



W3C Web & Networks Interest Group

TPAC 2021 IG Meeting

October 28th

Chairs:

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

Staff Contact:

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Welcome!

- Welcome to the TPAC 2021 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

Agenda

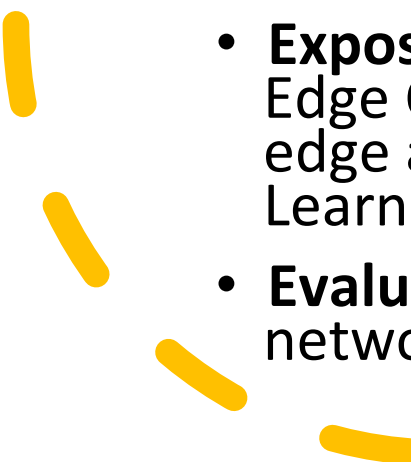
- Web & Networks IG Charter Overview: 10min
- Progress Update & Status : 15min
- Open Discussion : 30min



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):

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- **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 \(w3.org\)](https://www.w3.org/2022/05/web-networks-interest-group-charter/)

End Date: 30 April 2023



Focus areas

The group is currently focused on:

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



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.

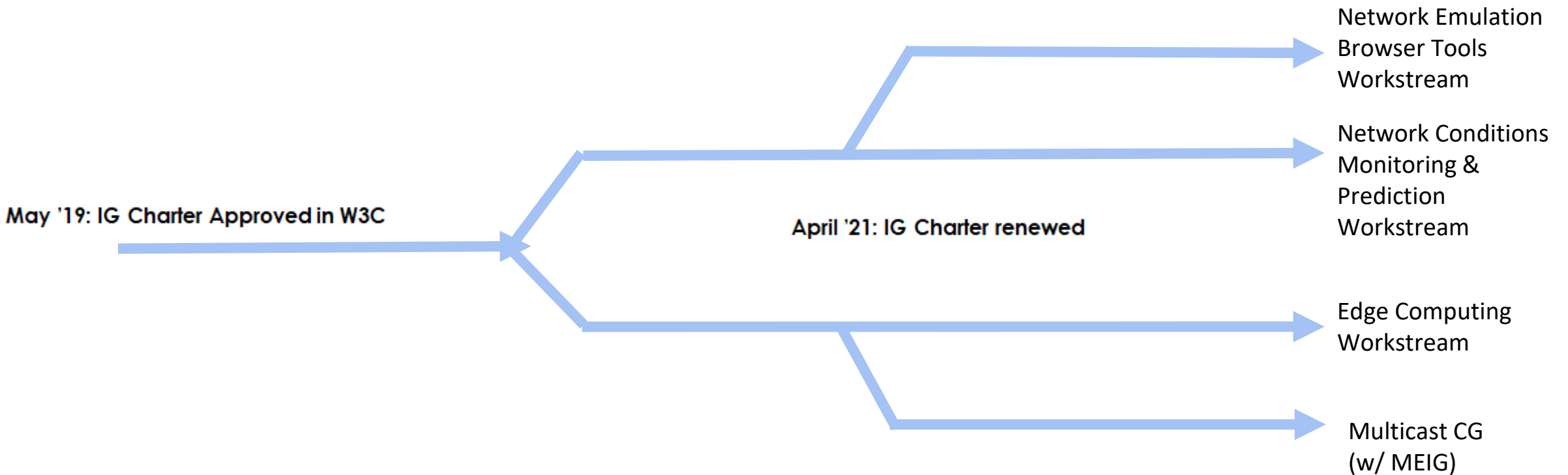
Wiki: [Web & Networks Interest Group \(w3.org\)](https://www.w3.org/2018/05/web-networks-interest-group/)



Timeline

- **Document list of use-cases** that can benefit from Network Information and corresponding requirements. Deliver a first draft in Q1 2022.
- **Evaluate Network Browser Developer Tools extensions** for web application testing. Depending on interest seen and proposals gathered, document a first draft by Q1 2022.
- **Identify and define requirements for the discovery and capability description** of network nodes used to offload web-based workloads to the edge. Findings, analysis and requirements document with Q2 2022 delivery.
- **Organize a W3C Workshop** in H2 2022 to consolidate new use-cases, requirements and respective cost-benefit analysis, and document outcome in a Whitepaper.

Progress Jun '19 to Oct '21





Edge Computing for the 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 for the 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](#)




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/lpp-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 \(github.com\)](#)



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 \(github.com\)](https://github.com/intel/lpp-network-trace)
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TPAC 2021 Breakout Session

▶ Edge Computing for the Web

 minutes

 video

 video

Dapeng(Max) Liu, Song XU, Dan Druta, Sudeep Divakaran, Michael McCool

“ Identify opportunities for web APIs needed for Edge computing use-cases, capitalize on latest networking capabilities and look at challenges around security and privacy.

Link: [TPAC 2021: Archive of breakout sessions \(w3.org\)](https://www.w3.org/2021/tpac/breakout/)

TPAC 2021 Demo

From Multicast Receiver CG

Multicast Video streaming use-case demo

[TPAC 2021: Multicast for the Web - Demo & Group Updates \(w3.org\)](https://www.w3.org/2021/09/24-tpac-multicast-for-the-web-demo-and-group-updates/)

The carbon footprint of our gadgets, the internet and the systems supporting them account for about **3.7%** of global greenhouse emissions

these emissions are **predicted to double** by 2025.

Watching online videos accounts for the **biggest chunk** of the world's internet traffic – 60% – and generates **300m tonnes** of carbon dioxide a year, which is roughly 1% of global emissions

“Why your internet habits are not as clean as you think”

Sarah Griffiths, BBC, 2020-03-05

<https://www.bbc.com/future/article/20200305-why-your-internet-habits-are-not-as-clean-as-you-think>

The screenshot shows a VLC media player window titled "Jake Holland". The main video area displays a scene from a game or animation featuring a cow in a field. The left sidebar lists several video segments with timestamps. The bottom panel provides technical information:

Player	
Program	to
URL	https://holland-ovce.mls.akamai.net/hls/live/2002/303/holland-ov/000000.m3u8
Event	InitialBufferAppended

Memory	
Total allocated WebAssembly memory	17 MB
WebAssembly memory reallocations	0

CPU	
Frequency	3.60 GHz (3.60 GHz)
Usage	12%
Run time total	2.6 ms
Run time average	1.7 ms
Run time standard deviation	0.7 ms

Past TPAC Demos: 2019-20



Link Performance
Prediction in Web
applications

Demo example

- Take game advertising as an example, realize interactive advertising



MIGU 咪咕

Trace based
Network
Emulation toolkit
for Browsers

Future Collaboration

Multicast Networking

- Multicast CG
- 5G MAG
- IETF
- ETSI EBU DVB

Network Latency

- NetInfo CG / DAS WG
- Web Transport WG
- Gaming CG
- WebRTC

Edge Computing

- WoT WG/IG

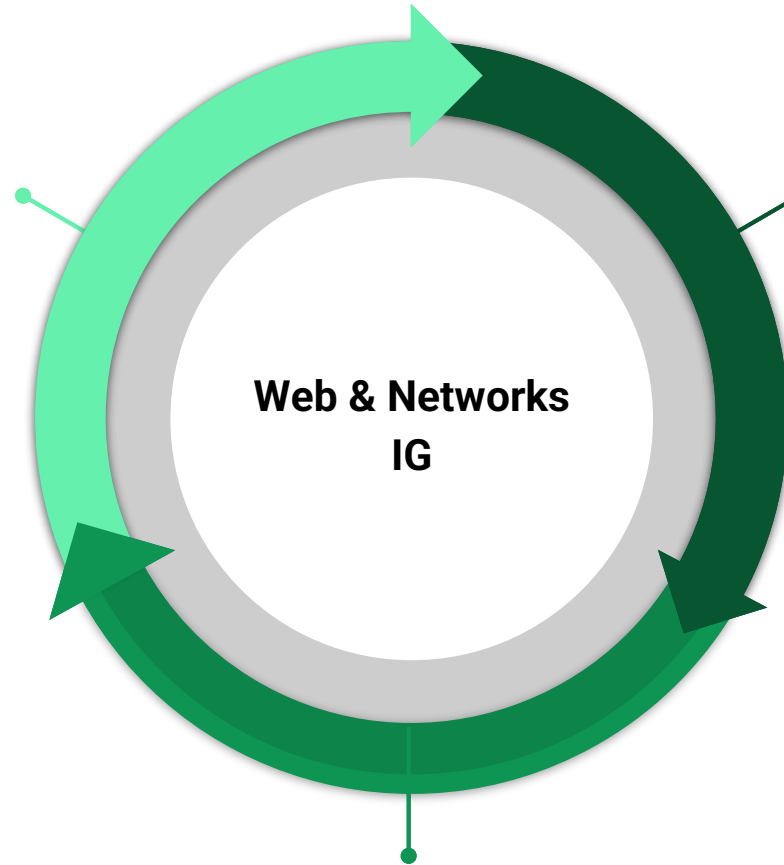
Transport

- IETF TAPS

Discussion

Network Emulation Browser Tools

- Trace Format and parameters
- Network Emulation in Browser
- Trace Repository
- Other standard formats



Edge Computing

- MEC API
- Use-cases and Requirements
- Edge Offload using Edge Workers
- Peer-to-Peer eCDN

Network Conditions Monitoring and Prediction

- NetInfo API
- Link Performance Prediction

*Any new Topics of
interest to add in
existing work-
streams or other?*

Thank you