Web & Networks IG

2nd Conference Call Meeting

31-Jul-2019

Agenda

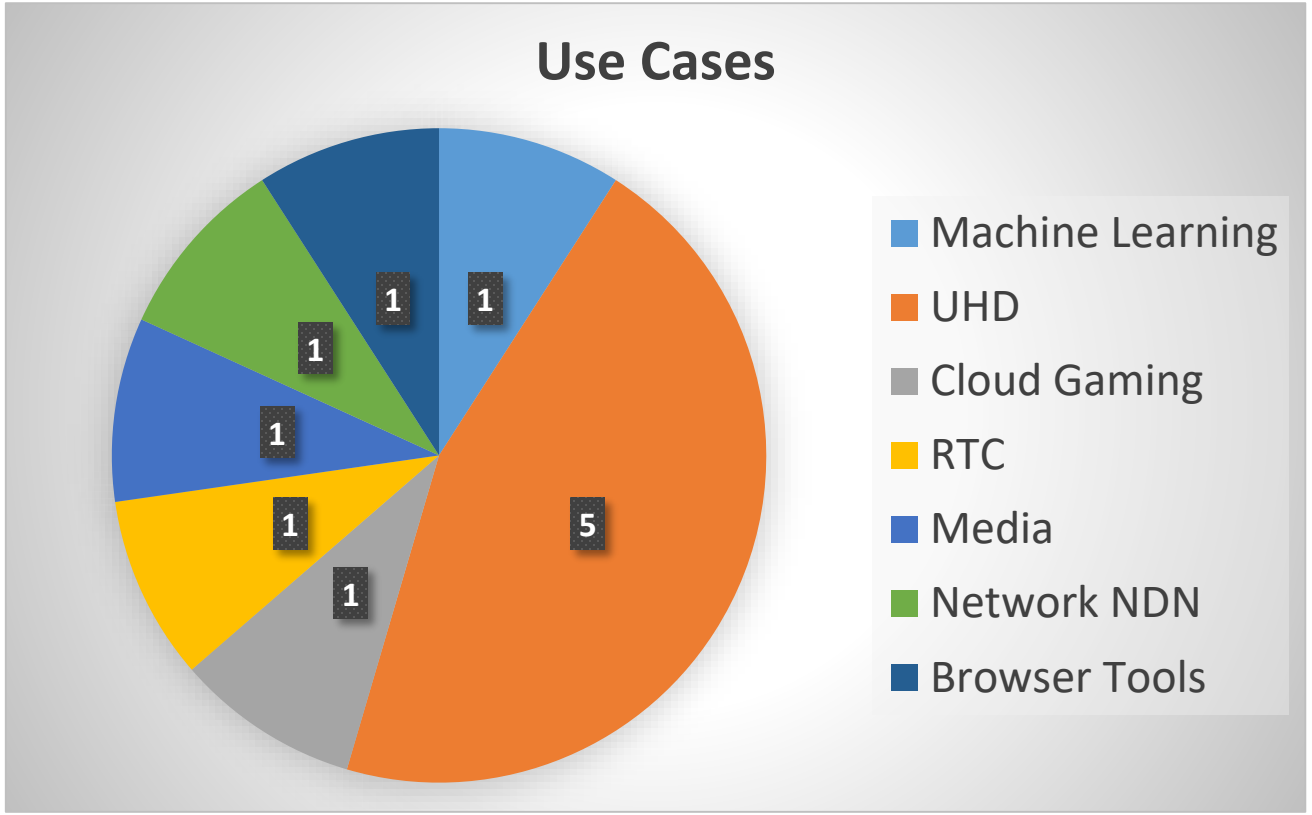
- Principles for Web and Networks Solutions
- Web & Network Use-Cases and Requirements
- Liaisons Update
- TPAC Meeting Information

Plan

- Plan
  - Gather and Document Use-cases (github) : On going
    - Capture Requirements
  - Privacy and Security Aspects
  - Liaisons
- Time Frame
  - July-Aug 2019
- Meetings
  - Conference Calls
  - IRC Channels
  - Public Mailing Lists
- Upcoming Milestone
  - TPAC September 16th -20th, 2019

Use-Cases

- Overall 11 issues added
  - https://github.com/w3c/web-networks/issues



How to Add Use-Cases

- Go to https://github.com/w3c/web-networks/issues to see Use-cases added.

- Click on any **Use-Case (UC) title** to read more about those added so far. Use "**Comments**" option to discuss and share feedback.

- To add new use-cases, click on "**New Issue**" button (green colour), and in the next page, click "**Get Started**" button.

- For UC title, we recommend to use this format

  <Application Domain> - <Title of use-case>

  This is to help identify the application domains of the UCs from the title.

- For the description, you can use the **template** provided. It is only a base template reference. Submitters are welcome to submit in any convenient format of their choice also.

- Click "**Submit new issue**" to upload

Use-Cases : Other Sources

- Use-cases from other W3C WG/IG which have Network touchpoint
  - Example
    - WebRTC Next Version Use-cases : https://w3c.github.io/webrtc-nv-use-cases/
      - **Multiparty online game with voice communications**
        - Congestion control between different connections
        - User Agent ability to manage multiple connections
      - **Mobility**
        - ICE Agent ability to maintain multiple candidate pairs and move traffic between them
        - ICE Agent ability to take network cost into account
      - **Others ?**
    - Media & Entertainment (eg. Broadcast related)
    - Web of Things
- Use-cases that are driving MEC API definition

Sample Use-Cases

Use-Case Application Domain
#1 : Cloud Gaming
#2 : Machine Learning Inference
#3 : Web Browser Tools
#4 : UHD video - Remote Education Service
#5 : UHD – Remote diagnosis
#6 : UHD - Massively multiplayer online role-playing
#7 : Augmented Reality
#8 : Virtual Reality
#9 : Named Data Networking

Use-Case #1

- Cloud Gaming
  - Use-Case Description

    End users play Cloud Game for benefits in rendering quality, instant startup / handoff on any device, and battery life. In this cloud mode, the user agent needs to dynamically coordinate with cloud to decide / adjust the best video streaming parameters that fit into current network conditions.

    Meanwhile, if enabled, it may switch to local mode which execute the same game locally with Web technologies (WebGL, WebAssembly etc.) in case it observes or is notified that the network becomes (or soon will be) too bad in terms of latency, bandwidth, stability, cost of data plan etc. It may switch back again to cloud mode if network requirements are satisfied again.

  - Example

    An illustration in next page.

  - Requirements

    - User agent could dynamically query network status / metrics
    - User agent could register events to be notified if certain network metrics exceed / below a threshold
    - Optional: User agent is able to pin to a dedicated network channel for a given web app. This allows cloud gaming to go through a special data plan.

User-Case #1

Game @Local **VS** **Game @Cloud**

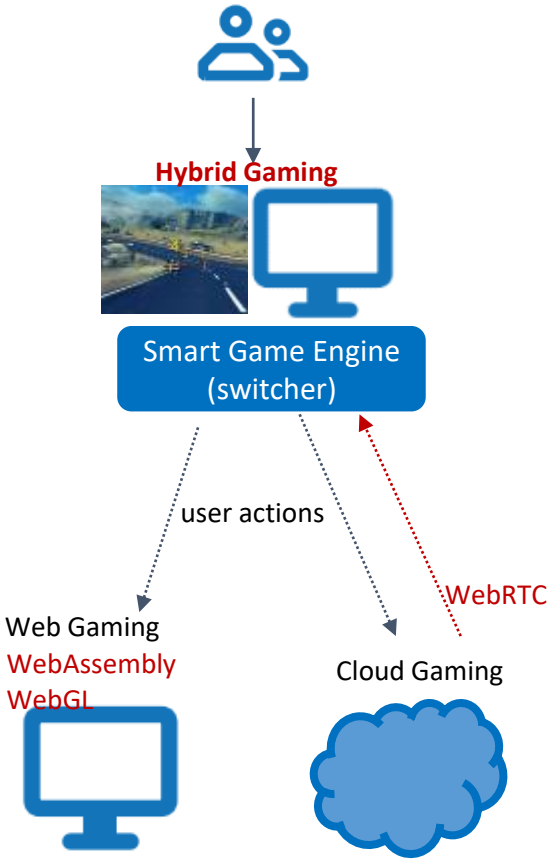
Web & Networks

Good Networking

negligible latency
smooth experience

Bad Networking

great delay, jitter/wait
unpleased experience



Use-Case #2

- ML Inference
  - Use-Case Description

    Machine learning inference via web apps can be done either on the cloud or on the edge/device. When it comes to deciding between the two options, there are trade-offs to consider such as quality of interference versus
    - Result output delay or latency (due to network delay or processing delay either on device/cloud)
    - Device Power Consumption
    - Privacy
    - Cost to user (e.g. Data usage costs)

    Also, the size of the data vary depending on use-case (i.e., images and video resolution/size) and upload time depends on network bandwidth.

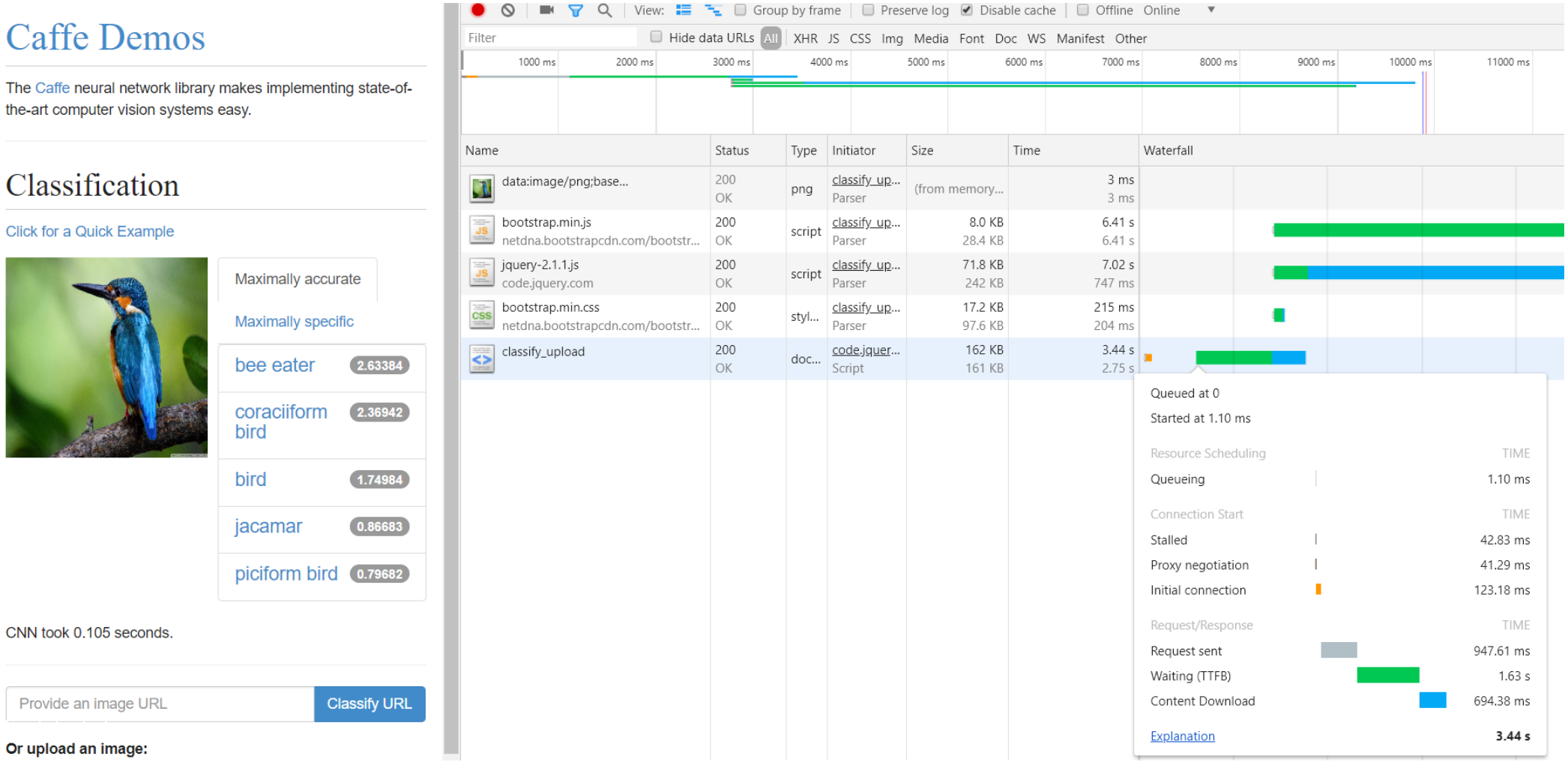
    Currently, there is no effective way to decide in real-time, if inference is best done on the edge/device or on the cloud for different use-cases.
  - Example

See next page.

Use-Case #2

- Example

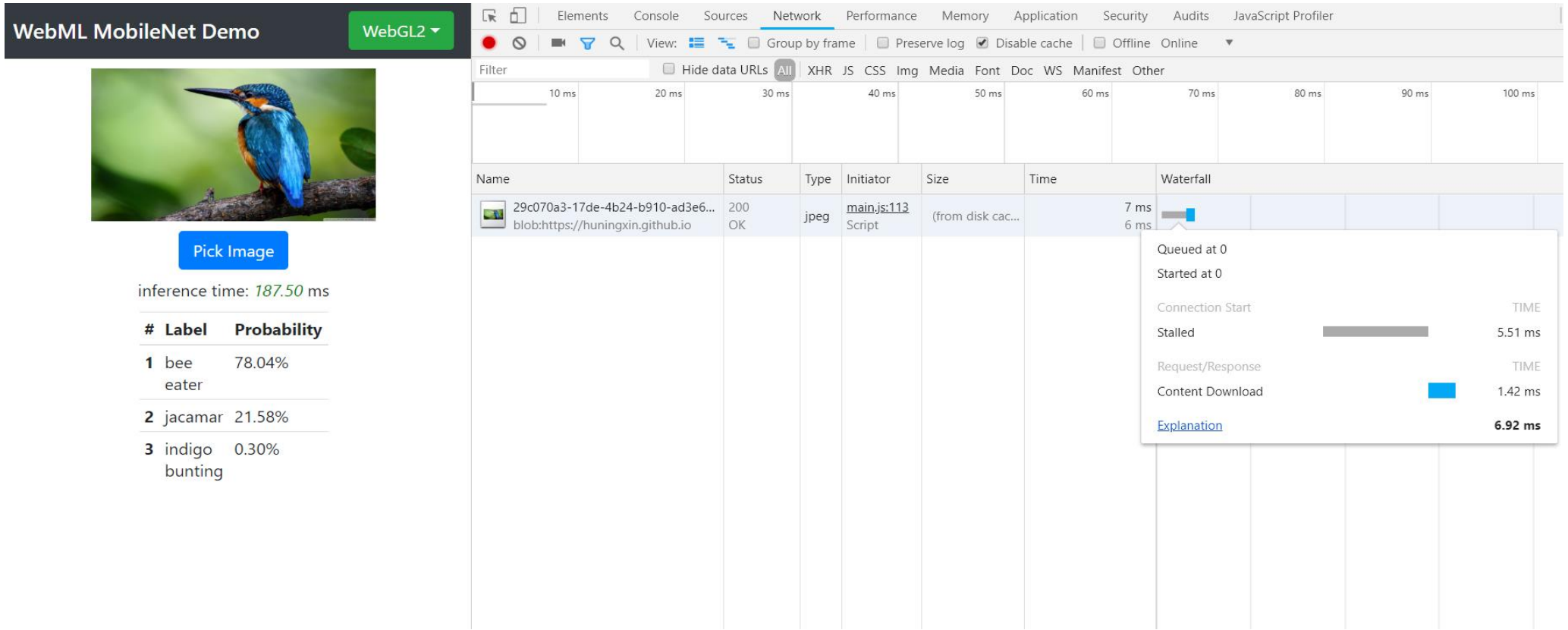
ML App via Chrome Web Browser using Cloud ML Inference



Use-Case #2

- Example (contd)

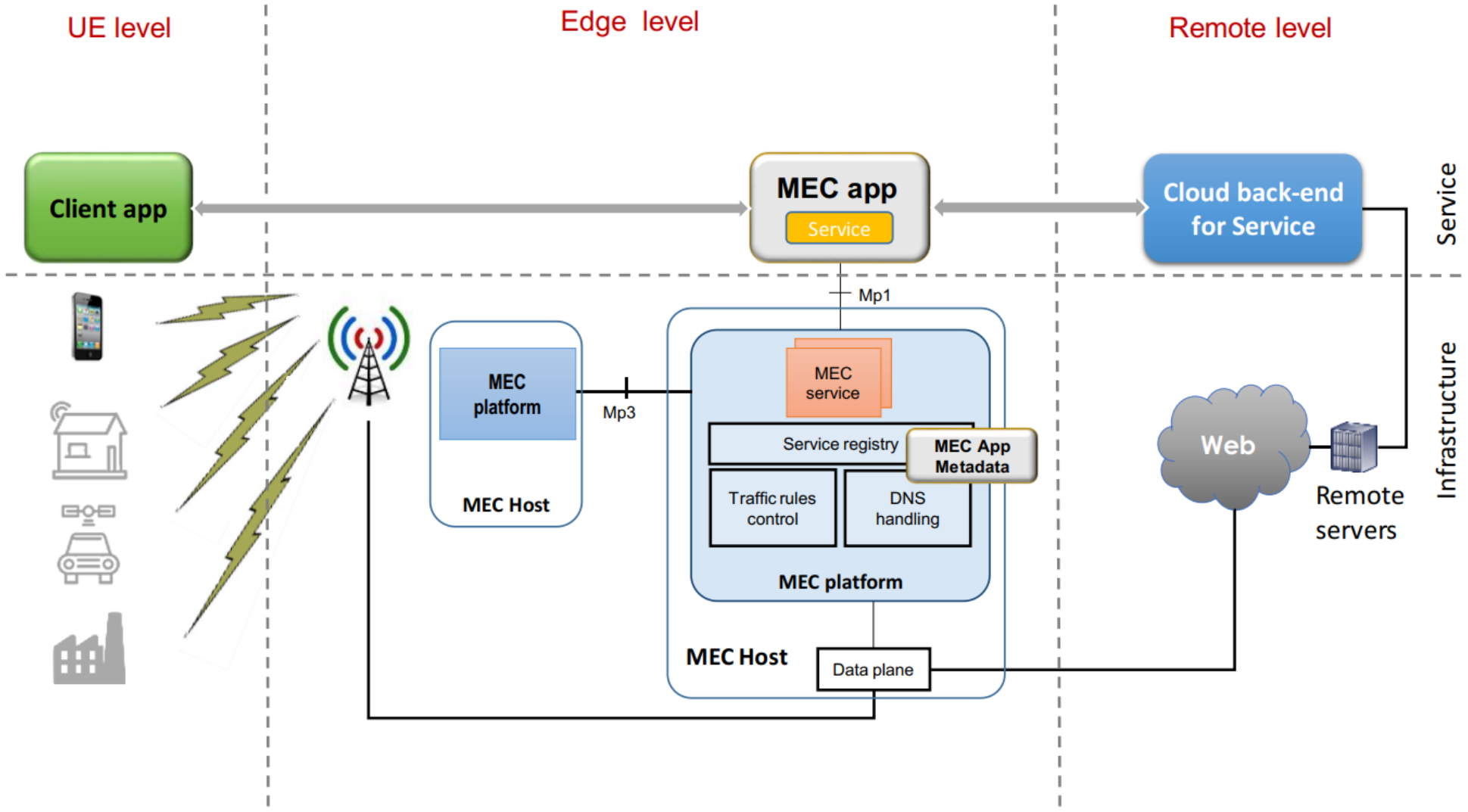
ML App via Chrome Web Browser using Local Browser ML Inference engine



Questions to Ask Ourselves

- Is it useful for an WebApp to dynamically decide whether it should do inference on the device or edge or cloud?
  - If yes, what are the factors to decide? (latency, privacy, inference quality, cost, etc.)
- What are the various Machine Learning content types?
  - Speech
  - Audio
  - Image
  - Video (with audio)
  - Sensor Data
- What are the characteristics of each?
  - Size
  - Inference complexity and accuracy expectations
  - Use-case real-time needs or latency bounds

Taking Architecture from ETSI MEC as Example



Ref: ETSI MEC

Figure 2: New application development paradigm introduced by MEC.

Questions to Ask Ourselves

- Parameters what potentially help address QoE requirements

QoE Criteria

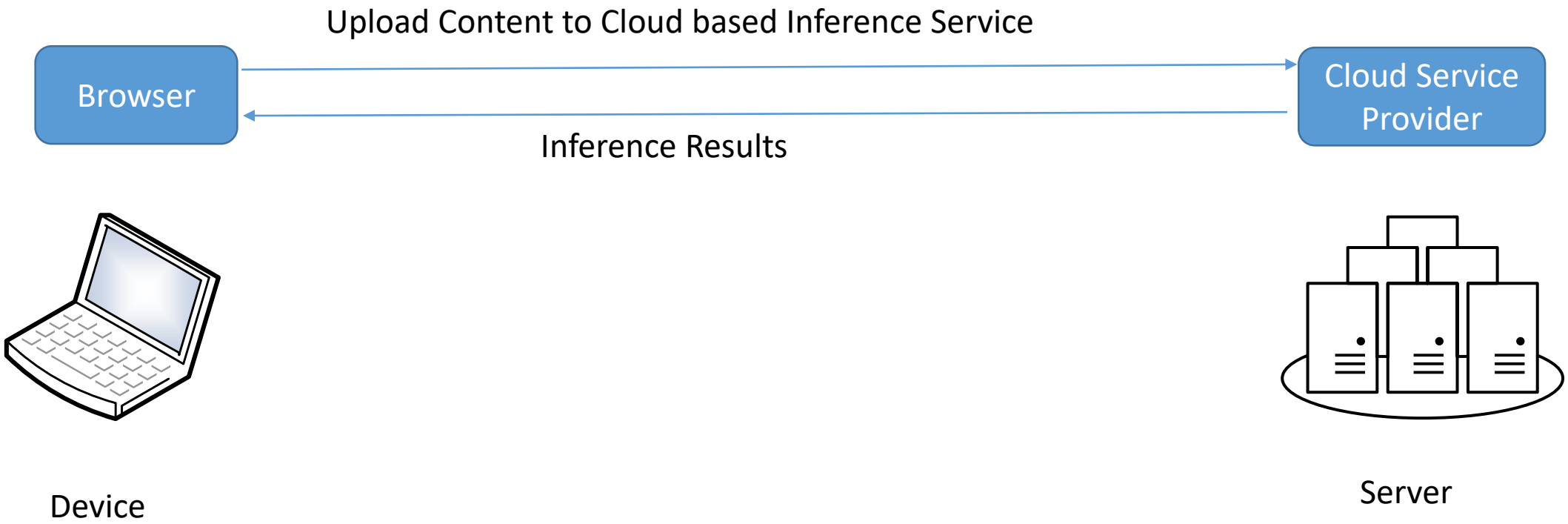
- Inference accuracy/quality
- Content Size
- Content Type
  - Real-Time
  - Non-Real Time
- Number of Contents streams analysed in parallel
- Content Privacy aspects
- Cost to user
- Link Quality impact on Latency (current / future)

Parameters

- Network To WebApp
  - Round-trip-delay
  - Network bandwidth
  - Current Link Quality
  - Future Anticipated Link Quality
  - Edge Compute Presence
- WebApp to Network
  - RT or Non-RT App
  - App Type, Data Size
  - Throughput requirements
  - Mobile/Stationary
  - Instantaneous Rcvd Signal Quality

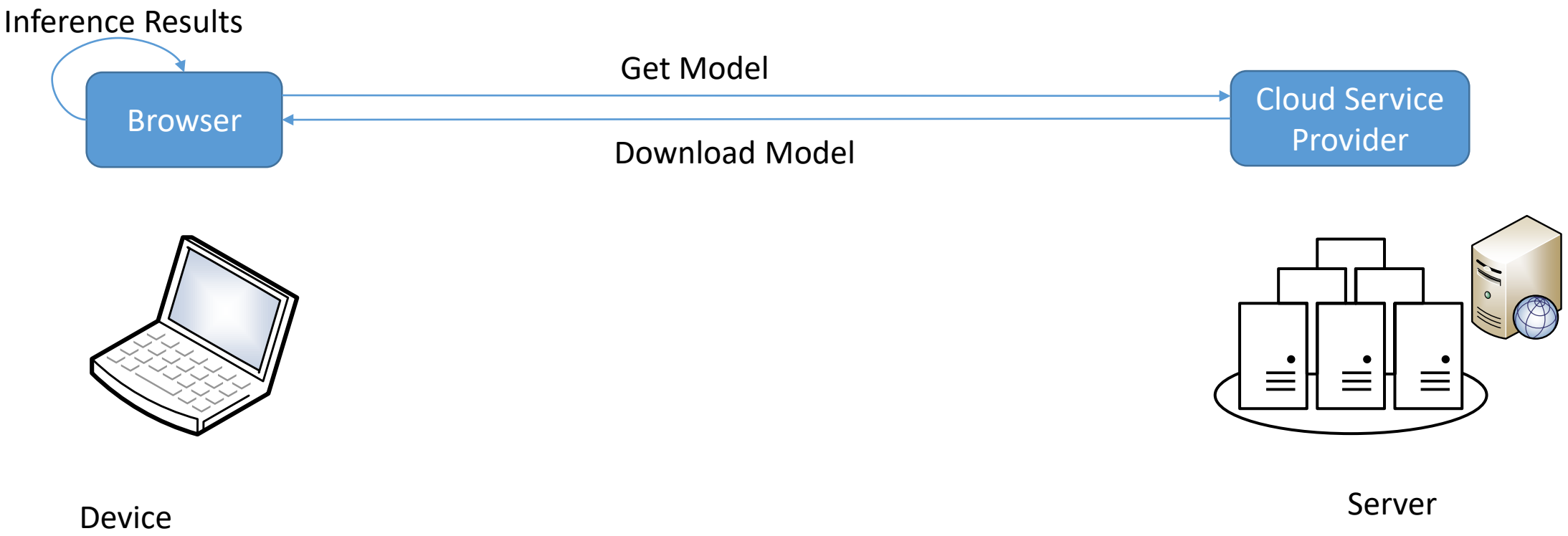
How to decide between Options…

- Option A



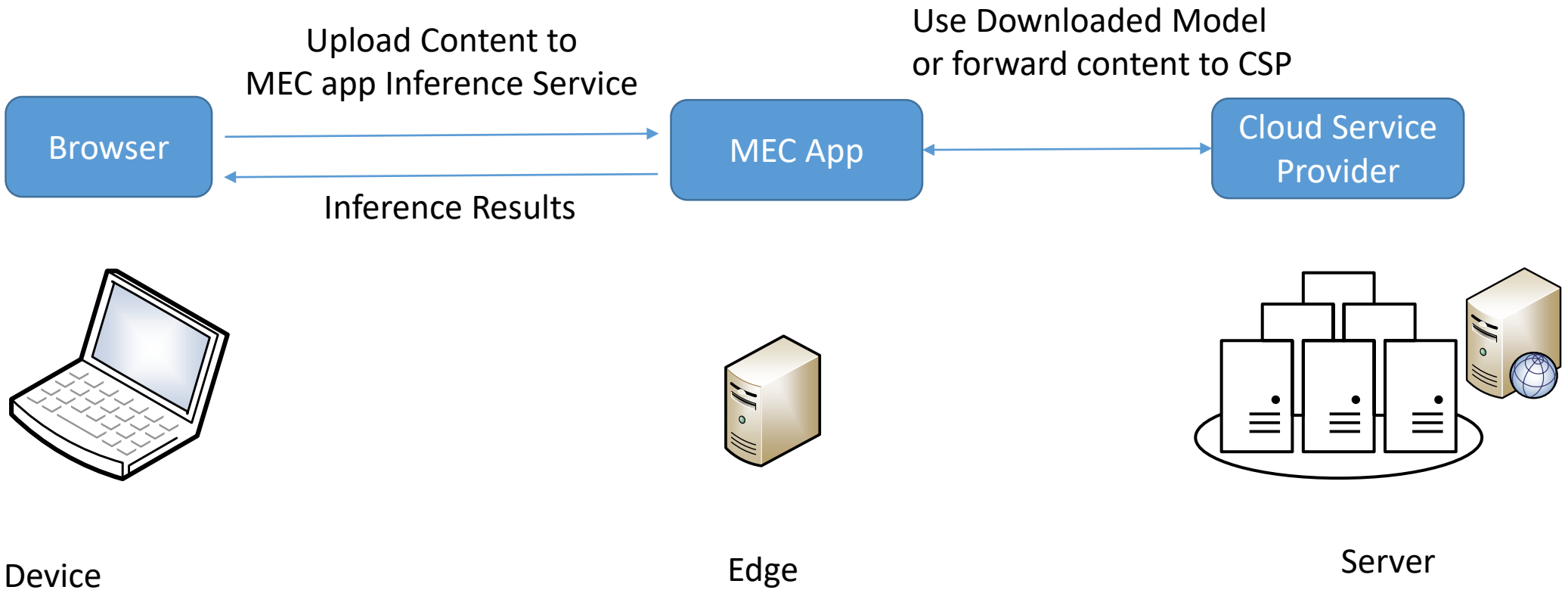
How to decide between Options…

- Option B



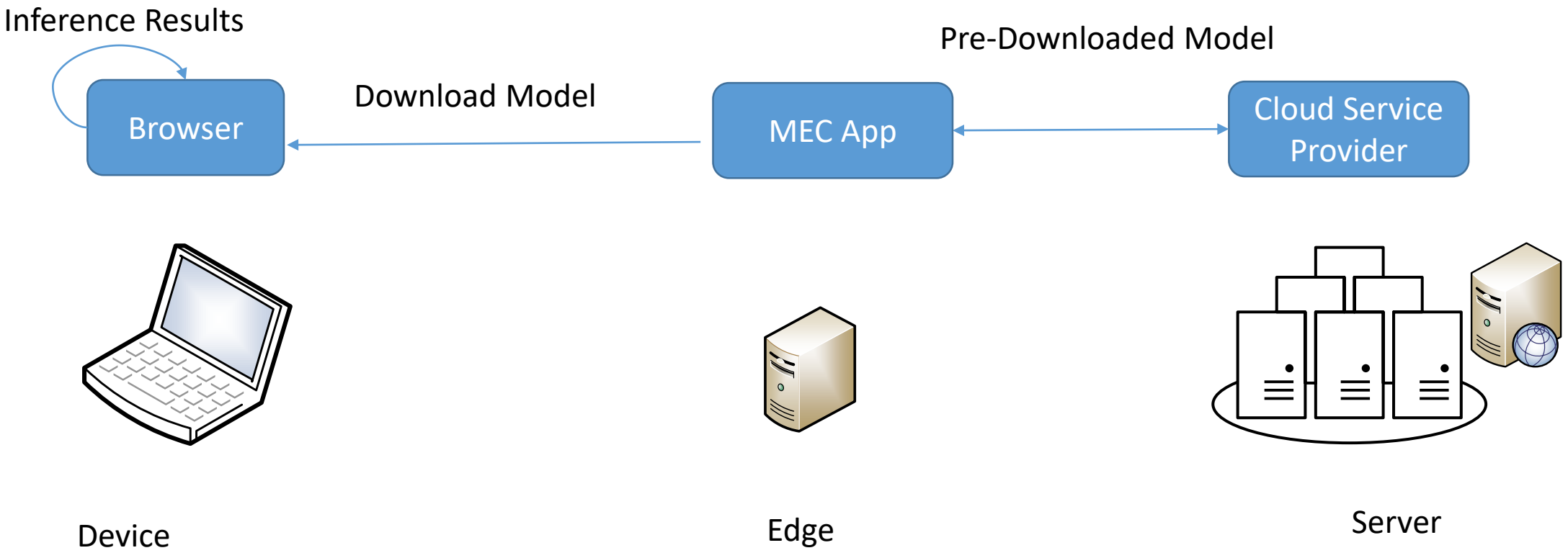
How to decide between Options…

- Option C



How to decide between Options…

- Option D



Use-Case #3

- Web Browser Tools
  - Use-Case Description

A Web Application developer develops an application whose quality of experience is dependent on factors such as network bandwidth/type, network latency, device power consumption, etc. The developer would like to profile the Web App under various external conditions. For example,

- Profile and test Apps under various Network conditions using different Network models
- Compare performance of Apps running on Edge/Device vs that on the Cloud

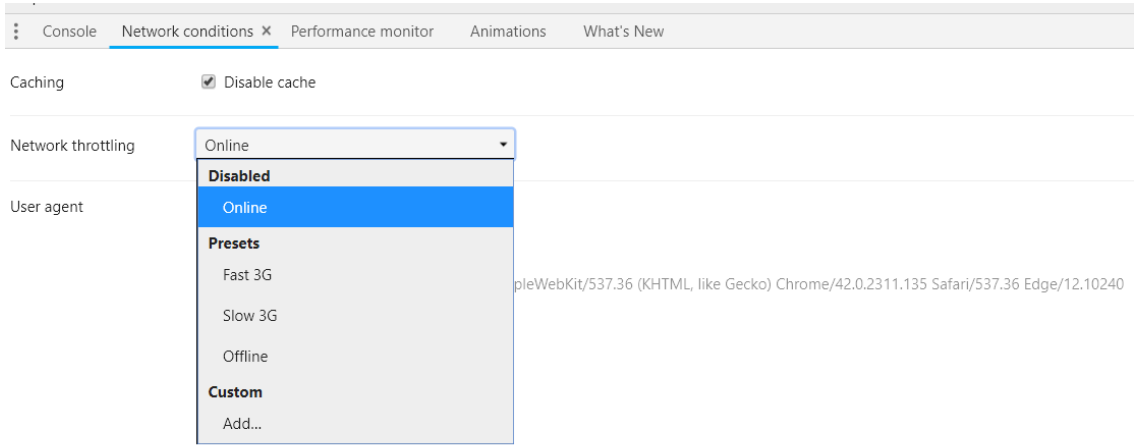
  - Example

See next page.

Use-Case #3

- Web Browser Tools
  - Example

Extend Developer Tools (similar to the one available in Google Chrome Browser) to include parameters like network congestion pattern profiles, simulate network type change during runtime, simulate sending of “hints” from network, etc.



Use-Case #4

- **UHD video - Remote Education Service**
  - Use-case Description

In rural area, where fiber-based fixed broadband infrastructure is limited, remote education service via web is important 5G application for China or other developing countries.

Thanks to ultra reliable low latency communications(uRLLC) and enhanced mobile broadband(eMBB) technologies， the synchronized video streaming across different locations brings real-time education use experience。 The shared whiteboard is a platform for interactive in real-time within milliseconds.

  - Requirements

The web is an ideal platform for resource-restricted computer environment in above scenario, and the video web application could be built on top of webRTC.

Use-Case #4

- **UHD video - Remote Education Service**
  - Example

Use-Case #5

- **UHD – Remote diagnosis**

  Scenarios such as tele-consultation, tele-medical training, tele-pathological analysis, surgical teaching and so on can all be realized by Web-based tele-medical system. The requirement of high-definition video is more stringent in medical treatment, because it needs to check the patient's medical record and the patient's test sheet. With the support of 5G low delay and wide bandwidth, telemedicine has become a new way of doctor-patient diagnosis and treatment.

  Because China and other developing countries have vast territory and poor infrastructure in marginal provinces, Web applications are the lowest-cost platform, and 5G wireless transmission over very long distances can greatly reduce the cost of fiber-optic fixed network deployment.

  - Requirements

  It needs the network to offer ultra reliable low latency and enhanced broadband, and to protect the privacy data of patient.

Use-Case #5

- Example (http://mudu.tv/?a=scenearticle&id=107)
- http://www.hnsycyxzx.com/page/telem-colla.html

Use-Case #6

- **UHD -** Massively multiplayer online role-playing (MMORPG)
  - Description

Real-time synchronization of game data to individual player, that's the key for MMORPG. The edge network computing can bring satisfaction for players with tens of thousands are online.

The magnitude and frequency of game data transmitted in the Web are larger and more frequent than those in general Web applications. 5G ultra-low latency can decrease the delay due to frequent request transmission from use experience perspective.

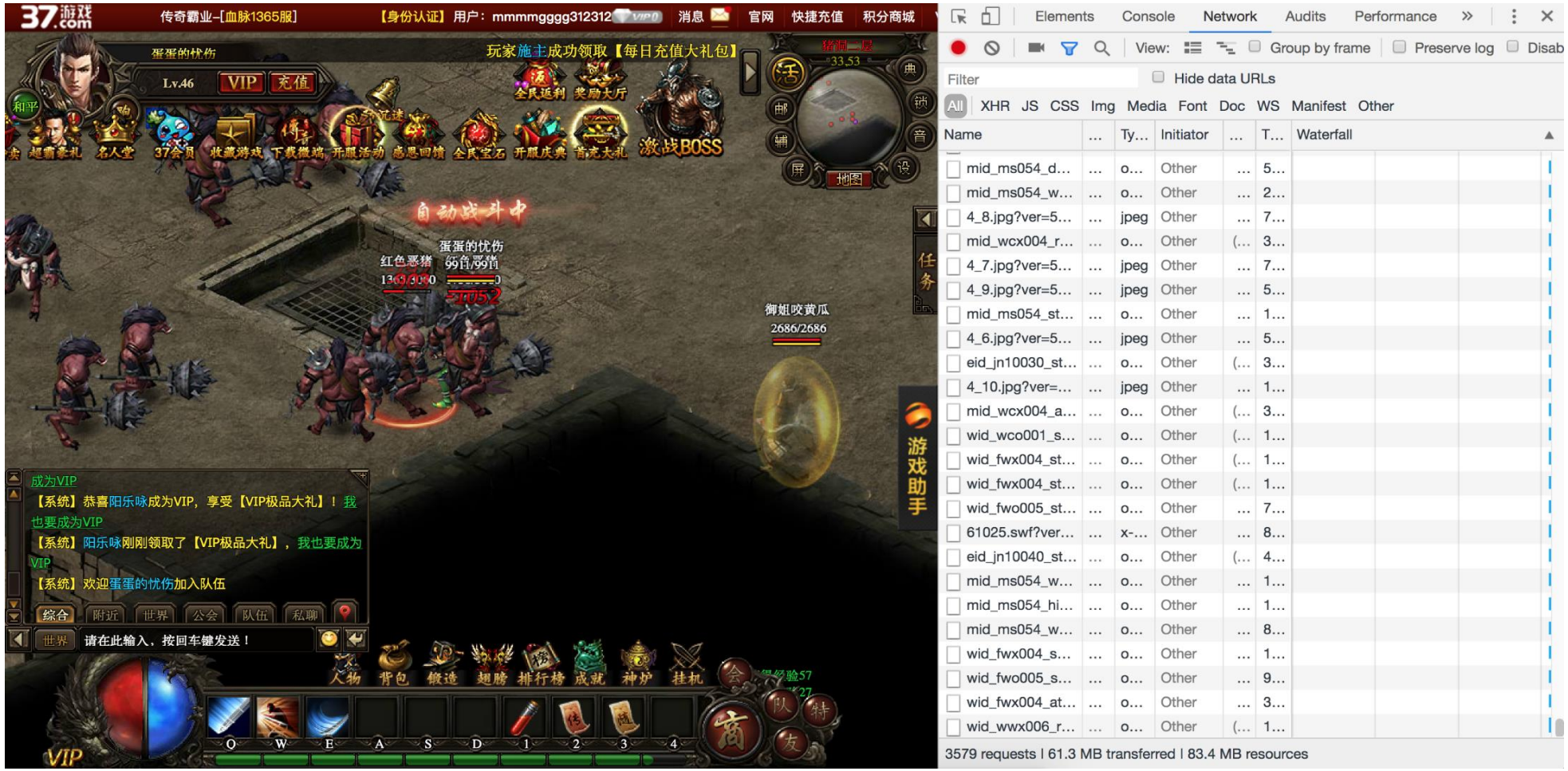
  - Requirements

It needs the network to offer ultra reliable low latency and enhanced broadband, and to protect the game subscribers privacy data.

Use-Case #6

- Example (“Chuanqi”, one of the hottest web game in China)

UHD –MMORPG , sports, racing games



Use-Case #7

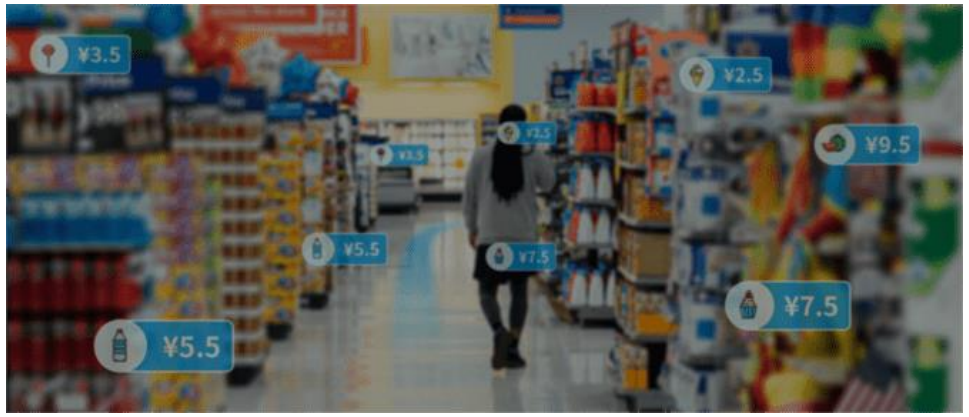
- **Augmented Reality advertising and promoting**

  AR may become a key component of marketing and consumer experience. Consumers can scan specific posters to display advertising information, scan specific logos to get red envelopes, and scan specific goods to get prices.

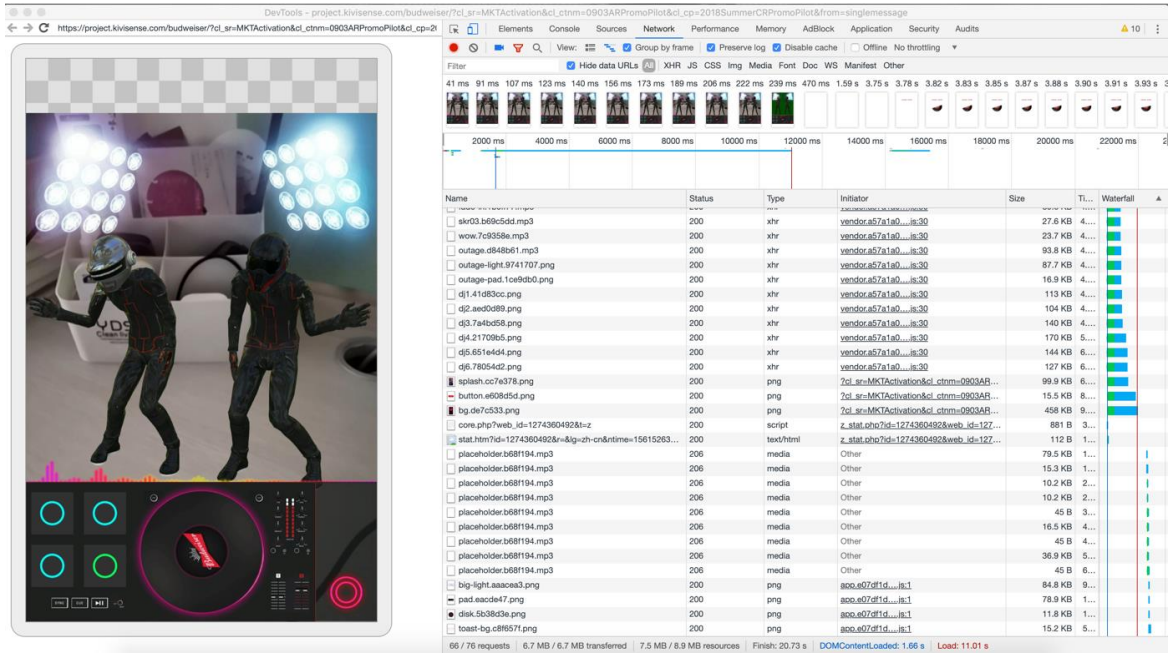
  The computing power of edge devices is limited. AR recognition needs the support of cloud-based AI algorithm. Cloud-to-end delay affects the experience.

  - Example

  scanning QR-code with extended AR commercial information



  - Requirements



Use-Case #8

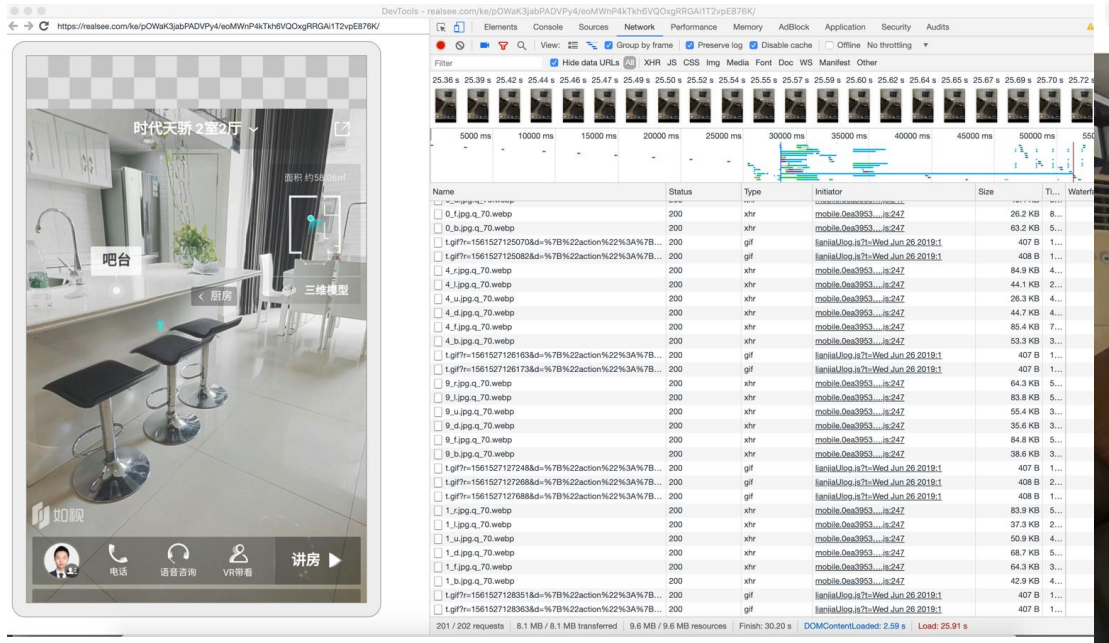
- **Virtual Reality -**

  In large or medium-sized cities, there are usually millions of renters who want to know about the apartment rental information monthly. The AR/VR platform can reduce the rush and bring multi-angle experience.

- **Example**

https://realsee.com/

https://sh.ke.com/ershoufang/18120717410100309898.html?fb_expo_id=196285496109473794



- **Requirements**

  To alleviate vertigo issue of VR use experience and provide a smooth VR room-watching experience