain network conditions.

Fast - Respond quickly to user interactions with silky smooth animations and no janky scrolling.

Engaging - Feel like a natural app on the device, with an immersive user experience.

Key Characteristics of PWA

Progressive - Works for every user regardless of browser and users

Responsive - Fits any form factor; desktop,mobile,tablet etc

Connectivity Independent - Enhanced with Service Workers to Work Offline or on Lie-Fi.

Fresh - Always up to date courtesy of service worker update process

Key Characteristics of PWA - cont’d

App Like - Feels like an app to the user because it’s built on the app-shell model

Re-engageable - Makes re-engagement easy through features like push notifications.

Installable - Allows user to ‘keep’ apps on their homescreen without the hassle of an app store.

Safe - Served via HTTPS to prevent snooping and ensure content isn’t tampered with.

Connectivity Independent

What is a Service Worker ?

A script run by the **browser** in the **background**, separate from a webpage, that opens the door to features which don’t need a web page or user interaction

Note

- Can’t access the DOM directly. Only way to communicate with pages is through postMessage.
- Service worker can “hijack” network requests, giving you the developer absolute control.
- Terminated when idle. Restarted needed.
- Persist data using IndexedDb or something similar[1]
- Can make request and cache for better performance and lower network usages
- Service workers make extensive use of promises[2]

Read more :

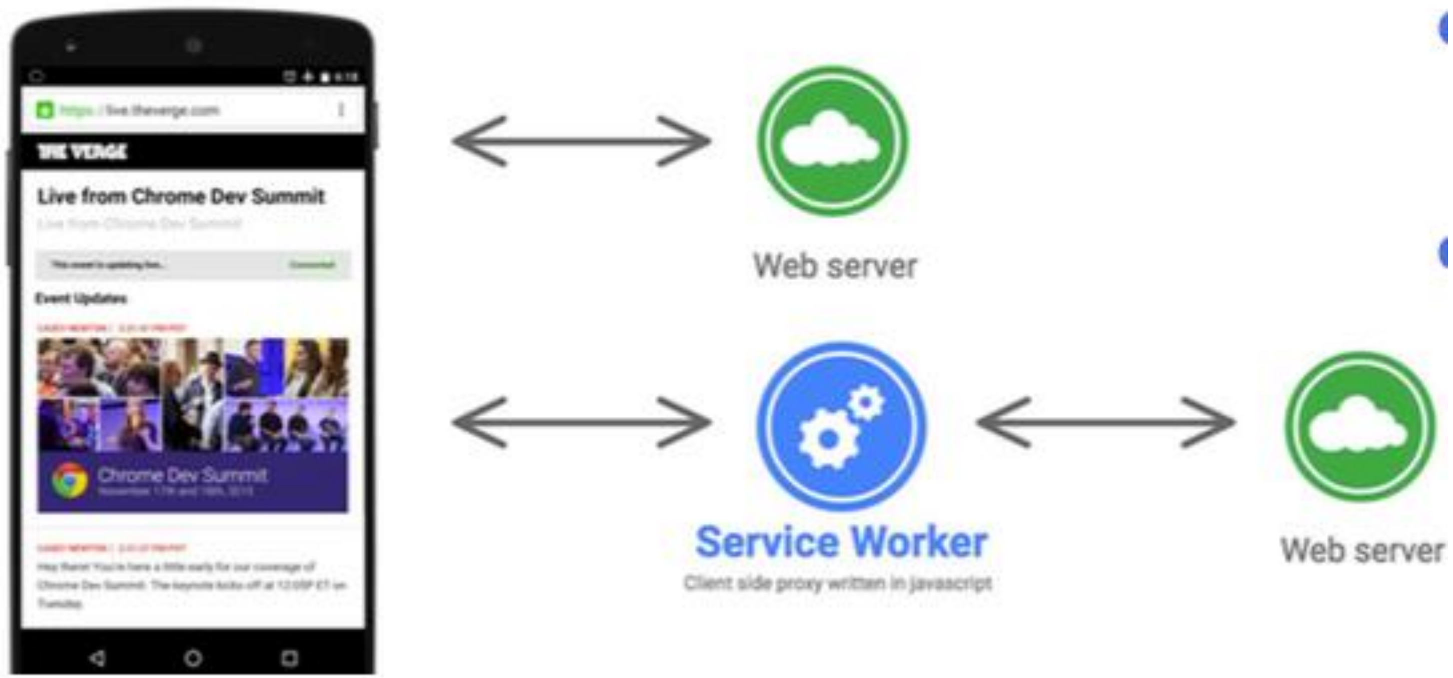
http://www.html5rocks.com/en/tutorials/service-worker/introduction/

http://www.html5rocks.com/tutorials/es6/promises/

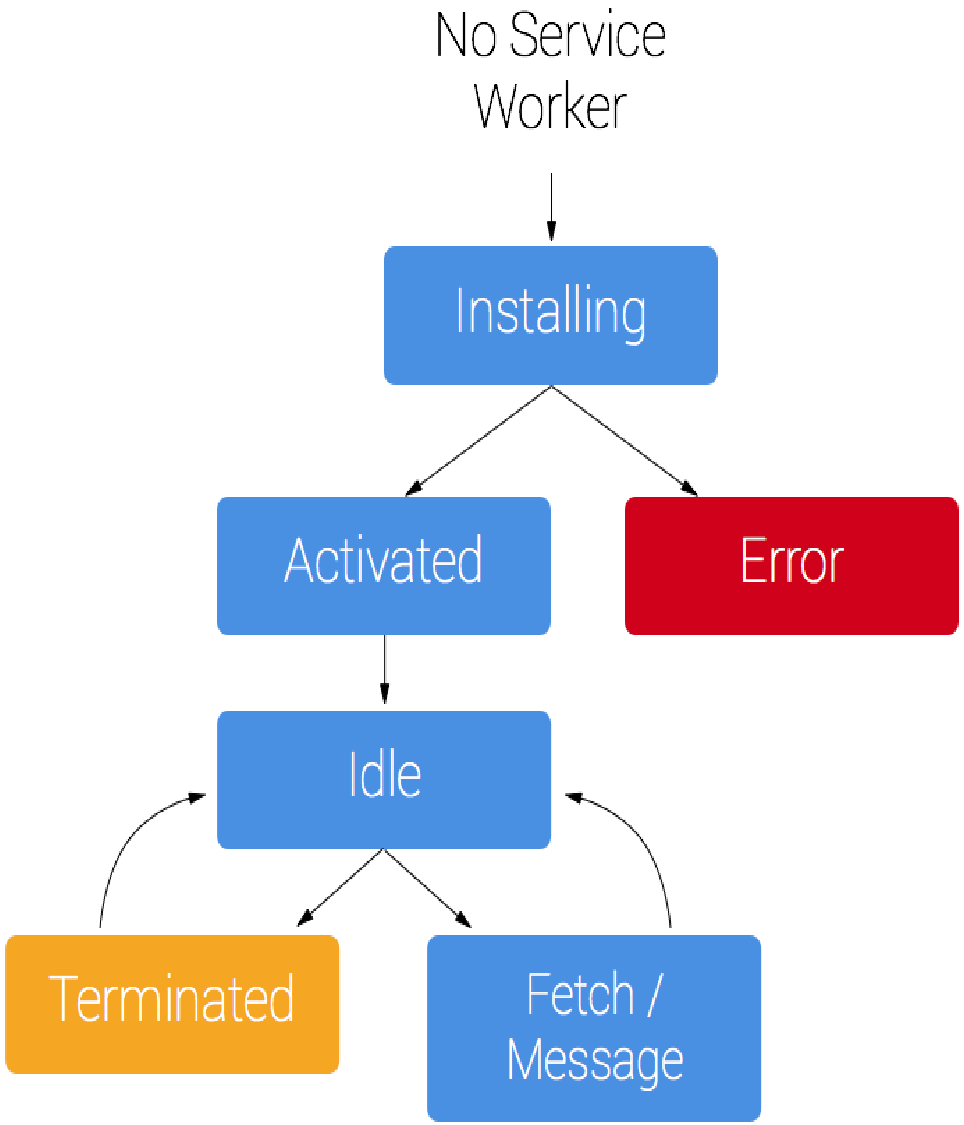
Service Worker

Client-side proxy in JavaScript

Net requests, but also push & sync


https://live.theverge.com
THE VERGE
Live from Chrome Dev Summit
Event Updates
Chrome Dev Summit
Web server
Service Worker
Client side proxy written in javascript
Web server

Service Workers - LifeCycle



Caching Strategies - Responding to request

- Cache Only
- Network Only
- Cache, falling back to Network
- Network, falling back To Cache
- Stale While Revalidate
- Cache & Network Race
- Cache then network
- Generic Fallback
- SW Push Notification Flow

Read More : https://jakearchibald.com/2014/offline-cookbook/
https://jakearchibald.com/2016/caching-best-practices/

Web App Manifest

is a simple JSON file

What it does

- Creating a manifest and linking it to your page are straightforward processes.
- Control what the user sees when launching from the home screen.
- This includes things like a splash screen, theme colors, and even the URL that's opened.

Web App Manifest – cont’d

Web app manifests provide the ability to save a site bookmark to a device's home screen. When a site is launched this way:

- It has a unique icon and name so that users can distinguish it from other other sites.
- It displays something to the user while resources are downloaded or restored from cache.
- It provides default display characteristics to the browser to avoid too abrupt a transition when site resources become available.
- It does all this through the simple mechanism of metadata in a text file. That's the web app manifest.

Installable - Manifest.json

User can Add App to Homescreen

Easy access to Web App from homescreen

Add a Manifest.json file to your app’s directory

Read more : https://www.w3.org/TR/2016/WD-appmanifest-20160331/

```
{
 "short_name": "",
 "name": "",
 "icons": [ {
   "src":"",
   "sizes": "",
   "type": ""
  } ],
 "start_url": "",
 "background_color": "",
 "theme_color": "",
 "display": ""
}
```

Web Push Notifications

allow users to opt-in to timely updates from sites they love and allow you to effectively re-engage them with customized, relevant content

Containing: Push API and Notification API

Are service workers involved?

- Yes. Push is based on service workers because service workers operate in the background. This means the only time code is run for a push notification (in other words, the only time the battery is used) is when the user interacts with

Two technologies

- Push and notification use different, but complementary, APIs;
- **push** is invoked when a server supplies information to a service worker;
- a **notification** is the action of a service worker or web page script showing information to a user.

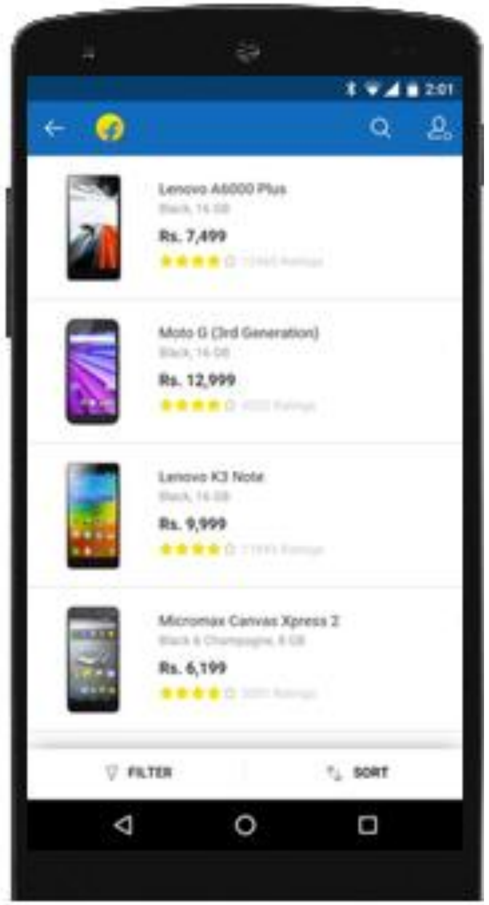
Use Cases

3x time spent on site, from 1 minute to 3.5 minutes

Seeing 40% visitors return week over week

Users love smooth experience on 2G & flaky networks

Flipkart - https://www.flipkart.com/



Lenovo A6000 Plus
Black, 16 GB
Rs. 7,499

Moto G (3rd Generation)
Black, 16 GB
Rs. 12,999

Lenovo K3 Note
Black, 16 GB
Rs. 9,999

Micromax Canvas Xpress 2
Black & Champagne, 8 GB
Rs. 6,199

Google’s Training

PWA Training

https://developers.google.com/web/ilt/pwa/

Web Accesibility

https://www.w3.org/WAI/fundamentals/accessibility-intro/

> **“*The power of the Web is in its universality.*
> *Access by everyone regardless of disability is an essential aspect.”***
>
> — Tim Berners-Lee, W3C Director and inventor of the World Wide Web

What is Web Accessibility

- Web accessibility means that websites, tools, and technologies are designed and developed so that people with disabilities can use them.

- Web accessibility encompasses all disabilities that affect access to the Web, including:

  auditory, cognitive, neurological, physical, speech, visual

- Web accessibility also benefits people *without* disabilities, e.g., different form factors, different input modes, older people, situational limitation (e.g., noisy environments), slow Internet connection.

- Web accessibility is **required by law** in many situations.

Making the Web Accessible

The W3C Web Accessibility Initiative (WAI) develops technical specifications, guidelines, techniques, and supporting resources that describe accessibility solutions.

International standards for web accessibility:

Web Content Accessibility Guidelines (**WCAG 2.0**)
is also an ISO standard: **ISO/IEC 40500**

Some Accessibility Requirements

Perceivable information and user interface

- Text alternatives for non-text content
- Captions and other alternatives for multimedia
- Content can be presented in different ways
- Content is easier to see and hear

Operable user interface and navigation

- Functionality is available from a keyboard
- Users have enough time to read and use the content
- Content does not cause seizures and physical reactions
- Users can easily navigate, find content, and determine where they are
- Users can use different input modalities beyond keyboard

Some Accessibility Requirements

Understandable information and user interface

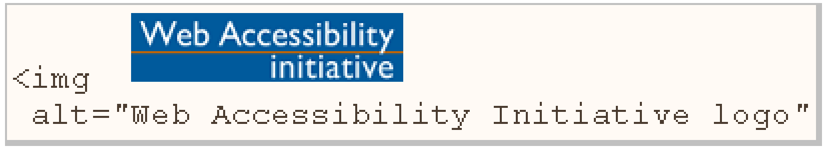
- Text is readable and understandable
- Content appears and operates in predictable ways
- Users are helped to avoid and correct mistakes

Robust content and reliable interpretation

- Content is compatible with current and future user tools

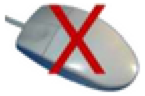
Examples

Alternative Text for Images



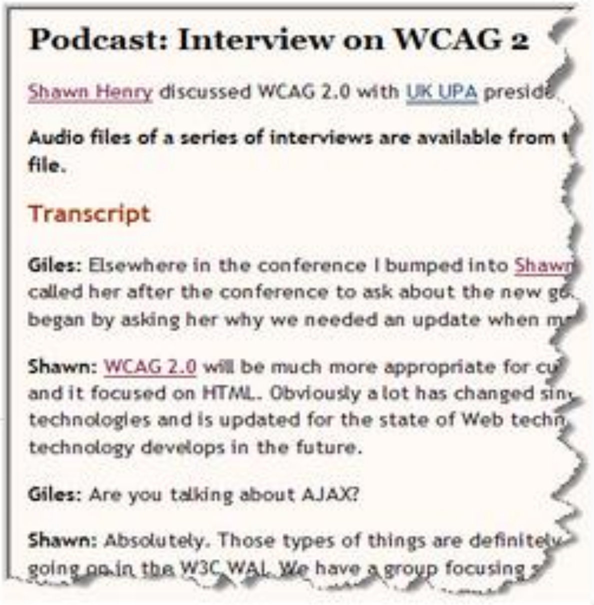
```
<img
 alt="Web Accessibility Initiative logo"
```

Keyboard input



An accessible website does not rely on the mouse; it makes all functionality available from a keyboard.

Transcripts for audio



Podcast: Interview on WCAG 2

Shawn Henry discussed WCAG 2.0 with UK UPA preside

Audio files of a series of interviews are available from t file.

Transcript

Giles: Elsewhere in the conference I bumped into Shawn called her after the conference to ask about the new gu began by asking her why we needed an update when m

Shawn: WCAG 2.0 will be much more appropriate for cu and it focused on HTML. Obviously a lot has changed sin technologies and is updated for the state of Web techn technology develops in the future.

Giles: Are you talking about AJAX?

Shawn: Absolutely. Those types of things are definitely going on in the W3C WAI. We have a group focusing s

Evaluating Web Accessibility

Use evaluation tools:

- https://www.w3.org/WAI/ER/tools/

Conformance Evaluation and Reports:

- Conformance evaluation determines how well web pages or applications meet accessibility standards.
- W3C's Website Accessibility Conformance Evaluation Methodology (WCAG-EM) is an approach for determining conformance to Web Content Accessibility Guidelines (WCAG).