BlackBerry Jam Europe

Optimization and Performance for Web Developers

JAM343

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Introductions

Adam

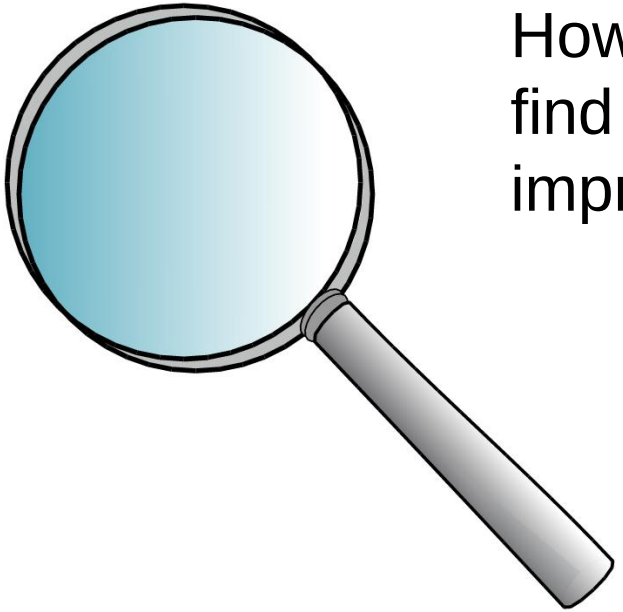
Developer Relations

Tom

Developer Evangelism

Web Inspector

Web Inspector will not make your apps faster.



However, it *will* help you find opportunities for improvement.

But you need to know what to look for …

Performance Goals

- Make fewer HTTP requests for all page resources
- Minimize bandwidth of application resources
- Reduce JavaScript execution time performed by the CPU
- Leverage hardware acceleration wherever possible

Today's Tasks

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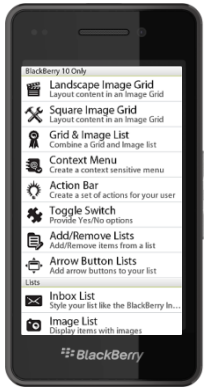
- Lab Setup (10 mins)

- Task 1: HTTP requests (20 mins)
- Task 2: Network latency (20 mins)
- Task 3: JavaScript performance (20 mins)
- Task 4: Scrolling and transitions (20 mins)



- Free Time (25 mins)

Lab setup

Installing sample application

[10 mins]

Lab setup: Environment

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- Development Tools:
  - Windows XP, Windows 7 or Mac OS
  - Chrome Browser
  - BlackBerry 10 WebWorks SDK
- BlackBerry 10 (Z10 or Dev Alpha)
  - USB cable
  - No device? Use the BlackBerry 10 simulator

Lab setup: sample app

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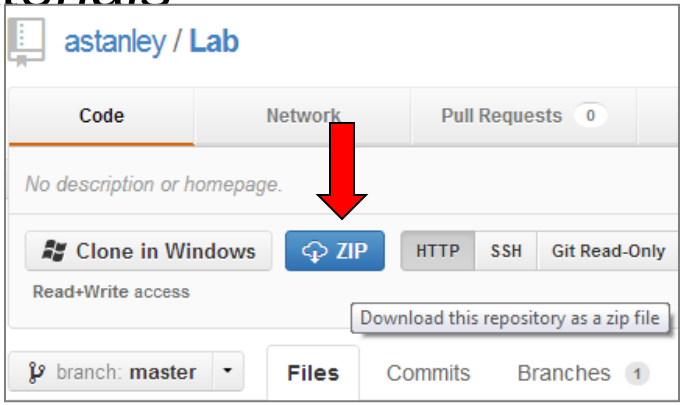
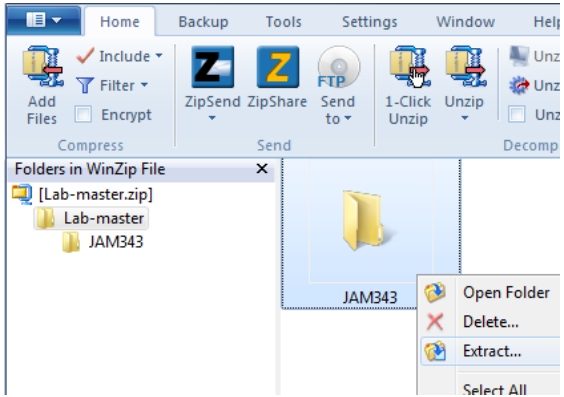
- ***TASK:*** *Download and setup Lab materials*
  - https://github.com/astanley/Lab
  - Click on ZIP button to download



- Extract source files from ZIP
  - Open **Lab-master.ZIP**
  - Extract JAM343 subfolder to C:\Lab
  - Goal = **C:\Lab\JAM343**



Lab setup: development mode

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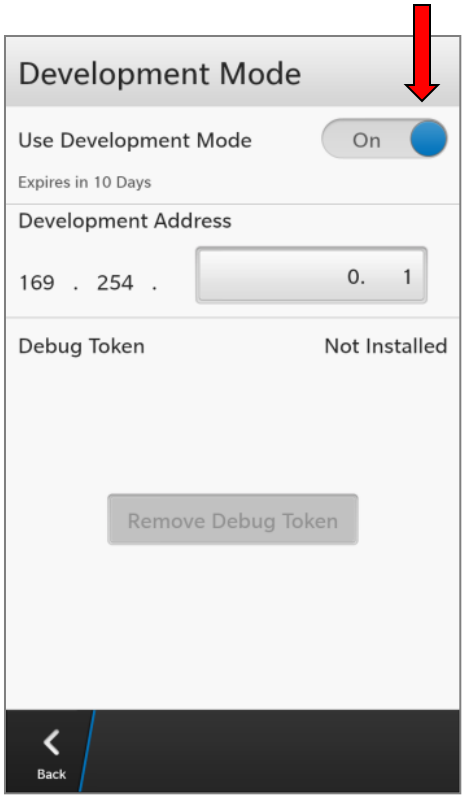
- Enable development mode on your device
  - Settings → Security and Privacy
  - Development mode

- Connect your device to USB
  - No requirement if you are using a simulator



Lab setup: load sample application

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- Run loading script from an open command prompt:
  - Start → Run … → cmd
  - cd **C:\Lab\JAM343**
  - load.bat [device IP address] [device password]
    - Example: **load.bat 169.254.0.1 pass**
- Confirm sample loaded successfully

Lab setup: remote web inspector

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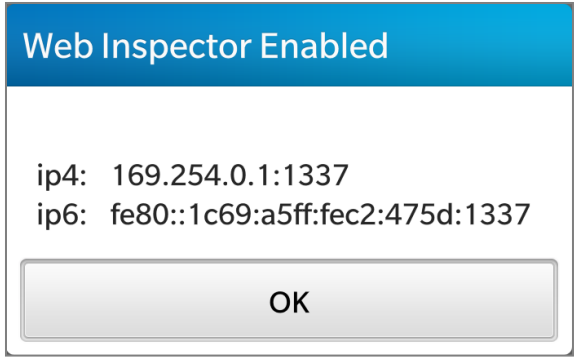
- Start WIC sample application
  - Should immediately see a dialog
  - Click OK to enable web inspector



- Open a desktop browser
  - Browse to http://169.254.0.1:1337
  - Click on “Web Inspector Companion”

Task 1. HTTP Requests

Fewer synchronous requests means faster web apps

[20 mins]

Make fewer HTTP requests

- You may often need to download external resources
  - Examples: images, JavaScript libraries, CSS
- Always try and minimize the total # of separate HTTP requests
- Why?
  - Only a limited number of concurrent connections are allowed
  - Waiting occurs when a web client has to wait for a connection

Quick Lesson: Network Panel

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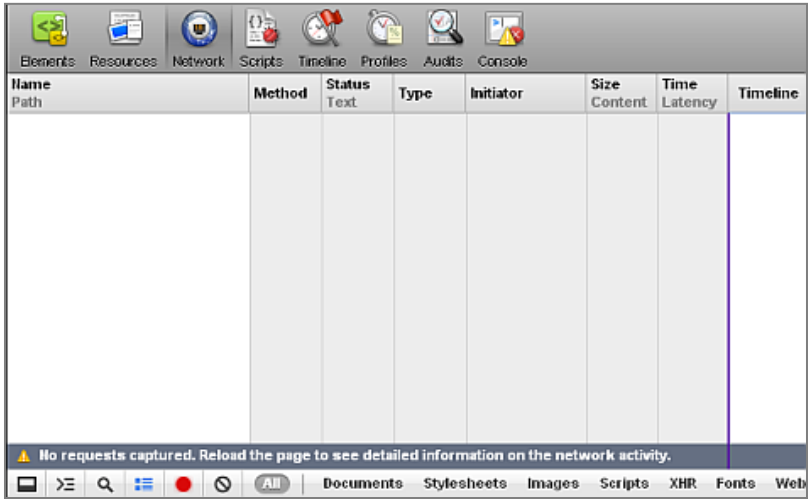
- Setup:
  - Start WIC sample application
  - Open http://169.254.0.1:1337 in Chrome

- Goals: master the timeline
  - Recording a timeline
  - View time to download
  - View resource size
  - Observe HTTP headers



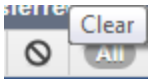
Quick Lesson: Network Panel

BlackBerry Jam Europe

- ***TASK**: Viewing HTTP response headers*
  - Click on 

panel in web inspector
  - Click on the “Network” link in sample application
  - Observe Results displayed in network panel of web inspector:
    - How much time did each document requests take to download?
    - What is the HTTP status for the invalid (red) request?
  - Click on the knight-broken.png resource in web inspector
    - Click on the **Header** pane to see all HTTP headers

Make fewer HTTP requests

- Tip: Click 

button in web inspector to clear results
  - Ensure Network panel in web inspector is opened

- ***TASK***: Observe inefficient resource downloading
  - Click on the “Display Images” button in sample application
    - How many HTTP requests are required to display these images?
    - What is the total file size and time required to display all images?

- ***TASK***: Observe more efficient resource downloading
  - Click on the “Display Image (Sprites)” button in sample application
    - How many HTTP requests are required to display the same images?

Avoiding blocking UI

- The Web model is single threaded
  - Synchronous JavaScript can block UI from being updated
- ***TASK***: Observe blocking HTTP requests
  - Click on the “Load Content” button
  - Use web inspector to measure how long it takes to see new content
- ***TASK***: non-Observe blocking HTTP requests
  - Click on the “Load Content (Async)” button
  - Use web inspector to measure how long it takes to see new content

Task 2. Network Latency

Minimize the amount of bandwidth used

[20 mins]

Network Latency

- Embedding resources and reducing bandwidth
  - Why download when it is not necessary?
  - WebWorks allows developers to package resources locally
    - Example: JavaScript, CSS, Images
  - Minify JavaScript and CSS
    - If you have to download something, make it as small as possible

Quick Lesson: Resources Panel

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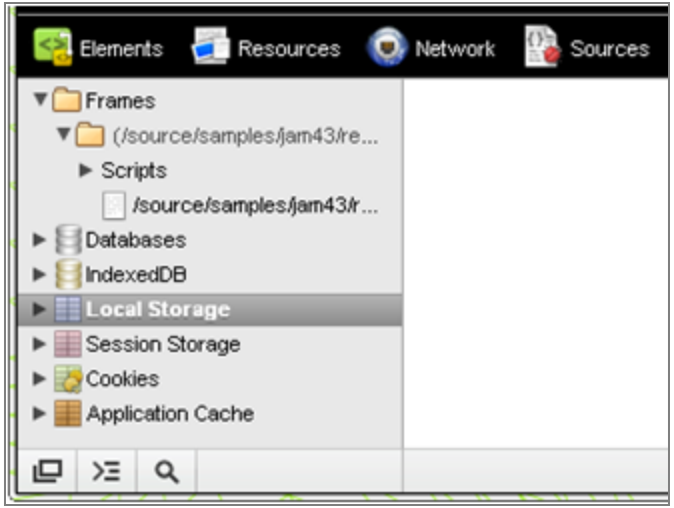
- Start WIC sample application
  - Open “Resources” page
- Open http://169.254.0.1:1337 in Chrome
  - Click on “Web Inspector Companion”
- Purpose: view active page resources
  - Page files (examples: html, css, js)
  - Local storage
  - Web database
  - Application cache



Quick Lesson: Resources Panel

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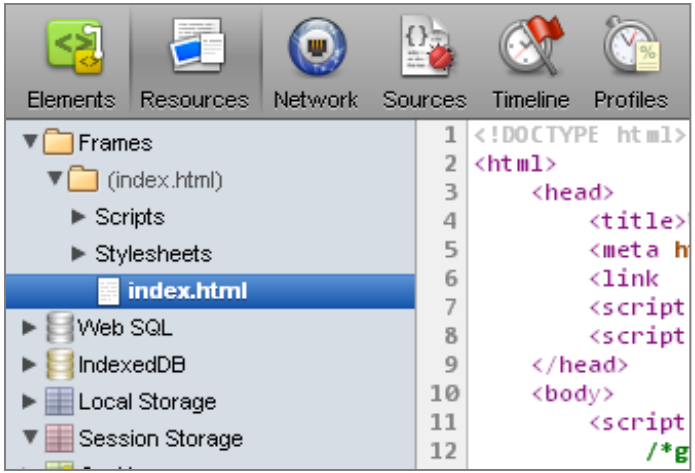
- Viewing the frames tree
  - View raw page resources
  - Before they were modified



- ***TASK:*** *Expand Frames tree*
  - Expand **Scripts** and **Stylesheets**
  - What JS and CSS frameworks are being used in this app?
  - Are these local or external resources?

Network Latency

- ***TASK***: Analyze minified JavaScript and CSS
  - Open “Network” page in sample application
  - Click on Network panel in Web inspector (clear results in advance)

  - Click on “Get jQuery” button in sample application (bottom of page)
  - How large is jquery-1.9.0.js ?

  - Click on “Get jQuery Min” button in sample application
  - How large is jquery-1.9.0.min.js ?
  - How much quicker does it take to download the minified version of jQuery?

Task 3. JavaScript

Reducing execution time required by CPU

[20 mins]

JavaScript

- The web is a single threaded model
  - The more time spent processing JavaScript means less time doing anything else
  - Finding inefficient JavaScript
    - Examples: loops, setTimeout, polling
  - Preventing JavaScript from blocking the UI
    - Asynchronous vs. Synchronous, non-blocking dialogs

Quick Lesson: Profiles Panel

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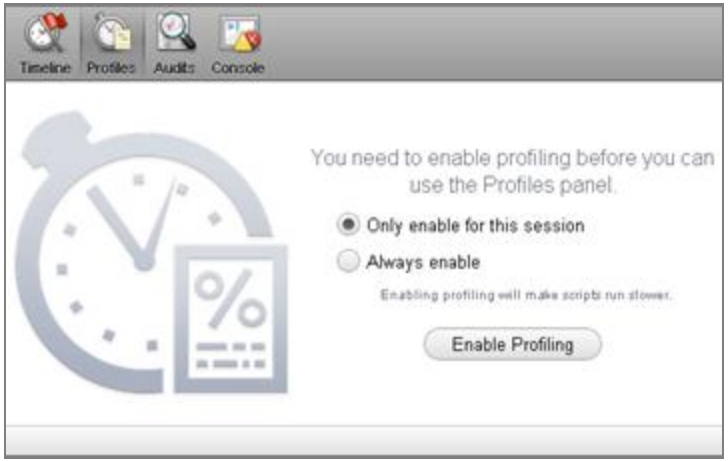
- Start WIC sample application
  - Open “Profiles” page
- Open http://169.254.0.1:1337 in Chrome
- What is profile information?
  - Measures JavaScript execution
  - Manually started & stopped
  - Results analyzed in % or milliseconds



Quick Lesson: Profiles panel

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- ***TASK:*** *Manually collecting JavaScript CPU profile info*
  - Click on 

panel in web inspector
  - Click 

button to begin profiling a session
  - From the sample app, click **Start 5s Profile Script** button
  - Once alert box is displayed, click **Stop** button in Web Inspector
  - Select 

from CPU profiles results (left side of panel)
    - Which 3 functions used the most CPU time % during this profile session?
    - How much time did each of these methods run for?

JavaScript

- ***TASK***: Finding inefficient JavaScript
  - Select 

result from web inspector
  - Expand results in the **Function** column to see calling methods
  - Which parent method called the **updateGraphics** method?
  - Which line of JavaScript source was this function called from?
  - How can you easily access the JavaScript source from the profiles panel?

Quick Lesson: Sources Panel

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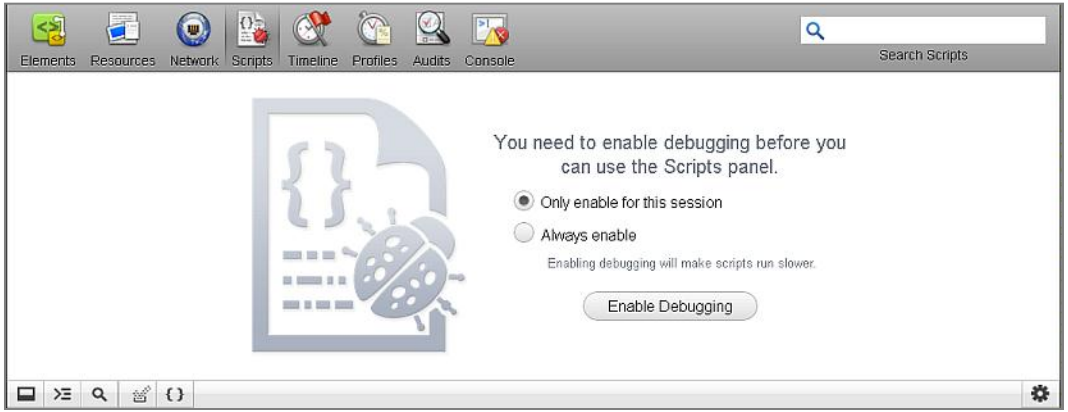
- Pause JavaScript execution at runtime

- Click on Sources panel in web inspector
  - If prompted, enable debugging



Quick Lesson: Sources Panel

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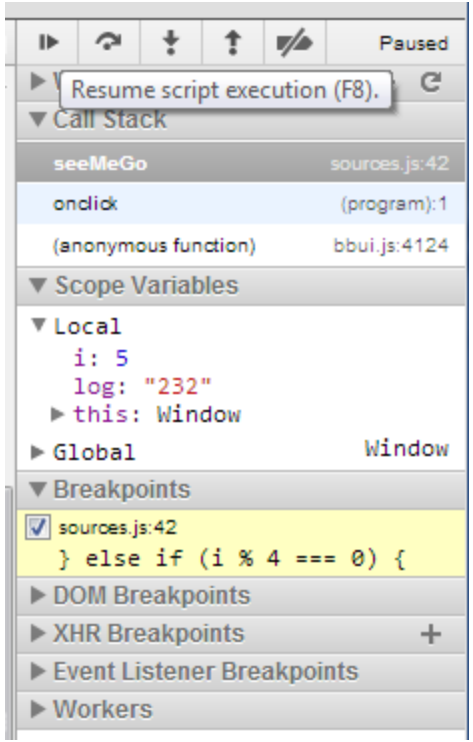
- ***TASK**: Setting a breakpoint*
  - Expand ‘Show Navigator’ button
  - Double click on **profiles.js** file
  - Click on line 45 of **profiles.js** to set breakpoint

  - Click on Profiles panel in web inspector
  - Click Start button to begin profiling a session
  - Click Start 5s Profile Script in sample application
    - Script execution should pause on line 42

  - F10 = step over, F8 = resume execution
  - Click on line 45 again to unset breakpoint



JavaScript

- Preventing JavaScript from blocking the UI
  - Avoid the use of alert() or confirm() dialogs
    - Use WebWorks system dialogs instead

- ***TASK***: Comparing different types of JavaScript prompts
  - Open Sources page in sample application
  - Click on the "**Show Time**" button
  - What happens to the time when the alert() dialog is displayed?
  - CTRL + R to reload the application, open Sources page.
  - Click on the "**Show Time (non-blocking)**" button
  - What happens to the time when the toast() dialog is displayed?

Task 4. Scrolling & transitions

Leverage hardware acceleration when possible

[20 mins]

Scrolling & Transitions

- Scrolling should be fast!
  - Poor scrolling performance is a common issue with the Web
    - Solution: Enable hardware acceleration
- Page transitions should be fast!
  - Developers often use JavaScript for animation – NO!
    - Solution: Use CSS 3D transformations to enable hardware acceleration
    - Tip: AVOID using JavaScript to perform transitions (high CPU load)

Quick Lesson: Timeline Panel

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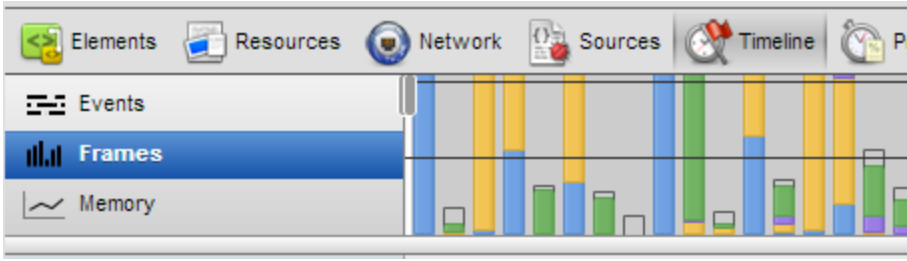
- Start WIC sample application
- Open http://169.254.0.1:1337 in Chrome
- Purpose of Timeline panel:
  - Page loading events
  - Frames per second
  - DOM memory usage



Quick Lesson: Timeline Panel

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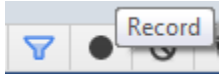
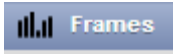
- ***TASK**: Read the Frames View*
  - Click on the 

panel in web inspector
  - Click the 

button to start recording the timeline
  - CTRL + R to reload the sample application page
  - Click the 

button to stop recording the timeline
  - Click on the 

view
  - Observe Results in web inspector (Timeline panel → Frames):
    - What color is used to represent painting to the screen?
    - How many frames did it take to draw the page? Frames per second?

Scrolling & Transitions

- ***TASK***: Observe CPU-powered scrolling performance
  - Click on the “Timeline” page in sample application
  - Using the Timeline panel in web inspector, begin recording a session

  - Find “40 rows of data” section in page
  - Scroll to the bottom of the 40-rows section
  - Stop recording the session in web inspector

  - How many frames are being drawn per second while scrolling?
  - What is the length of time for each frame?

Scrolling & Transitions

- ***TASK***: Observe GPU-powered scrolling performance
  - Click on the “Timeline GPU” page in sample application
  - Using the Timeline panel in web inspector, begin recording a session

  - Find “40 rows of data” section in page
  - Scroll to the bottom of the 40-rows section
  - Stop recording the session in web inspector

  - How much faster is this style of scrolling?
  - How many more frames are drawn per second while scrolling?

  - Next: how do we get such good performance?

Quick Lesson: Elements Panel

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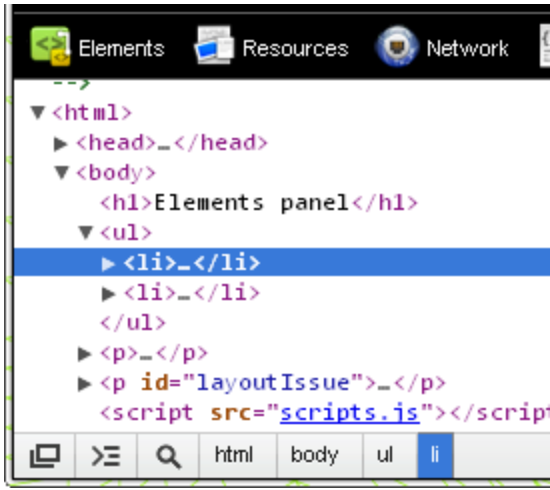
- Start WIC sample application
- Open http://169.254.0.1:1337 in Chrome
- Purpose:
  - Interact with the Document Object Model (DOM)
  - Page markup displayed on the left.
  - Additional DOM sub panels on the right.



Quick Lesson : Elements Panel

- Live DOM interaction
  - Open the “Timeline GPU” page in sample application
  - Click on the Elements panel in web inspector
  - Expand the markup until you find the element

- ***TASK:*** Changing CSS of the live DOM
  - Expand the Styles view on the right of the Elements panel
  - What value(s) are displayed in the ‘Matched CSS Rules’ section?
  - Disable “**-webkit-overflow-scrolling: touch**” checkbox
  - What happens to scrolling performance when this feature is disabled?

Free Time: Bonus tasks

Tips and tricks

[25 mins]

Bonus Tasks: Advanced features

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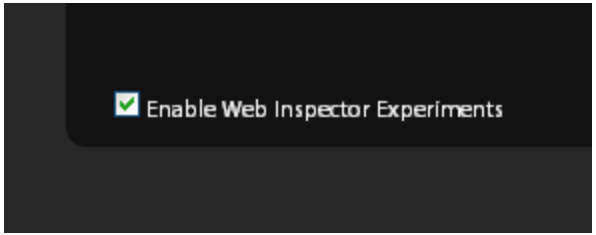
- Start WIC sample application
  - Open “Advanced Features” page
- Open http://169.254.0.1:1337 in Chrome
  - Enable **experiments** checkbox



  - Click on “Web Inspector Companion”

Bonus Tasks: Advanced features

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- ***TASK:*** *Overriding user agent*
  - Click **Display user agent** button in the sample application.
    - What user agent value is displayed?

  - Open **Settings** screen in web inspector 
  - Select the **Overrides** tab
  - Click **User Agent** checkbox
  - Select a different option user agent drop-down box

  - Click **Display user agent** button again in the sample application
    - What new user agent value is displayed?

Bonus Tasks: Elements Panel

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- Live DOM editing
  - Very useful for rapid UI testing
  - Tip: expand or collapse any elements

```
▼<div data-bb-type="round-panel" cla
  <div data-bb-type="panel-header"
  ▶<div>…</div>
  <h2> Elements panel</h2>
  ▼<ul>
    ▶<li>…</li>
    ▶<li>…</li>
  </ul>
  <div data-bb-type="panel-header"
  ▶<div>…</div>
```

- ***TASK:*** *Modify page content*
  - Open “Elements” page in sample application
  - Open Elements panel in web inspector
  - Double click DOM elements in the markup view.
  - Change the contents of an element and press ENTER.
    - E.g. `<h2>Elements Panel</h2>` → `<h2>Let’s rock and roll this!</h2>`

Bonus Tasks: Resources panels

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- Interacting with Local storage
  - Enables offline application data

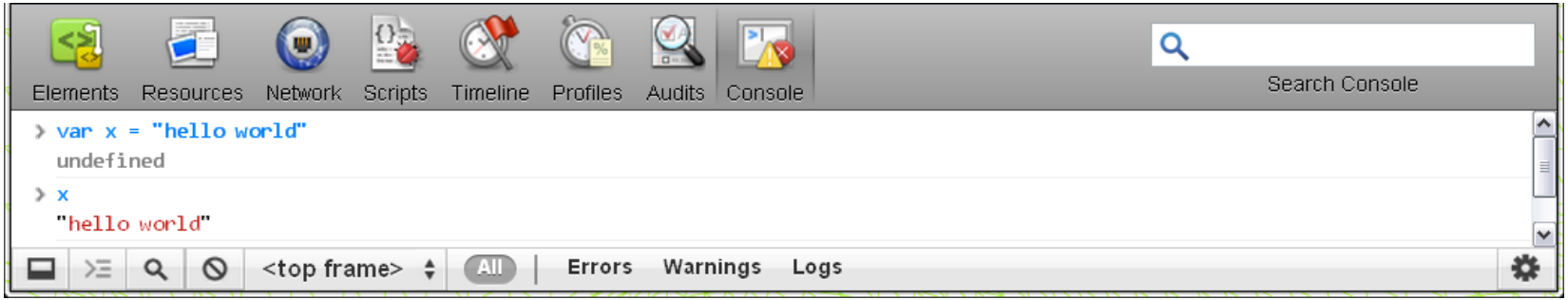
- ***TASK:*** *Viewing and modifying data*
  - Open Resources page in sample application
  - In web inspector, click on **Local Storage** item in resources panel
  - From sample application, click **Insert into localStorage** button
    - What happens to local storage results in resources panel?
  - In web inspector, double click key or value, modify values
    - E.g. “Foo” → “Bacon”
  - Right click a local storage record and select **Delete**

Bonus Tasks: Console Panel

BlackBerry Jam Europe

- Start WIC sample application

- Open http://169.254.0.1:1337 in Chrome
  - Click on “Web Inspector Companion”



Bonus Tasks: Console Panel

- Running JavaScript from the console
  - You can access any variable or method that the web page can.
- ***TASK:*** *Viewing runtime data*
  - Open Console panel in Web inspector
  - What do you see when you type **window.localStorage** or **document.body** and press enter?
- ***TASK:*** *Manually running methods*
  - Type **window.location.reload()** to reload the current page.
  - What happens when you type **openBrowser()**?

For More Information…

- Sessions:
  - JAM333 – Porting Apps: Apache Cordova
  - JAM343 – Lab: Optimization and Performance
  - JAM360 – HTML5 frameworks: Up-And-Comers
  - JAM397 – A pixel is not a pixel
  - JAM336 – Web API Deep Dive: Leveraging PIM

- Resources:
  - http://developer.blackberry.com/html5
  - http://github.com/blackberry

THANK YOU

JAM343

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