W3C Web & Networks Interest Group

TPAC 2023 IG Meeting

Sep 11th 2023

Chairs:

Dan Druta (AT&T)
Song Xu (China Mobile)
Sudeep Divakaran (Intel)

Staff Contact:
Dominique Hazael-Massieux dom@w3.org

Welcome!

- Welcome to the TPAC 2023 W3C Web & Networks IG Meeting

- W3C meetings operate under the Principles and Procedures of our Positive Work Environment at W3C: Code of Ethics and Professional Conduct

- Patent Disclosures

Please see the W3C Patent Policy

- IRC Channel https://irc.w3.org/?channels=#web-networks

Channel: #web-networks

W3C WORLD WIDE WEB consortium

Agenda

- Introductions : 15min
- Web & Networks Overview : 15min
- Use Cases & Requirements : 45min
- Open Discussion : 45min

Web & Networks Interest Group Overview

The mission of the Web & Networks Interest Group is to explore solutions for web applications to leverage network capabilities in order to achieve better performance and resources allocation, both on the device and network.

Key Topics in scope (from the charter):

- **Application hints to the network** (e.g. ways for applications to declare their operational wishes to the network).
- **Network hints to device applications** to enable moving of compute functions across the network between client, edge or cloud depending on user-experience and compute requirements, and optimal resource utilization.
- **Exposure of specialized services** such as DiffServ, 5G Slices, WebTransport and Edge Computing, including load balancing computing between client devices, edge and cloud, particularly in latency-sensitive applications like Machine Learning inference and Cloud Gaming.
- **Evaluation of aggregated web metrics** for enhanced troubleshooting and network performance optimization to improve web application experience.

Web & Networks Interest Group Charter (w3.org)

End Date: 31 October 2023

W3C WORLD WIDE WEB consortium

Focus areas

The group is currently focused on:

- **Edge Computing** with the objective of understanding the impact of edge computing for Web applications and build a roadmap to enable its adoption
- **Network Quality Monitoring and Prediction** with the goal of improving how Web apps can monitor and prepare for changes in network conditions
- **Network Emulation Browser Tools and Trace Formats**

Tasks

- Identify **opportunities** for network and application collaborations
- **Liaise and coordinate** with relevant networking standards organizations
- Collaborate with W3C Working and Interest Groups
- Share the latest developments in **networking standardization bodies**.
- Propose **incubation of new work**
- Represent **knowledge** about networking technologies
- Provide guidelines to **browser developers**
- Provide guidelines to web **application developers**

Deliverables

- The primary deliverables of the Web & Networks Interest Group are IG Notes that identify
  1. List of **new use-cases and innovations** in networking domain that can benefit Web applications
  2. **Requirements** for existing and/or new technical specifications
  3. **Gap-analysis** between use-case requirements and current Web Platform standards
- **Maintain a public list** of the network-related features on the Web that it is tracking and investigating.

Wiki: [Web & Networks Interest Group (w3.org)]

Edge Computing or Web

The following themes have been identified to guide our initial exploration:

- understanding in what context and for what use cases **edge computing** might be used in Web applications
- sketching what approach to **offloading computing tasks** from the browser to an edge node might require architecturally
- understanding if the **"split-browser"** model built for cloud-based rendering of Web pages needs more attention in an edge-enabled world

We had people present ideas on compute offload to the edge using:

- WebWorker
- WebAssembly
- ServiceWorker

Collecting use cases and requirements on the wiki

Edge Computing on Web

Presentations:

- Video Cloud Service : CMCC
- MEC in action: An overview of Edge Computing activities : Intel
- Accelerating DNNs for the Web with Edge Computing : BUPT
- EDGE Applications: Supporting an Ambient Computing Ecosystem: Intel
- Distributed Web Browser : Samsung
- Seamless offloading of Web App via Web Worker Migration : Seoul University
- P2P eCDN Overview: Peer5
- Client-Edge-Cloud Coordination: Alibaba

Github Explainers

- Client-Edge-Cloud coordination Use Cases and Requirements (w3c.github.io): Alibaba

Network Quality Monitoring and Prediction

- The **primary goal** of the workstream is to **study use-cases** that can benefit by using network quality information, either instantaneous or predicted values, to adapt to varying network conditions.
- The **secondary goal** is to **identify requirements**, both from application or network perspective, such that the right network quality parameters are monitored and used to improve the quality of experience of the use-case.
- The workstream also discusses **similar existing APIs** introduced for this purpose in web browsers in the past

Detailed findings are maintained on the wiki and the group keeps issues in github

W3C WORLD WIDE WEB consortium

Network Quality Monitoring and Prediction

Presentations:

- Link Performance Prediction: Intel
- Lessons from Network Information API WICG: Google
- Predictive QoS for Edge Computing : Insights from 5GAA: Intel
- Multicast Receiver : Akamai

Github Explainers

- Network Information API (wicg.github.io)
  - by WICG
- intel/Ipp-network-trace (github.com)

- Multicast Community Group Charter (w3c.github.io)
  - by Akamai & Multicast Receiver CG
  - w3c/multicast-cg: Docs for initial W3C Multicast Community Group proposal (github.com)

W3C WORLD WIDE WEB consortium

Network Emulation Browser Tools and Trace Formats

The use cases discussed:

- Developers run **automatic-test** on their site loading under different network conditions and find invisible **performance** bottlenecks.
- **PWA Application** testing, real-time and latency-sensitive apps testing for **WebRTC**, Cloud Gaming and **WebTransport** scenarios.
- **Trace format** requirements, to design programmatic traces, including modifications to existing traces.
- Important parameters for Web developers, **Bandwidth, latency, packet loss / re-ordering**

Network Emulation Browser Tools and Trace Formats

Presentations:

- Network Trace Emulation and Test Toolkit for Browser Developer Tools: Intel
- Existing Network Emulation Tools and Trace formats study: WNIG Workstream/CMCC

Github Explainers

https://github.com/w3c/network-emulation

intel/lpp-network-trace (github.com)

Progress So Far

- WNIG had three workstreams
  - Edge Computing workstream
  - Network Monitoring and Prediction workstream
  - Network Emulation Browser Tools and Trace Formats workstream
- Outcomes
  - Held over **25+ meetings**, including **4 TPAC meetings**, on a broad range of topics around Web & Networking.
    - A **public list** maintained covering all network-related features on the Web that are being tracked and investigated. Ref: https://www.w3.org/wiki/Networks#Meetings
  - Invited **8 guest speakers** from other groups in W3C and external speakers to share insights from areas like Edge Computing, Telecom standards, etc.
- Primary Deliverables
  - **Published Technical Note**: Client-Edge-Cloud coordination Use Cases and Requirements. Editors from Alibaba, Intel and China Mobile. Contributors include ByteDance.
    - Ref: https://w3c.github.io/edge-computing-web-exploration/
  - **Wiki**: Web & Networks Interest Group (w3.org)
- TPAC Demos: **5 demos** show-cased at previous TPAC F2F and Virtual Meetings
  - Including reference implementations showcasing some of the novel use-cases.

Key Takeaways from past two years

- **Edge Computing** is **a topic of strong interest** in the Web Community.
  - Edge Offload, Client-Edge-Cloud Coordination and leveraging WASM on the Edge nodes for new use-cases have emerged as key topics.
- **Network Monitoring and Prediction** and **usage of hints** was seen **as a key topic to continue focus**.
  - Looking ahead: Usage of Network metrics and User Perceptions to tune network for optimal resource utilization and energy efficiency, in addition to QoE.
- **Network Emulation Browser Tools and standardization of Trace Formats**
  - This topic **got deprioritized** due to limited interest
- Published Technical Note on Client-Edge-Cloud coordination Use Cases and Requirements to the broader community
  - https://w3c.github.io/edge-computing-web-exploration/

Call For Action

- Inviting members to share feedback and suggestions to take the work done in WNIG forward.

- For example, highlight/discuss
  - New Use-cases
  - Recommendations (e.g. bring in information about latest developments in 5G/6G, WiFi7 and wired domains from external standard bodies and eco-systems like 3GPP, ETSI, IEEE, IEFT, O-RAN, etc. into W3C)
  - Workshops/Explainers on specific topics linked to Networking domain

- Review Recharter Proposal
  - Draft WNIG recharter proposal draft available at: https://w3c.github.io/web-networks-charter/

  - Link with track changes enabled: https://services.w3.org/htmldiff?doc1=https%3A%2F%2Fwww.w3.org%2F2021%2F04%2Fweb-networks-charter.html&doc2=https%3A%2F%2Fw3c.github.io%2Fweb-networks-charter%2F

- How to share your inputs:

  1. Create “Issues” in git here https://github.com/w3c/web-networks-charter and discussing there.
  2. Send email to WNIG Members public mailing list : 'member-networks-ig@w3.org’
     - https://lists.w3.org/Archives/Member/member-networks-ig/

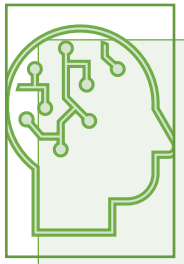
     Or public mailing list “public-networks-ig@w3.org”
     - https://lists.w3.org/Archives/Public/public-networks-ig/

  3. Share inputs in WNIG Meeting Call

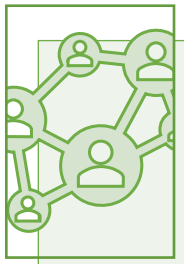
Discussion: Future Topics

2021-23

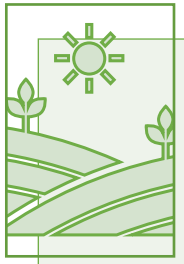
- Edge Computing workstream
- Network Monitoring and Prediction workstream
- Network Emulation Browser Tools and Trace Formats



Quality of Experience



Optimal Resource Sharing



Energy Efficiency

For Future Consideration

- Edge Computing workstream
- Network Utilization Prediction and Analysis
- Telecom Networking standards introduction into W3C Community
- Application User Perception Metrics
- Network Utility Maximization, Resource-efficiency, Cost & Power efficiently

Thank you