Web & Networks IG

4th Conference Call Meeting
25-Nov-2019
Agenda

• TPAC Meeting Summary [Song]
• Introduction to 2 Workstreams [Dan & Sudeep]
• Video Cloud Service [Song]
• Peer-To-Peer CDN Overview [Qingqian]
TPAC Events 2019

• TPAC Web and Networks IG Group Meeting
  • 17th September 2019 – Full Day

• Demo
  • 18th September 2019

• Breakout session: Edge Computing
  • 18th September 2019
TPAC Summary

- The meeting was focused on 3 main objectives
  - Share the **charter**, **scope** and **task** of the IG to the members
  - Provide a set of **guiding principles** for network or application “hints”.
  - Discuss **use-cases and requirements**, using examples from IG member to illustrate the benefits of hints.

- Over **35+ members** attended the meeting

- The following was presented by members
  - **Backgrounder on existing W3C networks intersections** and Why Web Apps should leverage insights from Networks
  - **Guiding Principles for Web & Networks Solutions**
  - **Overview of adjacent work in W3C and other standardization bodies**
  - **Network Link Performance Prediction** solution from Intel and related Web API considerations.
TPAC Summary

• **Key Take-aways** from meeting are:
  • **Use-cases and requirements** analysis
  • New solutions like **Link Performance Prediction** (introduced by Intel) are of interest in IG
    • Take a deeper look into privacy and security aspects when it comes defining new API.
  • **Extend Developer tools** to enable web application developers to test their apps in various time variant network conditions.
    • Browser vendors expressed interest
  • Review **existing work** done (e.g. Network Information API, Background Fetch API, usage of 5G network slicing by Browser).
TPAC Summary : Unconference

• **Edge Computing**
  • Introduced the concept of **Edge Computing** and the benefits of it for Web Apps.
    • Use-cases like browser application offloading to edge (similar to Cloud Browser) and peer-to-peer CDN network.
  • In the solution space, topics brought up for consideration within IG are
    • Usage of Service Worker in the realm of Edge Computing
    • Scope of new Edge discovery APIs
TPAC Summary : Demo

• The benefits of Link Performance Prediction for mobile gaming
• Network Link Prediction
Edge Computing Workstream
Conclusions and Next steps

• Edge Computing is a broad subject – it means different things to different players:
  • On premise edge (gateway devices, etc.)
  • Near edge (close to radio base stations for wireless)
  • Far edge (distributed data centers)
• Consequentially, constraints are different (physical space, power consumption, access and security control)
• Standardization is slowly being addressed mostly on the infrastructure and Edge Cloud layers
• Web platform use cases have not been explored/identified
Exploration tracks

1. Edge Use cases – Not to rehash the existing use cases but to put them in the perspective of the Web platform execution environment:
   - AI/ML
   - Games
   - AR/VR

*Particularly expanding on the cloud offload ideas (GPU)*

Questions to address:
- How to make this offload transparent
- Is there a need for the client side application to know where the offload is taking place?
- Are the edge node’s restrictions/limitations a factor in the selection for the offload?
Exploration Tracks

2. Split User Agent concept
   
   Explore previous split browser designs
   Packaged web apps/widgets
   Progressive Web Apps

   Challenges to address:
   - Are State-full transitions from client user agent to edge user agent required?
   - Is discovery a prerequisite?
   - Can multiple client side user agents share an edge instance
Next Steps

1. Engage key stakeholders to bring their ideas:
   • W3C:
     • Web of Things
     • Immersive Web
     • WebRTC
   • Industry experts and Edge Compute implementers:
     • Cloud providers
     • Operators
     • Game developers

2. Drive towards a proposed design
   Tackling the two tracks should give the group some ideas about:
   • API requirements
   • Security implications
   • Privacy considerations
Network Quality Monitoring and Prediction Workstream
Network Quality Monitoring and Prediction

• **Goal**: Improve how Web apps can monitor and prepare for changes in network conditions
Network Quality Monitoring and Prediction

• Use-Case and Requirements Analysis Phase
  • Prepare Use-case list & start Requirements gathering
  • Evaluate existing API and evaluate possible extensions
    • e.g. Network Information API, Background Fetch/Sync API

• API Parameters Benefit Analysis Phase
  • Study API and parameter considerations and cost-benefit analysis
    • Optimization goals
    • Information types
    • Application focus (is it per client or per application?)
    • Accuracy and benefits
      • Security implications
      • Privacy considerations

• Architecture Analysis
  • System Architecture: New interfaces and entities involved, deployment aspects
Network Quality Monitoring and Prediction

• Liaisons Interaction Phase
  • Focus areas:
    • Share findings with other W3C groups like Privacy IG, WebRTC WG, WebTransport CG etc.
    • Expert inputs from other Standards groups, exchange ideas

• Documentation Phase
  • Consolidate information gathered and capture in a whitepaper

• Prototyping Phase
Video Cloud Service
Use Case

- Some enterprises want to deploy video business with low cost and high efficiency, such as live video.

- But two problems in the self built video system:
  - Expensive infrastructure resources: data center, CDN, server, bandwidth, etc.
  - Complex audio and video technology: codec, transcoding, transmission, processing, multi terminal adaptation.
    - Start-ups only have web developers, and don't have IT resources.

- Some enterprises have infrastructure, but not full load in practical, server resources are idle.
Video Cloud Service

• A video streaming service based on cloud computing technology
  • Include capture, codec, storage, manage, transcoding, delivery, playback etc.
  • Let users build professional video system in a low-cost and efficient way, and easily carry out video business

• Video cloud service provides the API and SDK for developers
Video Cloud use P2P CDN acceleration

• Baidu PCDN:
  • Four layer architecture, Layer 4 -> Layer 3 -> Layer 2 P2P network, and then traditional CDN. Clients use SDK.

• Alibaba PCDN: VoD, live video, large file download
  • Clients use PCDN SDK and interact with PCDN dispatch control center to obtain resources from P2P nodes nearby or CDN nodes
  • Push hot content from CDN to P2P nodes on a regular basis.

• Tencent X-P2P:
  • Based on P2P, edge computing storage capacity and idle bandwidth
  • User use X-P2P SDK to access Live, VoD etc.

• iQIYI:
  • Clients can request video content from multiple seeds in CDN and P2P networks.
  • By predicting the scarce video in the future and actively pushing it to the seed node with strong upload ability
Web Development Aspect

• Capture and Codec API
  • MediaStream API, WebCodec

• Decode and Playback API
  • WebCodec, <video>

• Video Cloud Service API: Developers face multi vendor specific APIs and adaptations
  • Streaming API: streaming protocol (RTMP, etc.), streaming mode (Web / SDK, etc.), camera, etc
  • Control API: recording, storage (Edge / Center), transcoding, screenshot, watermark, playback, time shift, etc
  • Playback API: streaming protocol (DASH, HLS, etc.)
  • Analysis API: statistics, retrieval
  • Security API: authentication, authority
  • ...
Thinking and Discussion

• How web developers use video cloud more easily
• For security monitoring, video cloud faces a large number of monitoring points with lightweight camera
  • How to access video cloud efficiently and cost effectively
  • How WoT devices to interact with video cloud service
    • WoT's API requirements for video cloud
• From the perspective of operators, CDN will sink to the base station, such as China Mobile.
  • How can developer use the edge node capabilities.
Peer-To-Peer CDN Overview

Qingqian Tao (Tingyu)
2019.11.25
Outline

• Overview of PCDN
• How Tingyu build PCDN
• Thinking of PCDN in web
Overview of PCDN

- What is PCDN?

PCDN integrate idle upstream bandwidth resources to form a large and stable P2P network, which can solve the quality problem of edge network, accelerate the effect better, and can be used at a lower cost. There are CDNs to expand the capacity several times, so as to provide CDN services with high quality and low price.
How Tingyu build PCDN

Architecture of Tingyu PCDN system

Native App

Client SDK

Web App

PCDN Network (composed of edge nodes)

Normal node

Core node

Super node

Decentralized Filesystem

File synchronization

CDN System

Server API

p2p

http

CDN System
Thinking of PCDN in web

• How the browser connects to PCDN, use WebRTC or another?

• What p2p protocol between browser and edge nodes?

• Find edge node by a centralized server or by another way?
Useful Information

- IRC channel: #web-networks
  - [http://irc.w3.org/](http://irc.w3.org/)

- Web & Networks IG Charter
  - [https://www.w3.org/2019/05/web-networks-ig-charter.html](https://www.w3.org/2019/05/web-networks-ig-charter.html)
  - [https://www.w3.org/web-networks/](https://www.w3.org/web-networks/)

- Mail Archives
  - [https://lists.w3.org/Archives/Public/public-networks-ig/](https://lists.w3.org/Archives/Public/public-networks-ig/)
    - [https://lists.w3.org/Archives/Member/member-networks-ig/](https://lists.w3.org/Archives/Member/member-networks-ig/)

- Use-cases and Requirements
  - [https://github.com/w3c/web-networks/issues](https://github.com/w3c/web-networks/issues)