Media and Entertainment IG Call

Introduction to Web and Networks IG

May 7, 2019

Outline

- Problem Statements

- Potential Approach to Solutions

- Sample Use Case

- Overview of Charter: Mission and Scope

- How Web and Networks IG work with other groups

- Ecosystem Enrollment

- Call to Action

Problem Statements

- Web Browsers and Web Apps <u>function more-or-less agnostic</u> of network type:
  - Limited hooks in browser available for Web Application Developers to get information about the network quality/performance, choices, etc. during run-time

- Network Service Providers <u>have limited information</u> to anticipate utilization and allocation of network resources required by the Web Apps.

- Web Application developers <u>need better tools</u> to:
  - Test their Apps under various Network conditions
  - Compare performance of Apps running on Edge/Device vs that on the Cloud

Ecosystem Stakeholder Engagement is Key

The Waiting Experience, Power Constraints, …

Depends on Various Factors such as

- Size of Upload/Download Data

- Type of Network Exchange e.g. latency vs bandwidth trade-off

- Time for data processing on Edge device vs that on Cloud

- Device capabilities and state

- Quality of Application design incorporating context parameters like compute power, power consumption rate, network conditions, etc.

Potential Approach to Solutions

- Provide <u>explicit</u> hints in both directions between web browsers and the Networks
    - Explicit hints protect privacy
    - Hints could be "early" hints or "instantaneous" hints

- Investigate new approach and other ideas with App Developers, Web Browser Vendors, Network Service Providers, Clouds Service Providers (CSPs), CDNs and Network Equipment Vendors.

Web And Networks Interest Group

Enhancing User Quality of Experience
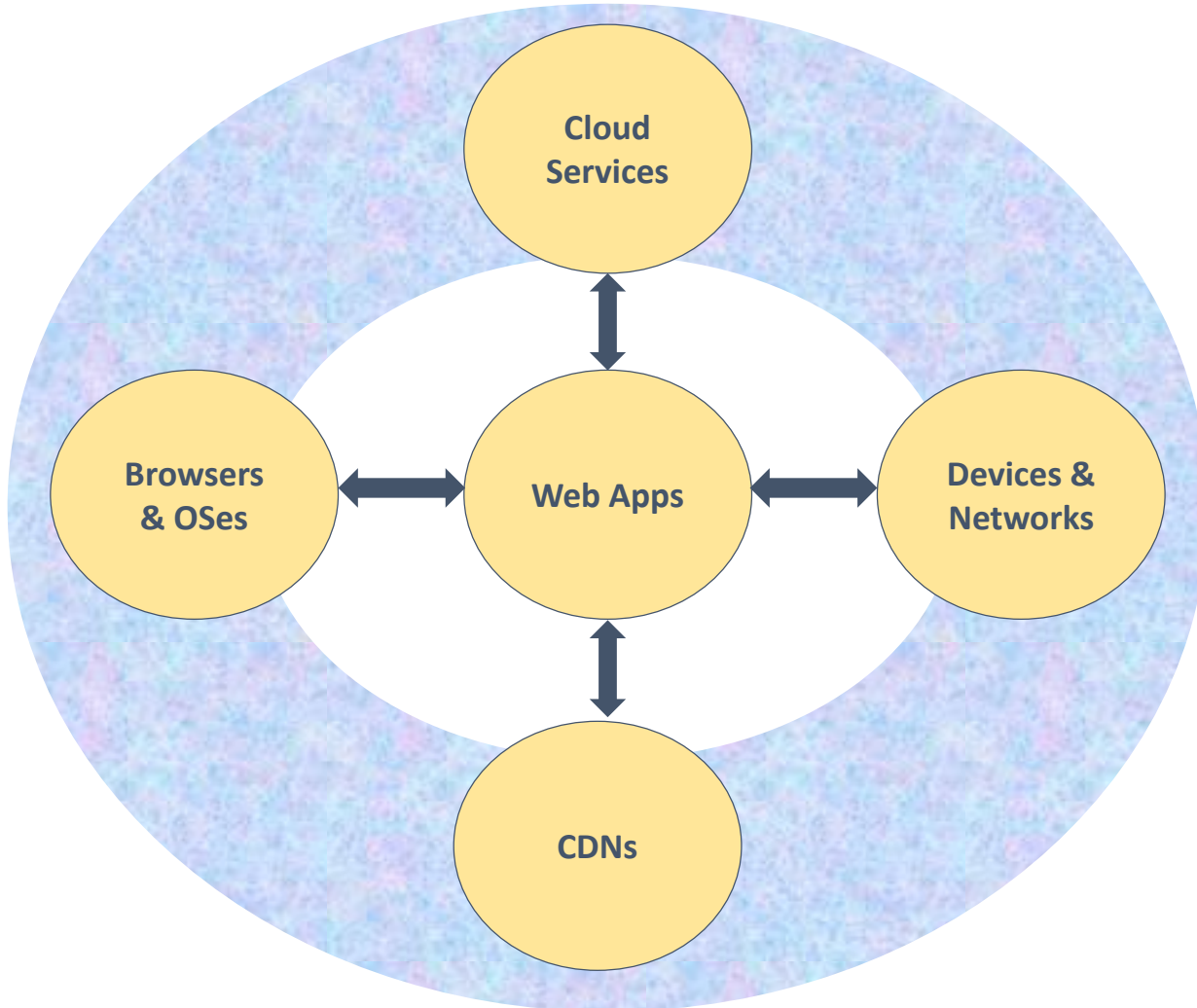
Context Awareness:

Application Context
- Video, Web Browsing etc.
- QoE Metrics

Network Context
- Congestion, Backhaul and Air-Interface type/quality, latency, throughputs, etc.

Device Context
- Battery State, Processing power etc.

User Context
- User preferences etc

Environmental Level Context
- Edge Computing; Relay Services etc.

Cloud Services

Browsers & OSes

Web Apps

Devices & Networks

CDNs

Sample Use Case:

Machine Learning on Cloud vs Edge/Device for Web Apps

- 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

- Trade-off between inference quality 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)

Example

- ML App via Chrome Web Browser using Cloud ML Inference
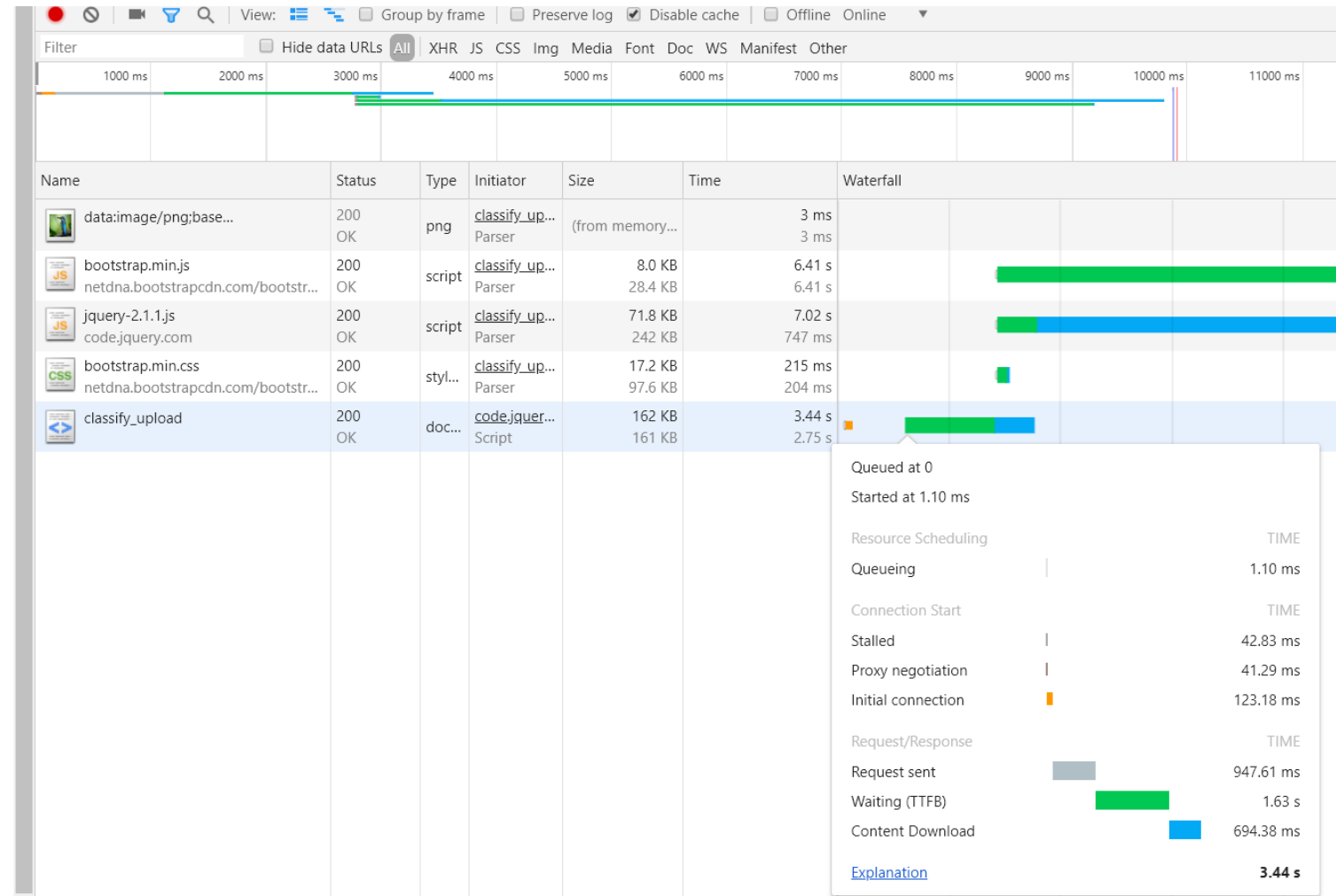
Example

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

Mission & Scope of Interest Group

- Mission: Explore solutions for web apps to leverage network capabilities:
  - **Achieve better performance and resource allocation, both on the device and network**.

- Scope:
  - **Hints between the apps and the network e.g.**
    - Multipath, multi-connectivity handling eg. WiFi vs. 5G or LTE and MP-TCP vs MP-QUIC.
    - Latency vs bandwidth trade-offs, for high bandwidth 4K video stream or low latency video call, etc.
    - Device power and performance balancing
  - **Exposure of specialized services & apps e.g.**
    - Architectures/Services: DiffServ, IntServ, 5G Slices and Edge Computing
    - Apps: AR/VR Streaming, load balancing bet. edge and the cloud for ML inference.
  - **Exposure of aggregated web metrics e.g.**
    - For network monitoring and troubleshooting purpose

Coordination with W3C Groups

Coordination with External Organizations
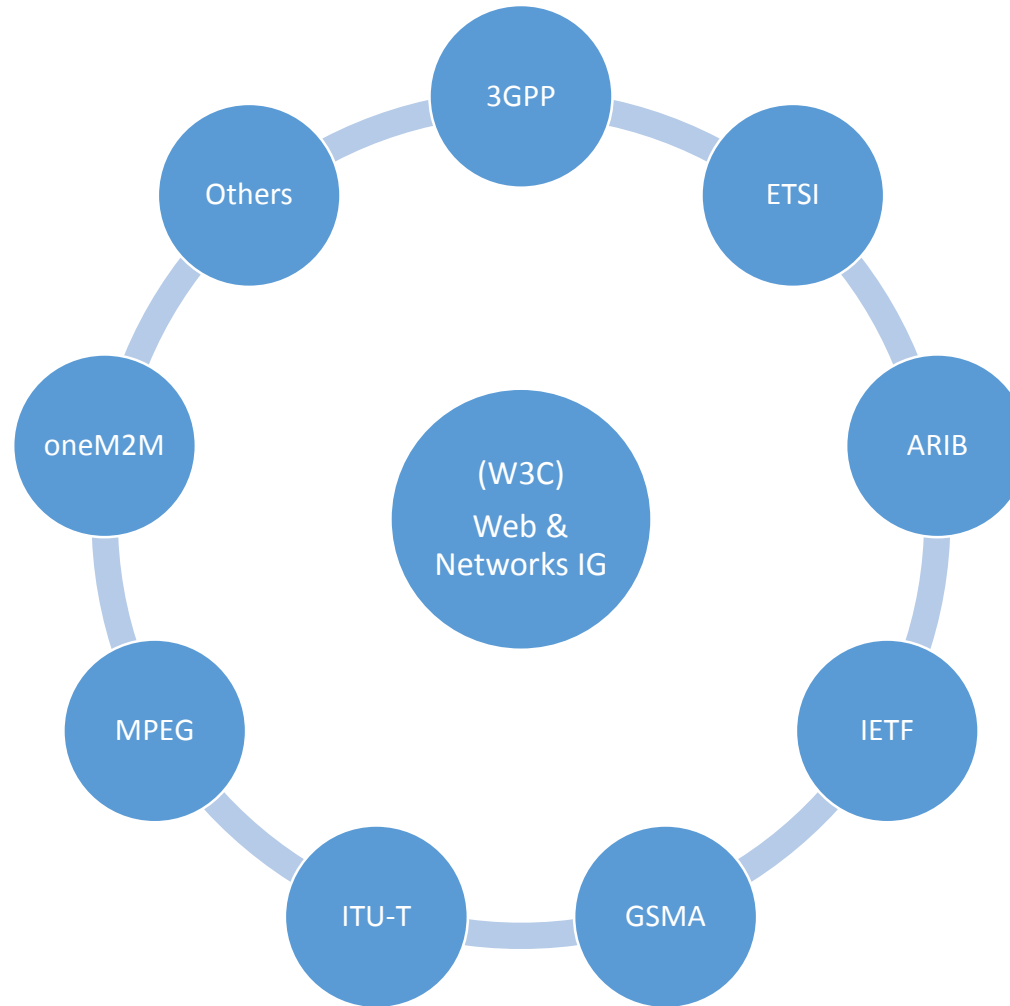
Participants Outreach Continues....

Stakeholder Categories								
App Developers	Network Service Providers	Content Distribution Networks	Cloud Service Providers	OS/Browser Vendors	Network Equipment Vendors	Broadcast Networks	Content Providers	Semiconductors

Call to Action

- Join and participate when Web and Networks IG is formed:

  https://www.w3.org/2019/03/web-networks-charter-draft.html

- Co-Chairs:
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