

Third Year B. Tech., Semester V [2021-22]

Programming Lab 3

Practical 3: To study web browsers and its developer tools option

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➤ **Problem Statement 1:**

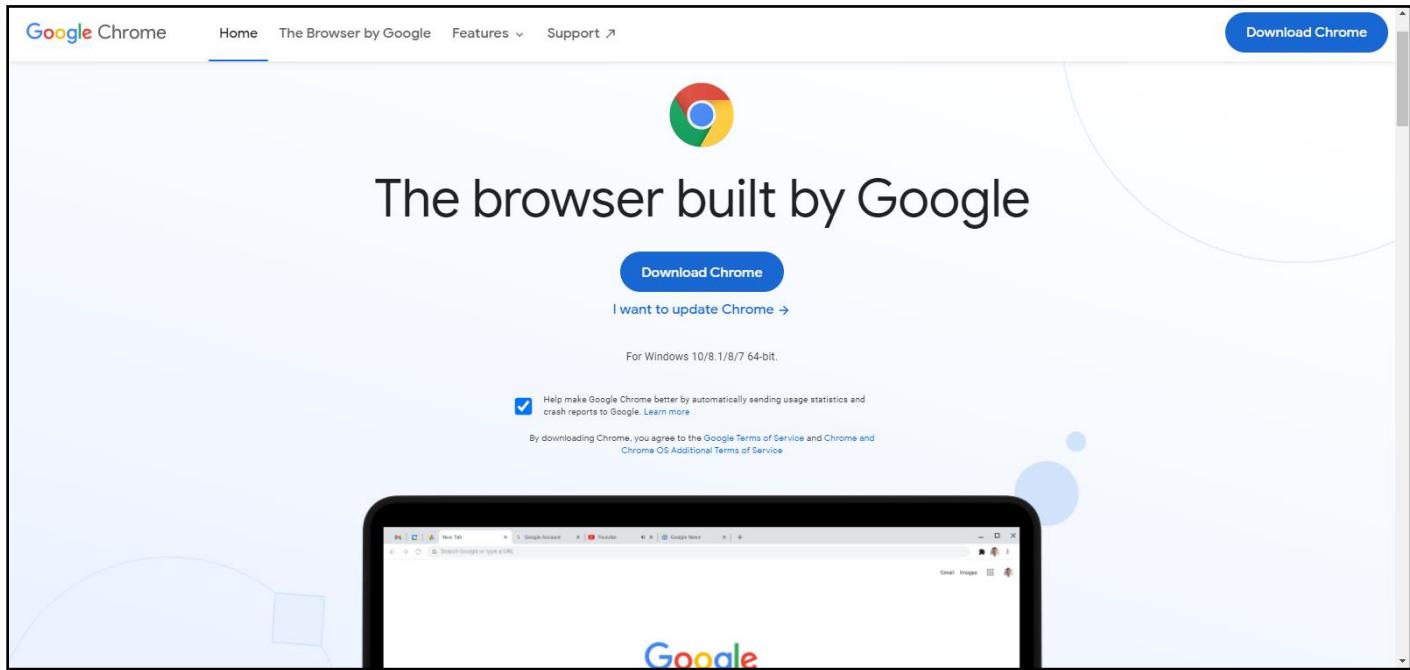
Install different web browsers on your machine. Go through the Developer Tools option of the browser.

➤ **Problem Statement 2:**

1. Visit https://en.wikipedia.org/wiki/Computer_science on various browsers.
2. Using browser's Developer Tools option find out how many requests-response cycles are needed to load the page fully on your machine?
3. Using browser's Developer Tools option get the header information of the page.
4. Using browser's Developer Tools option go through the DOM, CSS editor and JavaScript debugger options.

- **Problem Statement 1: Install different web browsers on your machine. Go through the Developer Tools option of the browser.**

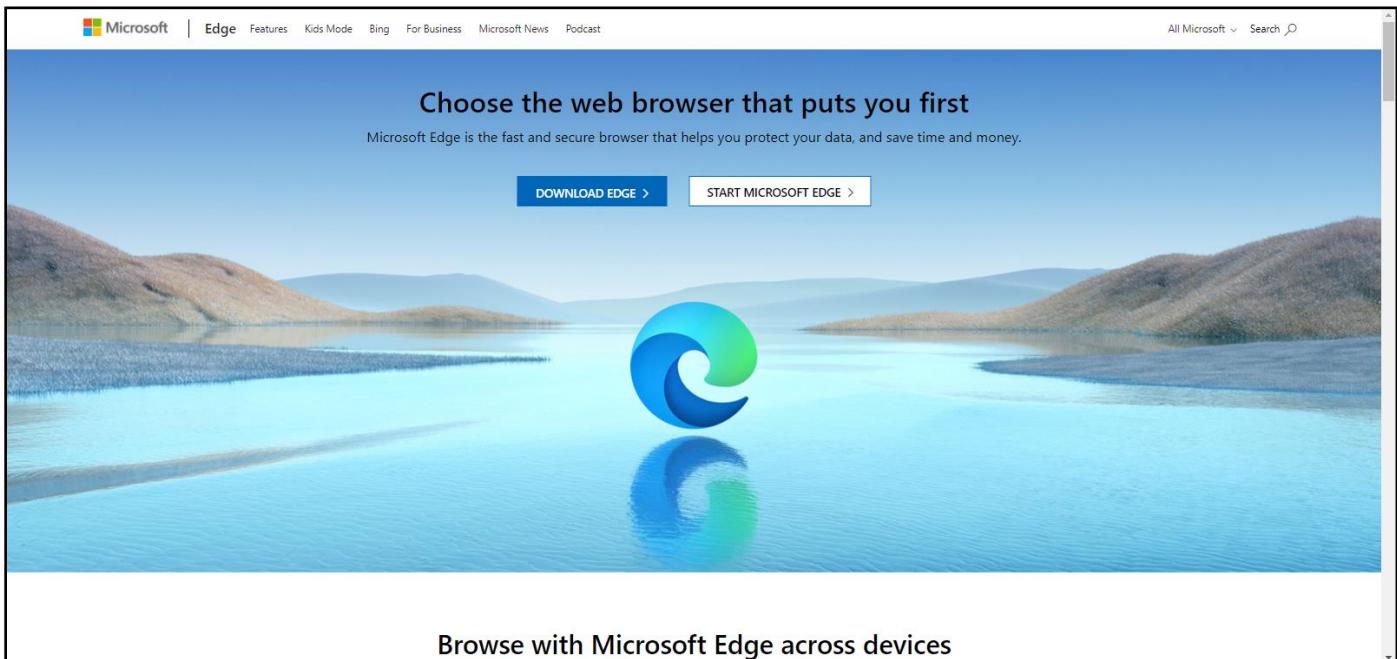
A. Google Chrome



- **Developer Tools of Google Chrome**

A screenshot of the Chrome DevTools interface. The left sidebar shows "Developers" and "Open Chrome DevTools", with a note that it was published on Friday, December 14, 2018. It also lists "Kayce Basques" and "Technically, I'm a writer". The main area shows the "Elements" tab of the DevTools, displaying the DOM structure of a page. The DOM tree includes nodes like <html>, <body>, and various CSS classes and IDs. To the right of the DOM tree is a "Styles" panel showing the CSS styles applied to the selected element. Below the DOM tree, there's a "Console" tab with a message about the "Highlights from the Chrome 92 update". The update highlights include "CSS Grid editor", "Source order viewer", "Lighthouse 7.5", "Improved CORS debugging", and "Network panel updates". A large blue banner on the right side of the interface says "new 92".

B. Microsoft Edge



- **Developer Tools of Microsoft Edge**

The screenshot shows a web browser interface with several tabs open. The main content area displays a news article from BBC News. The article's title is "Guinean president detained as Army seizes power; UN chief condemns coup". Below the title, there is a large image of a military vehicle and personnel. The browser's developer tools are visible on the right side, showing the page's HTML structure and CSS styles.

Top sites

- The new Edge
- Facebook
- Today's Deals
- Games
- B. Booking.com
- in LinkedIn

My Feed Personalise | News Entertainment ...

Guinean president detained as Army seizes power; UN chief condemns coup

Feedback

Elements Console Debugger Network Performance Memory Emulation

Inherited from html.hiperf

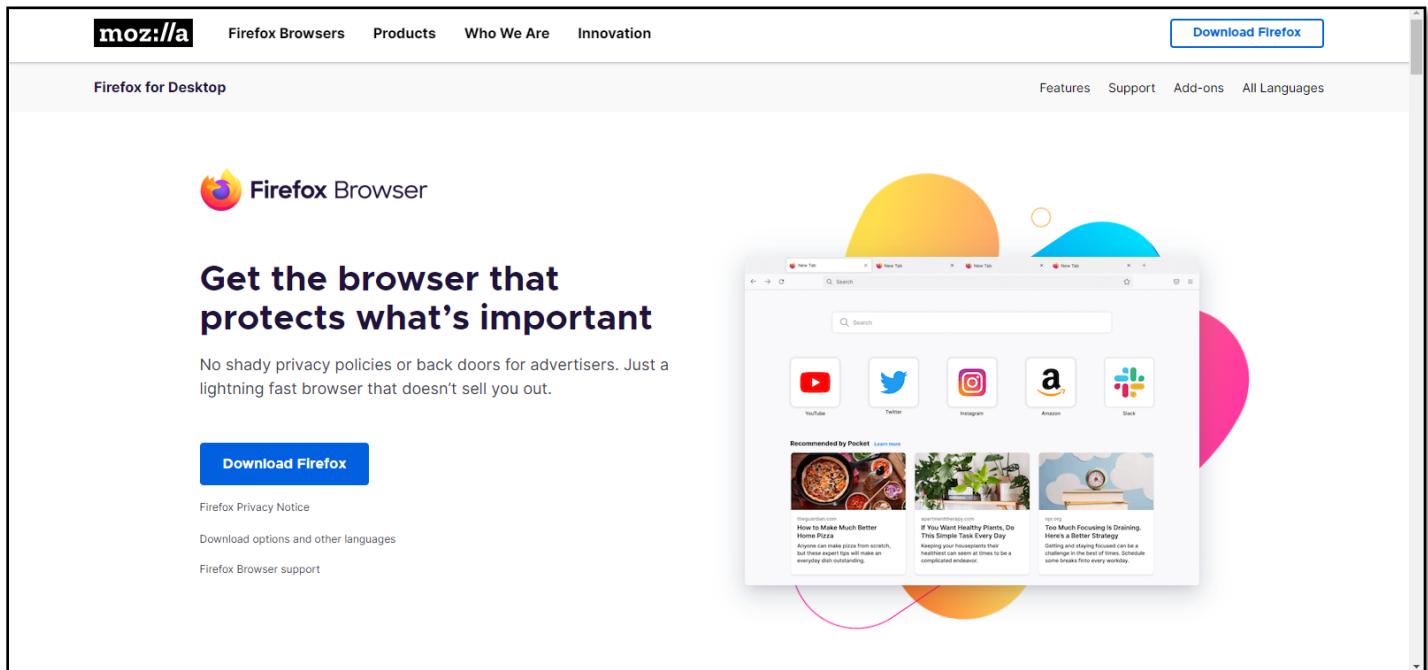
Styles Com... Eve... DO... Fonts Acc...

Find (Ctrl+F)

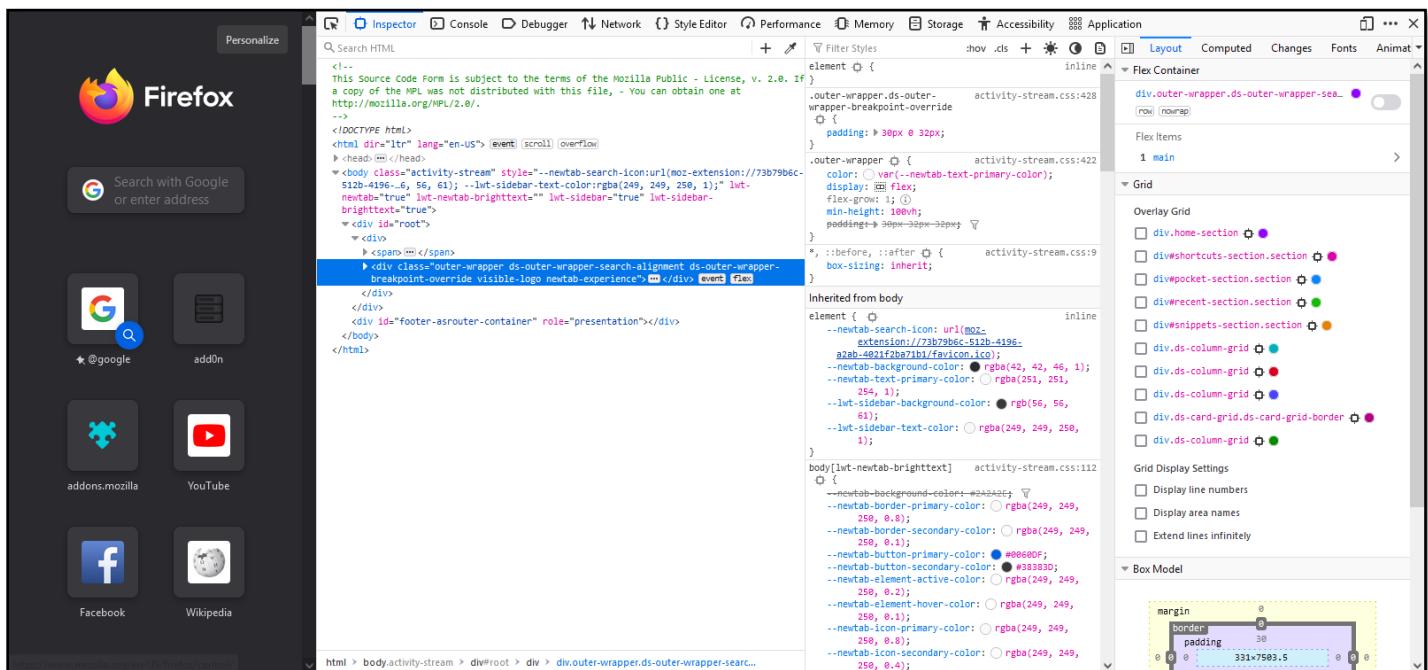
html.hiperf body.startpage

```
<!DOCTYPE html>
<html class="hiperf" lang="en-in" style="font-size:62.5% dir="ltr" manifest="/spartan/en-in/kernel/appcache/cache.appcache?market=US&enableregulatorypsm=0&enablecpsm=0&ishostisolationforced=0&targetexperience=default&locale=en-in">
<head iris-modules-settings="[{n:"banner",pos:"top",canvas:"ntp"}]" data-ajaxurl="/spartan/en-in/ntpajax?market=US&enableregulatorypsm=0&enablecpsm=0&ishostisolationforced=0&targetexperience=default&applocal=en-in">
    <meta data-pagetype="ntp" data-idx="108" data-client-settings="({appType:'hybrid', geo_country:'i_ng', geo_subdivision:'maharashtra', geo_zip:'416416', geo_ip:'59.94.117.0', geo_long:'74.566', os_region:'us', browser:'(browsertype:'edge', version:'17', 'isMobile':false), deviceFactor:(desktop:{domain:'www.msn.com', locale:{language:'en', script:''}, market:{id:'1', os:'windows', pagetype:'kernel_page', apps_locale:'en-in', base_url:'en-in/spartan'}, sid:'null', v:'20210624_23513043'}, static_page:false, empty_gif:'//static-spartan-eas-s-msn.com.akamaiized.net/sc/b9/e15e5.gif', functionality_cookie_experience:'false', functional_cookies:{}, functional_cookie_patterns:{}, fbi:d:'132970837947', lvk:'spartan', vk:'spartan', cat:null, autorefresh:'true', bingsg:'false', autorefreshsettings:{'is_marketing_enabled':true, 'timeout':20, 'idle_timeout':2}, uiprrefresh:{'enabled':false, 'frequency_minutes':10, 'banner_delay_minutes':null, 'maxfresh_display':null, 'minfresh_computetimeoutinseconds':60}, imgsrc:{'quality_high':60, 'quality_low':5, 'order_timeout':10000}, adsettings:{'wait_for_ad_in_sec':3, 'retry_for_ad':2, 'mecontroluri':"/lazyload", 'lazyload:{'enable_d':false}'}, data-ji:{'dpdi':1.0, 'dpdi1':1.0, 'dplo':null, 'forced_dpi':null, 'dms':6800, 'bdz':7, 'dg':'tmc.pc.edge.spartan.serviceline.rspnreplus', 'ssl':true, 'moduleapi':'https://www.msn.com/spartan/en-in/api/module/eschft', 'commoduleapi':'https://www.msn.com/spartan/en-in/api/pdp/updatepdadata', 'hdp':{bldid7qj,'signedin':0, 'ss_o':'', 'exchangeenabled':true, 'twitterimpenabled':false, 'greenieenabled':false, 'ispreload':false, 'anonnickname':e, 'ssocomplete':false}, data_info:v'20210624_23513043;j:3117573a3-6200-464a-85c6-0adff4f50903;c:3;z:(dd:el988946bf4e73b638ae44d589le, rid: 3, sm: easia-prd-spartan, dt: 2021-08-22T17:32:29.056391Z, bt: 2021-08-24T00:15:17.78911972);dpdi:1;dplo:1;dpdi1:0;edge.spartan.serviceline.rspnreplus;start:1;PageName:spartanStartPage;m:en-in;cb:1;len:in;jm:en-in;jud:{cid:,vk:spartan,n:,l:en-in,ck:map};utp:BB017Q3;ovc:f;ja:en-in;fxd:f;pxdpub:2021-04-01 21:12:24;xdmap:2021-09-06 05:27:56Z;axid:fmnmallexpusers;midf17cf, midf17cf, midf17cf, f1s-brsageft2, mudef1st57cf, pneedgefcf, bingcollabed2cf, compliancegefcf, platiyahpcf, starthrzcf, compliancehcfcf, gallery2cf, ls-blng-news, yebudum04302020, bhd20200521msncf, prg-lsw-hmcrl, prg-lsw-sdrank, prg-lsw-gtfcf-edge, prg-ad-speak, btrcreowl, ls-wiinuthservice, prg-capstalp, prg-lsw-multiply, prg-lsw-nounswitch, prg-wpo-holyptic, msnapcf,p, prg-lsw-flyt-htpc, prg-lsw-halfwae, prg-wseaourv2, prg-lsw-ownformat;userOptOut:false;userOptOutOptions:></head>
<body class="startpage sp_center-content start tmx_pc edge spartan serviceui rspnreplus rsthreplus dhpspartan has-ts htmlheader js-focus-visible">
    <div class="head-wrapper"></div>
    <div id="maincontent" data-m="{"i":8,"n":"main","y":6}" data-id="8" style="top: auto;"></div>
    <script><!--CDATA--&gt; require(["js!l10n&lt;/script&gt;
    &lt;noscript&gt;&lt;img src="//msn.com/.gif?u0" /&gt;&lt;/noscript&gt;</pre>
```

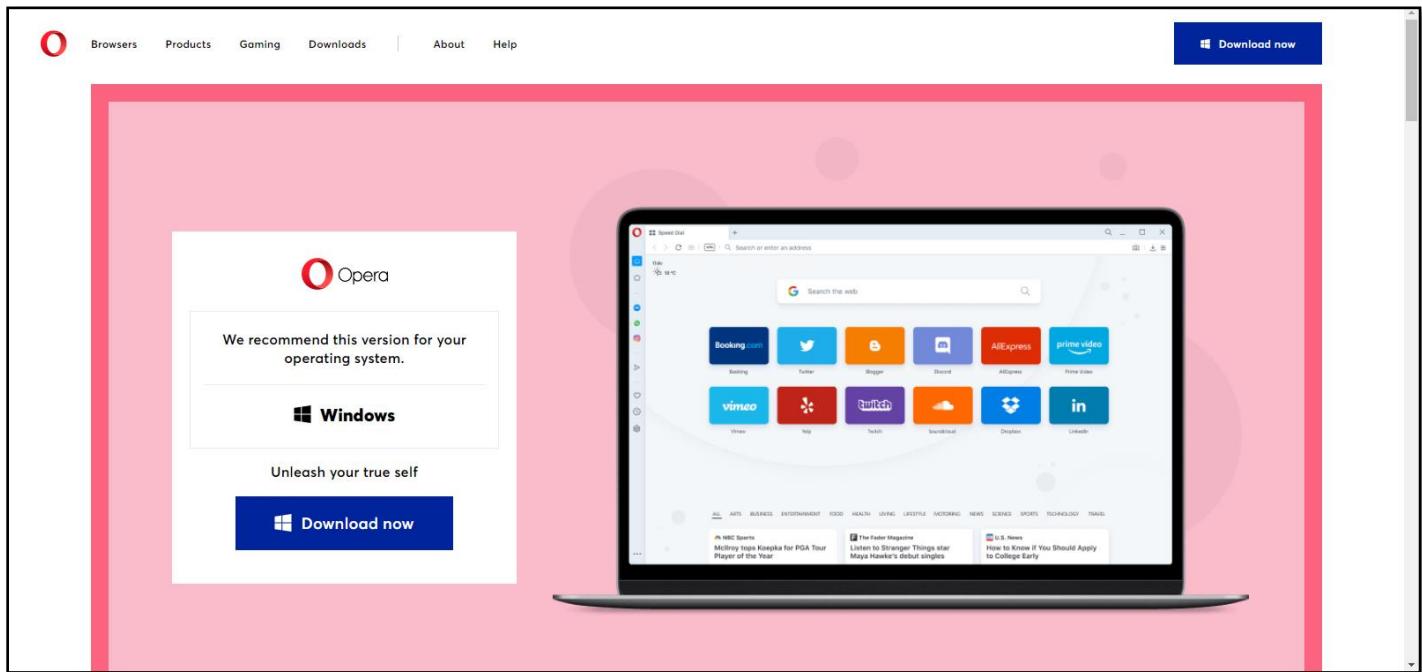
C. Mozilla Firefox



- **Developer Tools of Mozilla Firefox**



D. Opera



• Developer Tools of Opera

The screenshot shows the Opera developer tools open in a dark-themed browser window. The left side of the tools shows a grid of popular websites like Amazon, eBay, Booking.com, AliExpress, Kayak, and Forge of Empires. The right side has several tabs: Elements, Console, Sources, Network, Performance, Memory, Application, Security, and Lighthouse. The Lighthouse tab is active, displaying an audit report with a score of 96 F. The report includes sections for Accessibility, Best Practices, Performance, and SEO. The Elements tab shows the HTML code for the startpage, and the Styles tab shows the CSS styles applied, including a dark theme with colors like #2a343d and #3e4852.

➤ **Problem Statement 2:**

1. Visit https://en.wikipedia.org/wiki/Computer_science on various browsers.
2. Using browser's Developer Tools option find out how many requests-response cycles are needed to load the page fully on your machine?
3. Using browser's Developer Tools option get the header information of the page.
4. Using browser's Developer Tools option go through the DOM, CSS editor and JavaScript debugger options.

A. Google Chrome

- i. 242 Requests-Response cycles are needed to load the page fully on machine.

The screenshot shows the Google Chrome Developer Tools Network tab. The timeline at the top indicates 242 requests were made to load the page. The list of requests shows numerous files being loaded, including JavaScript, CSS, and image files. The main content area displays the Wikipedia article on Computer science, and the bottom right corner shows a sidebar with navigation links for the article.

ii. Getting the header information of the page

The screenshot shows the Network tab of the browser developer tools for the Wikipedia page "Computer science". The request URL is https://en.wikipedia.org/wiki/Computer_science. The Headers section displays the following information:

```

Request URL: https://en.wikipedia.org/wiki/Computer_science
Request Method: GET
Status Code: 200
Remote Address: 103.102.166.224:443
Referrer Policy: strict-origin-when-cross-origin
  
```

The Response Headers section shows:

```

accept-ranges: bytes
age: 55979
cache-control: private, s-maxage=0, max-age=0, must-revalidate
content-encoding: gzip
content-language: en
content-length: 79286
content-type: text/html; charset=UTF-8
date: Sun, 05 Sep 2021 14:27:25 GMT
last-modified: Sun, 05 Sep 2021 14:22:02 GMT
nsl: { "report_to": "wm_ne1", "max_age": 86400, "failure_fraction": 0.05, "success_fraction": 0.0 }
p3p: CP="See https://en.wikipedia.org/wiki/Special:CentralAutoLogin/P3P for more info."
permissions-policy: interest-cohort()
report-to: { "group": "wm_ne1", "max_age": 86400, "endpoints": [ { "url": "https://intake-logging.wikimedia.org/v1/events?stream=w3c.report-ingapi.network_error&schema_uri=w3c/reportingapi/network_error/1.0.0" } ] }
server: mw2270.codfw.wmnet
server-timing: cache;desc="hit-front", host;desc="cp5016"
strict-transport-security: max-age=106384710; includeSubDomains; preload
vary: Accept-Encoding,Cookie,Authorization
  
```

The Network tab also lists various resources loaded by the page, such as CSS files, JavaScript files, and images.

The screenshot shows the Network tab of the browser developer tools for the Wikipedia page "Computer science". The request URL is https://en.wikipedia.org/wiki/Computer_science. The Headers section displays the following information:

```

x-cacher: cp5007 miss, cp5016 hit:49
x-cache-status: hit:front
x-client-ip: 59.94.117.181
x-content-type-options: nosniff
  
```

The Request Headers section shows:

```

:authority: en.wikipedia.org
:method: GET
:path: /wiki/Computer_science
:scheme: https
accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/avif,image/webp,*/*;q=0.8,application/signed-exchange;v=b3;q=0.9
accept-encoding: gzip, deflate, br
accept-language: en-US,en;q=0.9
cache-control: max-age=0
cookie: WMF-Last-Access=06-Sep-2021; WMF-Last-Access-Global=06-Sep-2021; GeoIP=IN:MH:Sangli:16.86:74.56:v4; enwikimwuser-sessionId=f0dbb2725fe726e539cd; enwikiuME-sessionTickLastTickTime=1630908007920; enwikiuME-sessionTickCount=19; enwikie-sessionId=d96f43210f1f70a298a5
sec-ch-ua: "Chromium";v="92", "Not A;Brand";v="99", "Google Chrome";v="92"
sec-ch-ua-mobile: ?0
sec-fetch-dest: document
sec-fetch-mode: navigate
sec-fetch-site: none
sec-fetch-user: ?1
upgrade-insecure-requests: 1
user-agent: Mozilla/5.0 (Windows NT 10.0; WOW64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/92.0.4515.159 Safari/537.36
  
```

The Network tab lists various resources loaded by the page, similar to the first screenshot.

iii. DOM, CSS editor and JavaScript debugger options

The screenshot shows a browser developer tools window with several panels:

- Elements** panel: Shows the DOM tree for the page. A specific element, `<div id="mw-parser-output">`, is selected.
- Styles** panel: Shows the CSS styles applied to the selected element. It includes rules from user agent stylesheets and local styles.
- Computed** panel: Shows the final computed style for the selected element, including margin, border, and padding values.
- Layout** panel: Shows the element's position and dimensions on the page.
- Event Listeners** panel: Shows any event listeners attached to the selected element.

B. Microsoft Edge

i. 208 Requests-Response cycles are needed to load the page fully on machine.

The screenshot shows the Microsoft Edge developer tools Network tab with the following details:

- Content type**: Headers tab is selected.
- Request URL**: https://en.wikipedia.org/wiki/Computer_science
- Request Method**: GET
- Status Code**: 200 /
- Request Headers** (partial list):
 - Accept: text/html, application/xhtml+xml, application...
 - Accept-Encoding: gzip, deflate, br
 - Accept-Language: en-US
 - Cache-Control: max-age=0
 - Cookie: WMF-Last-Access=06-Sep-2021; enwikimE...
 - Host: en.wikipedia.org
 - Referer: https://www.bing.com/search?q=https%3A%
 - Upgrade-Insecure-Requests: 1
 - User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64)
- Response Headers** (partial list):
 - accept-ranges: bytes
 - age: 57069
 - cache-control: private, s-maxage=0, max-age=0, must-revalidate
 - content-encoding: gzip
 - content-language: en
 - content-length: 70286
 - content-type: text/html; charset=UTF-8
 - date: Sun, 05 Sep 2021 14:27:25 GMT
 - last-modified: Sun, 05 Sep 2021 14:22:02 GMT
 - nef: {"report_to": "wm_nef", "max_age": 86400, "fail_if_older": true}
 - p3p: CP="See https://en.wikipedia.org/wiki/Special:Cookies-Info"
 - permissions-policy: interest-cohort=0
 - report-to: {"group": "wm_nef", "max_age": 86400, "enforce_if_no_reporter": true}
 - server: mw2270.codfw.wmnet
 - server-timing: cache-descs="hit-front", hostdesc="cp5...strict-transport-security: max-age=106384710; includ...
 - vary: Accept-Encoding, Cookie, Authorization
- Network Statistics**:
 - 0 errors
 - 208 requests
 - 185.17 KB transferred
 - 74.17 s taken

ii. Getting the header information of the page

The screenshot shows the Network tab of the developer tools in a browser. The Headers section displays the following information:

- Request URL: https://en.wikipedia.org/wiki/Computer_science
- Request Method: GET
- Status Code: 200 /
- Accept: text/html, application/xhtml+xml, application/xml; q=0.9, */*; q=0.8
- Accept-Encoding: gzip, deflate, br
- Accept-Language: en-US
- Cache-Control: max-age=0
- Cookie: WMF-Last-Access=06-Sep-2021; enwikiwmE-sessionTickLastTickTime=163090102818; enwikiwmE-sessionTic...
- Host: en.wikipedia.org
- Referer: https://www.bing.com/search?q=https%3A%2F%en.wikipedia.org%2Fwiki%2Fcomputer_science&form=ED...
- Upgrade-Insecure-Requests: 1
- User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/64.0.3282.1...

iii. DOM, CSS editor and JavaScript debugger options

The screenshot shows the DOM tab of the developer tools in a browser. The DOM tree on the left shows the structure of the Wikipedia page for "Computer science". The right panel displays the CSS styles for the "Computer_science" class, including:

- Inline style: a { padding-left: 1.6em; margin-bottom: 0.5em; }
- .mw-parser-output div.hatnote { padding-left: 1.6em; margin-bottom: 0.5em; }
- .mw-parser-output h1 { font-style: italic; }
- Inherited from div#mw-content-text: .mw-content-ltr { direction: ltr; }
- Inherited from div#content: .mw-body .mw-parser-output body { color: #202020; direction: rtl; }
- Inherited from div#bodyContent: @media screen .mw-content-ltr { direction: ltr; }
- Inherited from body.mediawiki: .mw-body .mw-parser-output body { font-size: 0.87em; font-size: calc(0.875em); line-height: 1.6; }
- Inherited from html.client-js: .mw-empty-el1 { font-size: 0.87em; font-size: calc(0.875em); line-height: 1.6; }
- Inherited from html.body: .mw-empty-el1 { font-family: sans-serif; }

C. Mozilla Firefox

i. 105 Requests-Response cycles are needed to load the page fully on machine.

The screenshot shows the Mozilla Firefox browser interface with the Network tab selected in the developer tools. The page being loaded is the Wikipedia article on Computer science. The Network tab displays a list of 105 requests made during the loading process. These requests include various types such as GET, POST, and HEAD, primarily for files like scripts, stylesheets, and images. The requests are listed with their initiator (e.g., BrowserTab, XMLHttpRequest), type, transferred size, and status code (e.g., 200 OK). The page content visible in the main window includes sections on lambda calculus, sorting algorithms, and various diagrams related to computer science concepts.

ii. Getting the header information of the page

The screenshot shows the Mozilla Firefox browser interface with the Headers tab selected in the developer tools. The page being loaded is the Wikipedia article on Computer science. The Headers tab displays the response headers sent by the server. Key headers shown include Status (200 OK), Version (HTTP/2), Transfered (69.71 KB), and Response Headers (1,075 KB). The response headers list various metadata about the request, such as accept-ranges, age, cache-control, content-encoding, content-language, content-length, content-type, date, last-modified, and etag. It also includes specific details for the report-to and p3p directives, as well as various cookies and security-related headers.

Screenshot of a browser developer tools Network tab showing requests for the Wikipedia page on Computer science. The Network tab lists 105 requests, including various images and scripts. The Headers tab shows request and response headers, and the Request Headers section includes standard HTTP headers like Accept, Content-Type, and User-Agent.

iii. DOM, CSS editor and JavaScript debugger options

Screenshot of a browser developer tools CSS panel for the same Wikipedia page. The panel shows the current CSS styles applied to the selected element, including inline styles and those inherited from parent elements. It also displays the Box Model Properties for the selected element, showing dimensions and border styles.

D. Opera

i. 231 Requests-Response cycles are needed to load the page fully on machine.

The screenshot shows the Wikipedia article on 'Computer science'. The developer tools Network tab displays 231 requests. The requests list includes:

- Computer_science
- load.php?lang=en&modules=
- 144px-Lambda_calculus-Chur.
- load.php?lang=en&modules=
- 144px-Sorting_quicksort_anim
- 144px-Activemarker2.PNG
- 144px-Half_Adder.svg.png
- 100px-Flowchart_structured_p
- 150px-Ordinates_centraux_3
- 16px-Symbol_category_class.s
- 170px-Babbage40.png
- 170px-Ada_lovelace.jpg
- 130px-DFAexample.svg.png
- 96px-Syntax_tree.svg.png
- 0ef529b2d16ced36cd8fc5bfa
- 120px-Complexity_classes.svg
- 96px-Interaction_Net_as_Confi
- 96px-Blochsphere.svg.png
- 120px-XNOR_ANSI_Labelled.s
- 96px-Kellerautomat.svg.png
- 96px-Hamming.jpg
- 96px-Binary_symmetric_chann
- 96px-Digitaleichen.svg.png
- 96px-H0_h1_fehler.jpg
- 96px-Mandelpart2_red.png
- 96px-Tree_%28computer_sci.

The total number of requests is 231, and the total transferred data is 117 kB.

ii. Getting the header information of the page

The screenshot shows the developer tools Network tab for the 'Computer science' page. The Headers section for the main request shows:

- Request URL: https://en.wikipedia.org/wiki/Computer_science
- Request Method: GET
- Status Code: 200
- Remote Address: 103.102.166.224:443
- Referrer Policy: origin

The Response Headers section includes:

- accept-ranges: bytes
- age: 56762
- cache-control: private, s-maxage=0, max-age=0, must-revalidate
- content-encoding: gzip
- content-language: en
- content-length: 70286
- content-type: text/html; charset=UTF-8
- date: Sun, 05 Sep 2021 14:27:25 GMT
- last-modified: Sun, 05 Sep 2021 14:22:02 GMT
- p3p: CP="See <https://en.wikipedia.org/wiki/Special:CentralAutologin/P3P> for more info."
- permissions-policy: interest-cohort()
- report-to: { "group": "wm_ne1", "max_age": 86400, "endpoints": [{ "url": "https://intake-logging.wikimedia.org/v1/events?stream=w3c-reportingapi.network_error&schema_uri=/w3c/reportingapi/network_error/1.0.0" }] }
- server: mw2270.codfw.wmnet
- server-timing: cache;desc="hit-front", host;desc="cp5016"
- strict-transport-security: max-age=106384710; includeSubDomains; preload
- vary: Accept-Encoding,Cookie,Authorization
- x-cache: cp5007 miss, cp5016 hit/1

The screenshot shows a Microsoft Edge browser window. The main content area displays the Wikipedia article on Computer science. On the right side, the browser's developer tools are open, specifically the Network tab. This tab lists all the requests made by the browser to load the page, including images like 'Computer_science.svg' and 'Computer_science.png', and various CSS and JavaScript files. The status bar at the bottom right indicates the time as 11:46 AM on 06-Sep-21.

iii. DOM, CSS editor and JavaScript debugger options

This screenshot shows the same Wikipedia page for 'Computer science' as the previous one, but with the developer tools' Styles tab active. This tab lists the CSS rules being applied to the page's HTML elements. It includes rules for classes like 'mw-parser-output div.hatnote', 'mw-content-ltr', and 'mw-body'. The right side of the developer tools interface shows the raw CSS code for each rule, such as 'padding-left: 1.6em; margin-bottom: 0.5em;' for the hatnote class.