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
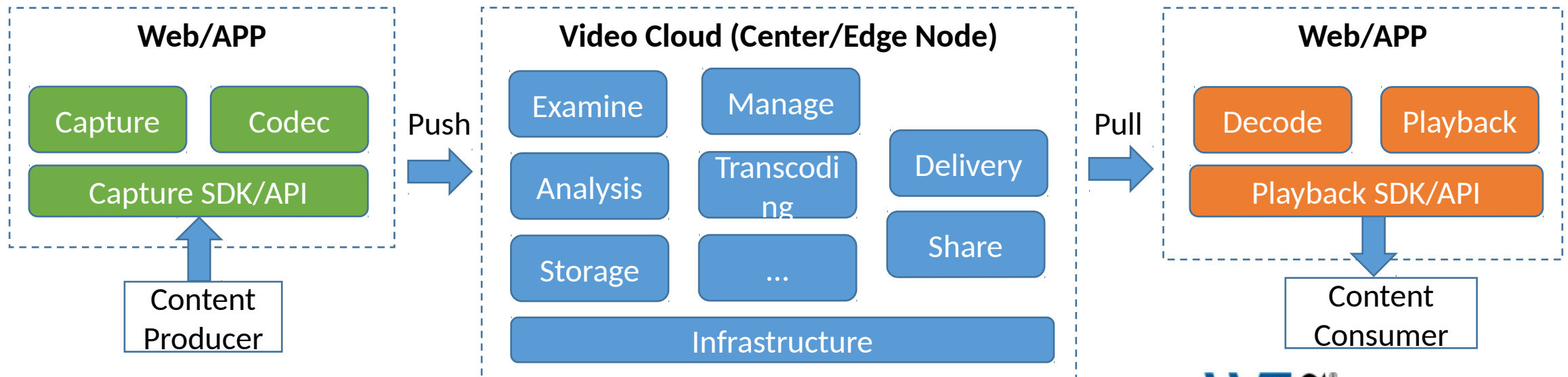
Video Cloud use P2P CDN acceleration

- 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

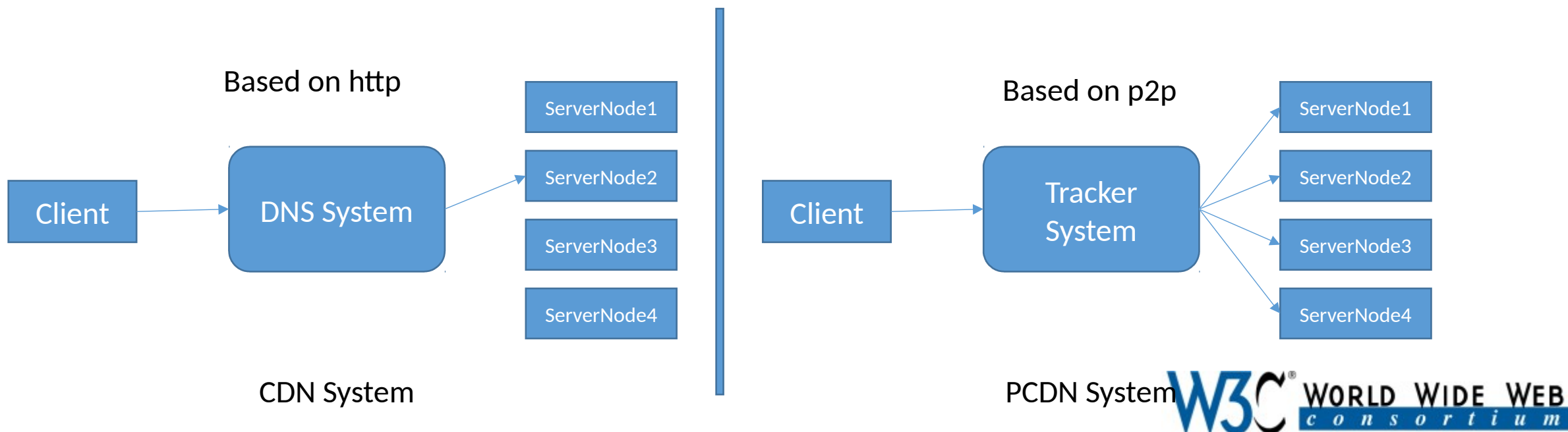Qingqian Tao （Tingyu）

2019.11.25

Outline

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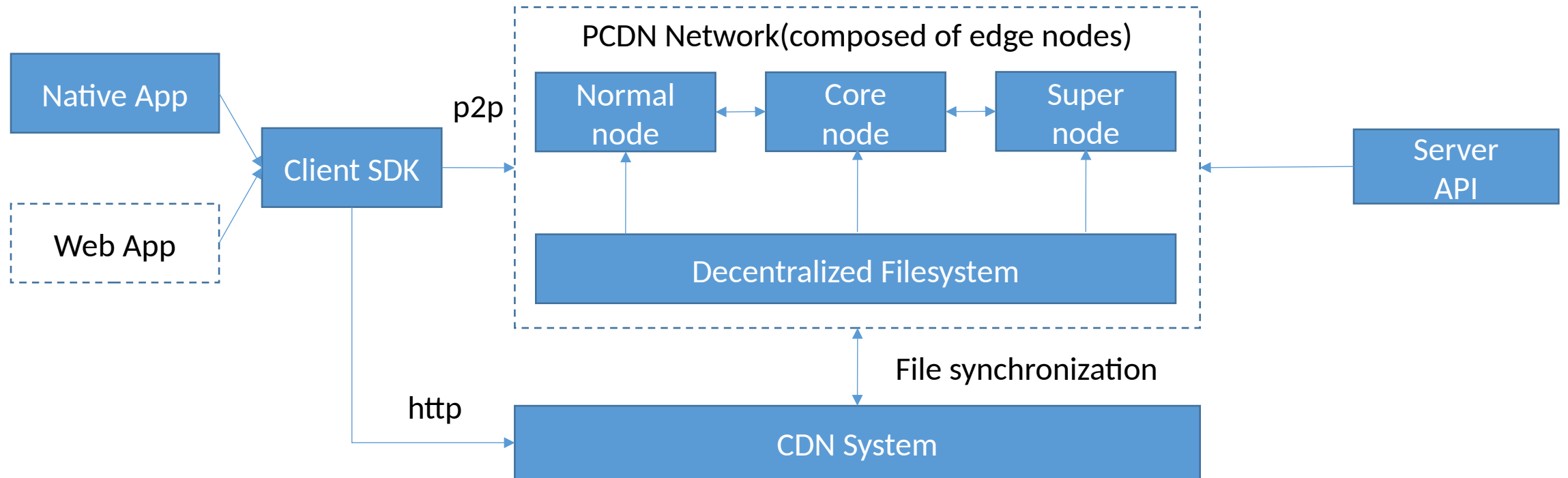- Thinking of PCDN in web

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.

Based on http

Client → DNS System → ServerNode1 / ServerNode2 / ServerNode3 / ServerNode4

CDN System

Based on p2p

Client → Tracker System → ServerNode1 / ServerNode2 / ServerNode3 / ServerNode4

PCDN System

How Tingyu build PCDN

Architecture of Tingyu PCDN 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/

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

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

- Use-cases and Requirements
  - https://github.com/w3c/web-networks/issues