

The Art of Realtime Sync: Media and Machine in Harmony



9th Nov, 2025

NTT docomo Business Inc.

Self introduction

Kensaku KOMATSU, @komasshu

- Director of Innovation Center at NTT docomo Business
- An organizer of Web community in Japan
- Interest :
 - Web and Networking
 - Media Streaming technology
 - Real Time Web
- Chair of “Sync on the Web CG”



Topics for tonight

- Streaming case
 - Media over QUIC
- Archive case
 - WebVMT / DataCue API

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Real Time Web?

Typical current Real Time Web cases

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Meetings

Bring teams together with video conferencing

Connect, collaborate, and get more done together with trusted video meetings.

[See pricing](#)

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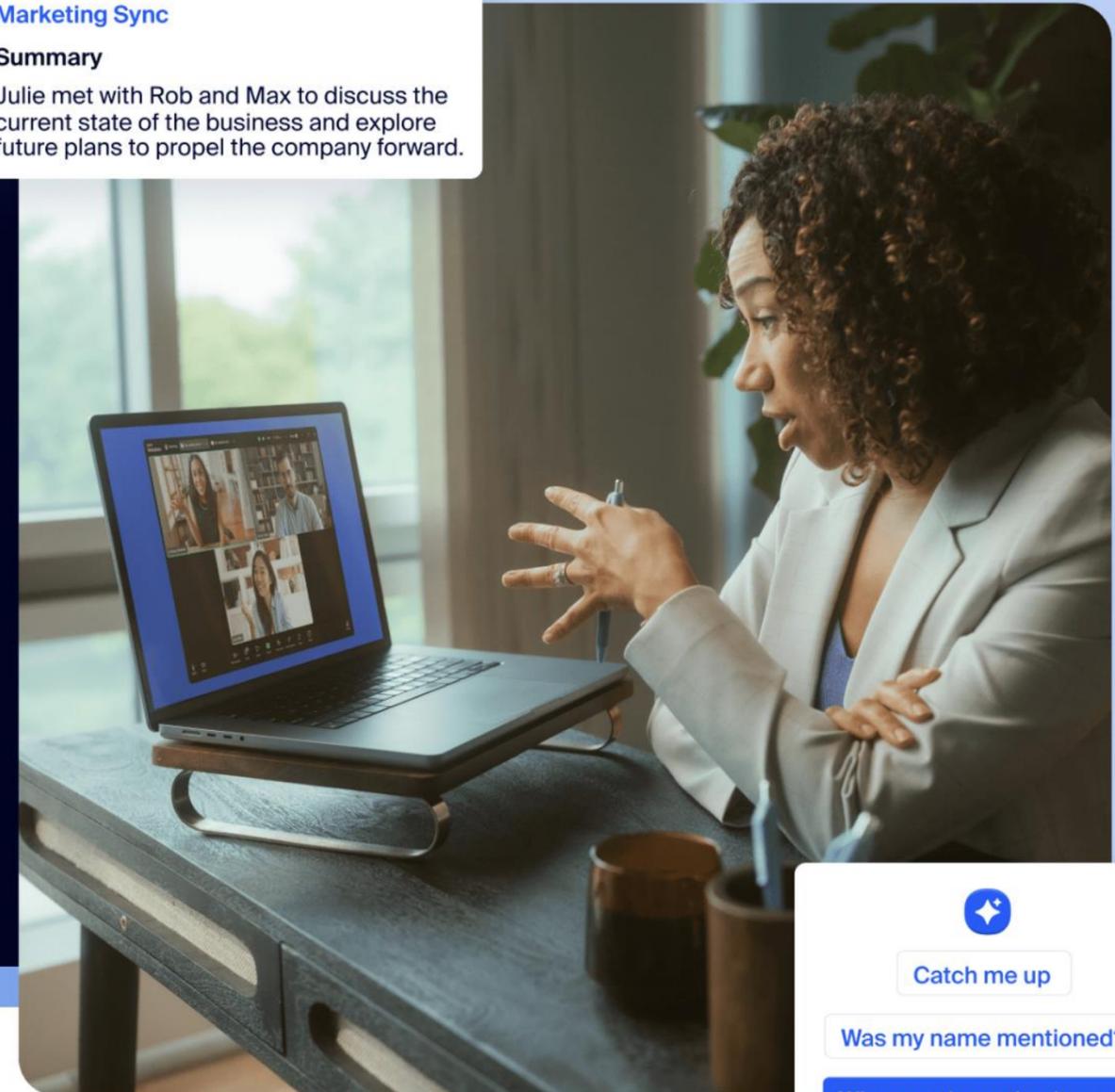


 Meeting Summary

Marketing Sync

Summary

Julie met with Rob and Max to discuss the current state of the business and explore future plans to propel the company forward.





[Catch me up](#)

[Was my name mentioned?](#)

[What are the action items?](#)



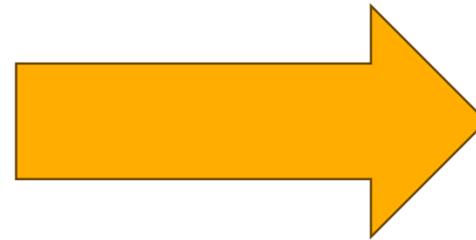
<https://www.zoom.com/en/products/virtual-meetings/>

What's next?

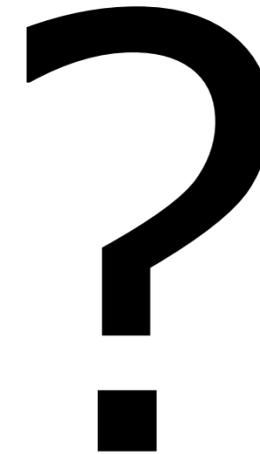
For Video Conference



WebRTC

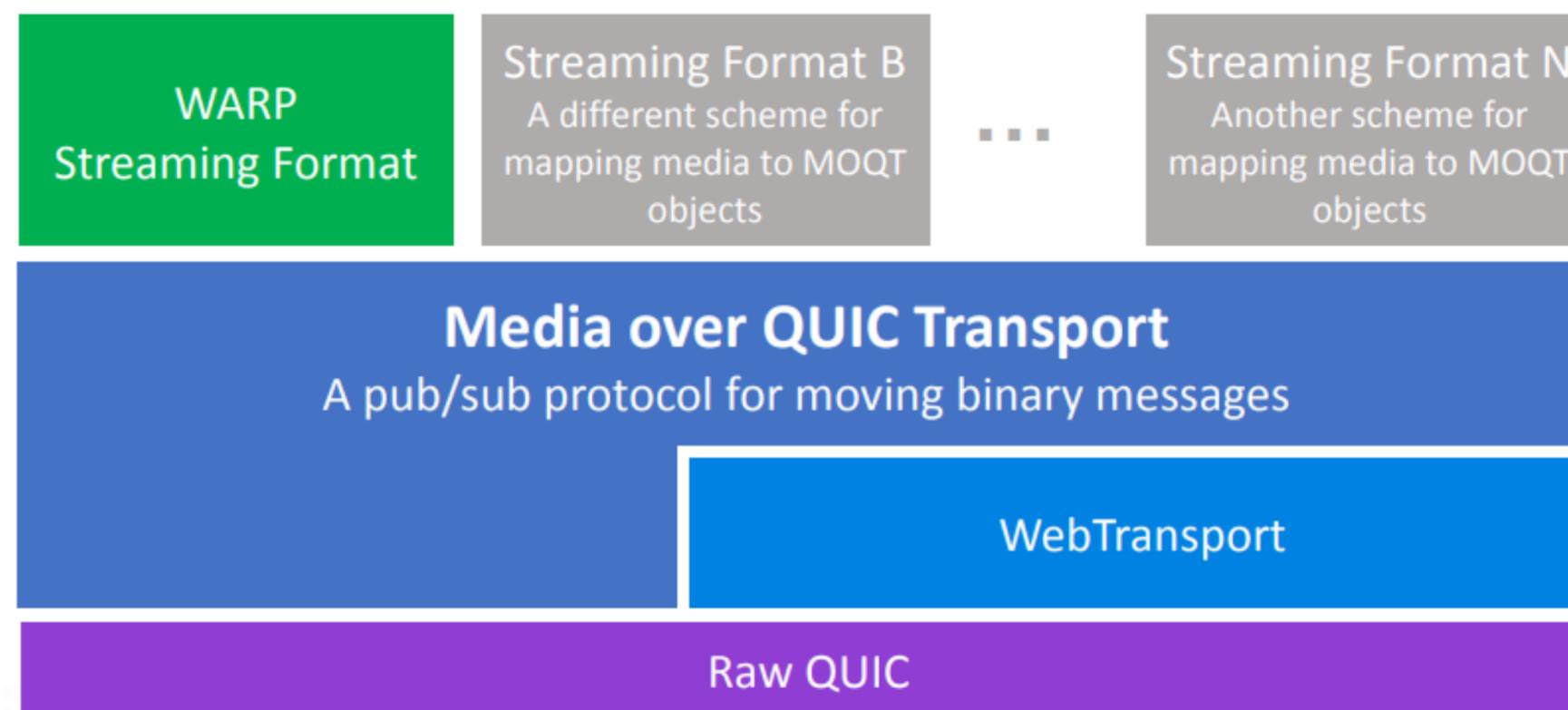


For Specific Case



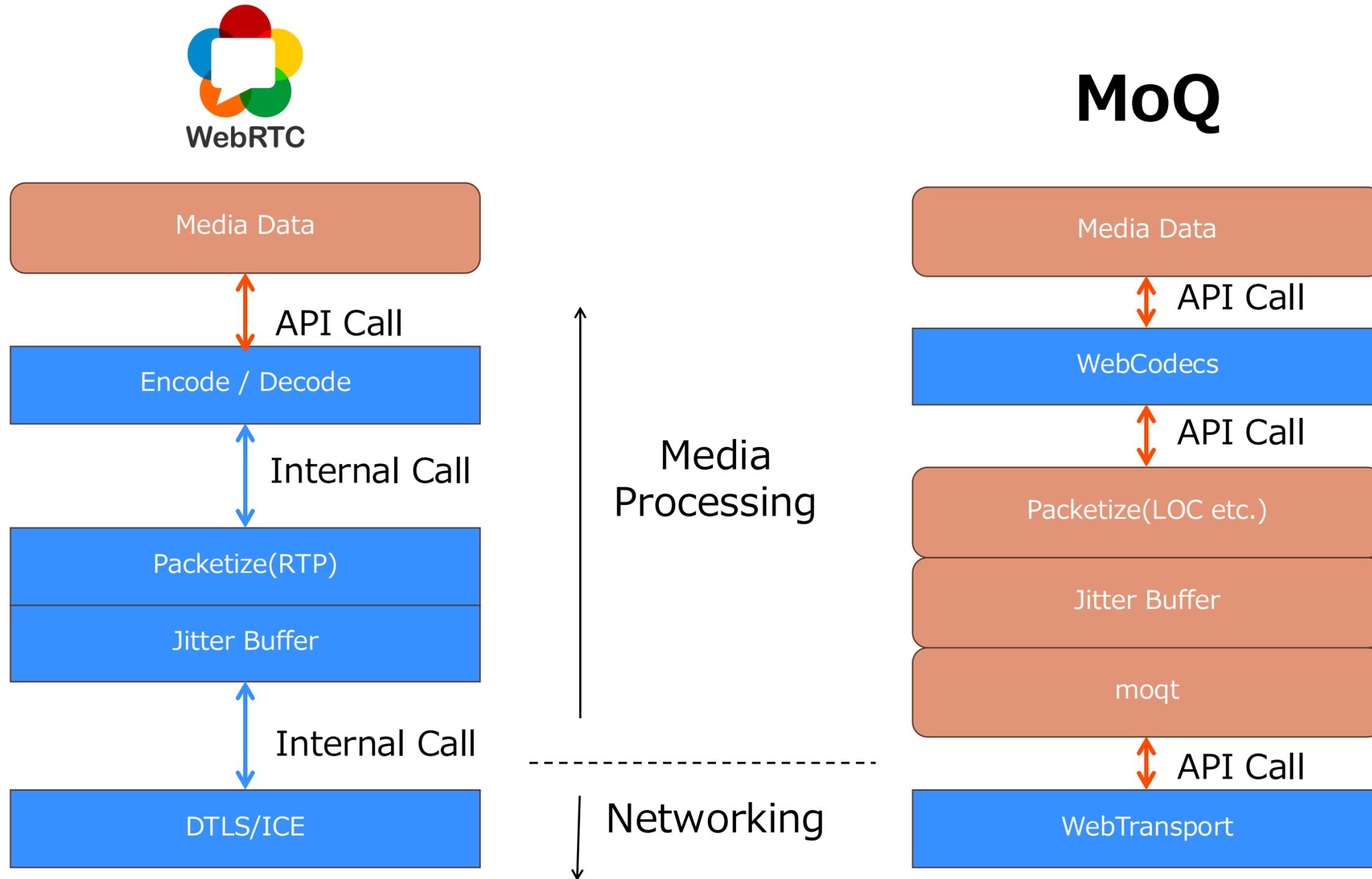
Media over QUIC

- QUIC
 - Underlay Protocol of HTTP3
 - Better TCP, Better UDP
- Media over QUIC
 - Media Transport over QUIC
 - Mainly discussed in IETF. Core protocol is moqt (protocol for Media over QUIC Transport)
 - For browser: WebTransport API, WebCodes API are used, mainly.



<https://datatracker.ietf.org/meeting/interim-2023-moq-08/session/moq>

Comparison – WebRTC and MoQ



Which case, will MoQ be adequate?

- High Quality Audio / Video with Low Latency
 - 4K / 8K
 - Multi Track Video
 - High resolution / Loss-less Audio
 - Multi Channel / Multi Track Audio
- Media and Device Orchestration
 - Synchronization (Timestamp alignment)

Our approach

つなごう。驚きを。幸せを。

NTT docomo Business

Interactive Live Screening

Bridging spaces, creating a unified live experience between venues.



MoQ-ILS

Typical use case of MoQ-ILS

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 **docomo Business**

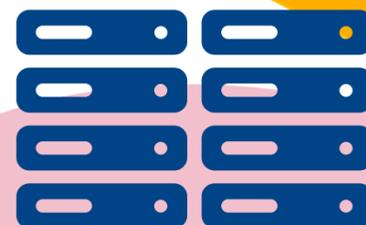
Main venue



Live Streaming (Artist)

Video / Audio / DMX data

moqt



moqt relay

Satellite Venue



Live Streaming (Remote audience)

Cheers, Applause, Call and Response

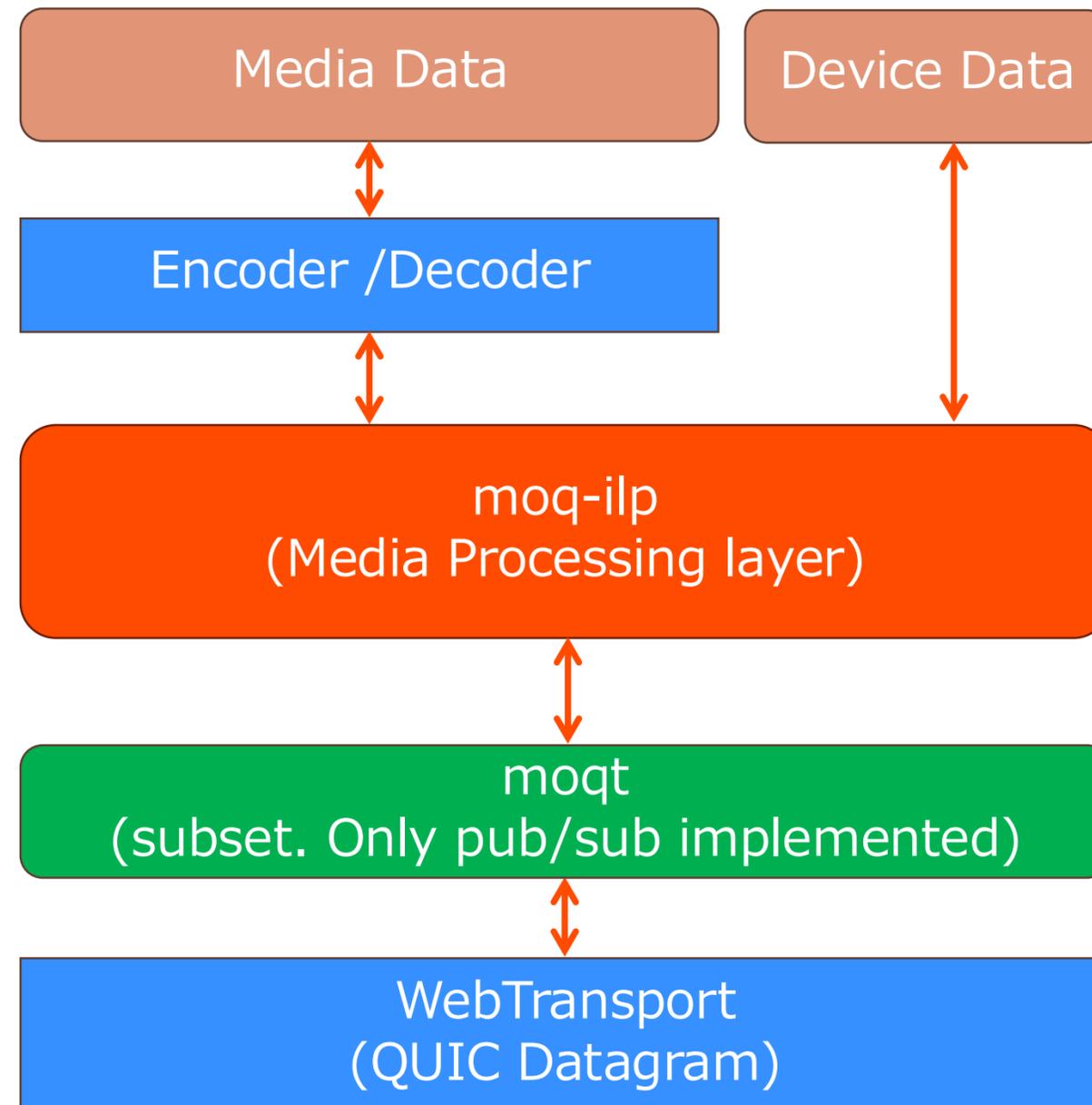


moqt

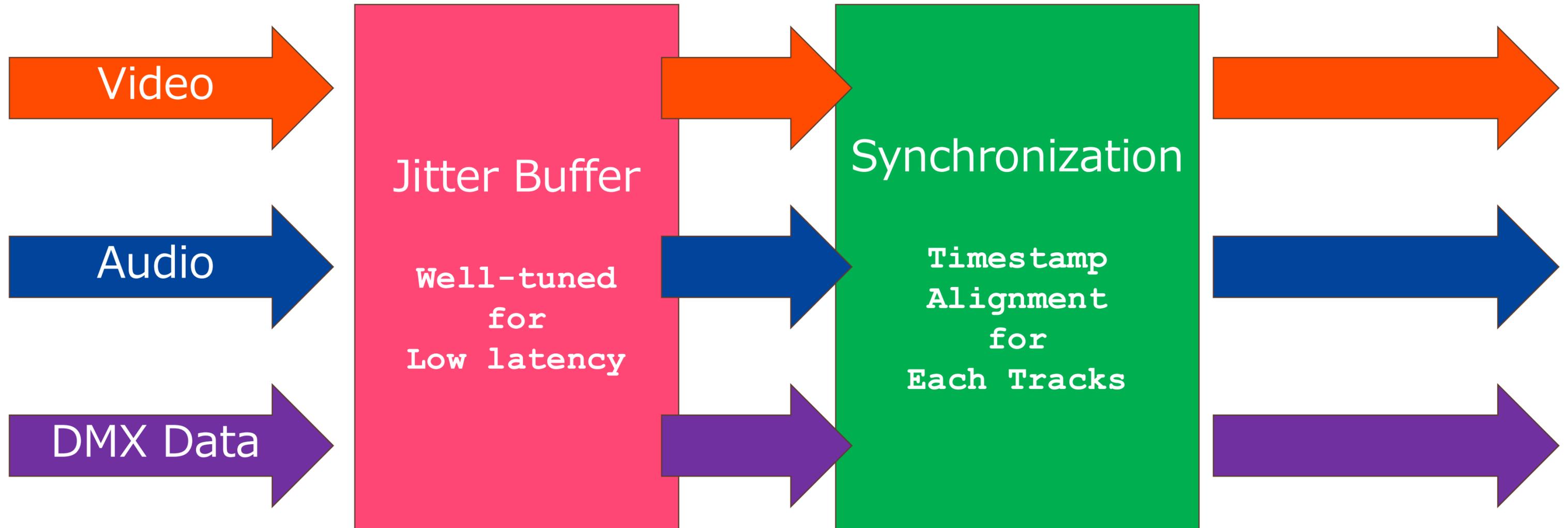
About 0.1 sec latency, we realize unified live experience between venues!

Stack for MoQ-ILS

MoQ-ILS



Our challenge



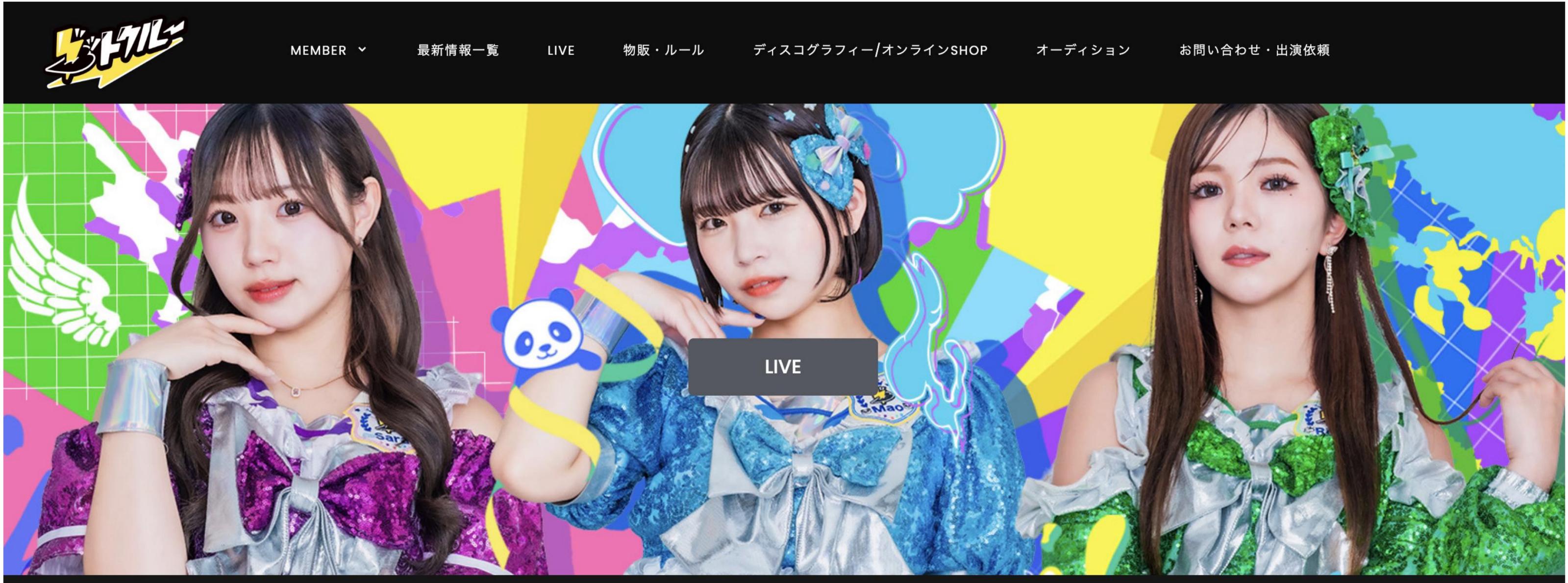
Immersive Interactive LiveViewing



Interactive Live Screening for Tonight

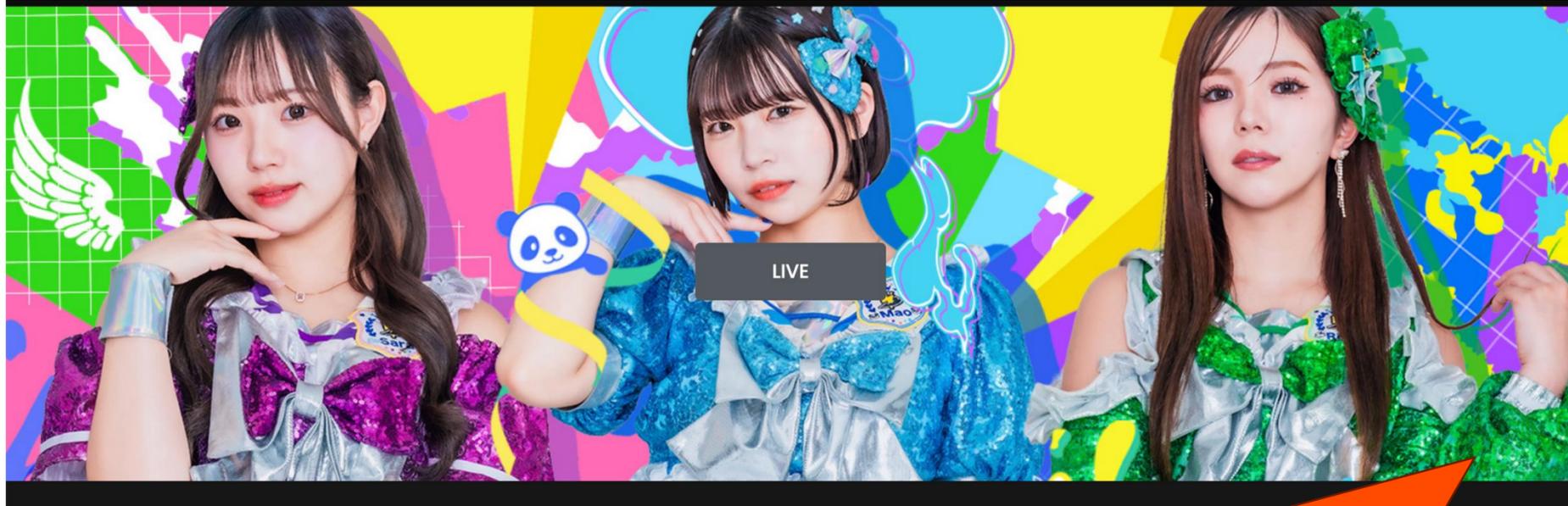
Gootcrew – Famous Regional Idol in Kobe

At the beginning of the networking time (19:00 – 19:10)

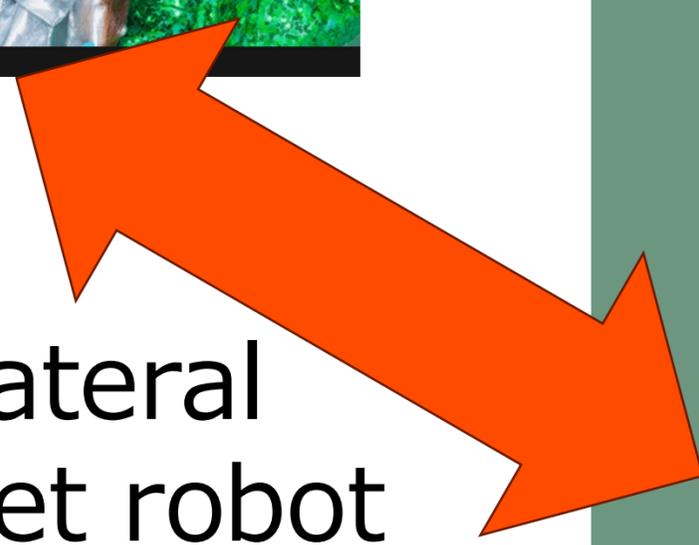


<https://gootcrew.jp/>

Media and Device Orchestration for Tonight



Bilateral
puppet robot
control



https://www.asratec.co.jp/portfolio_page/nekozukin/

Enjoy!!

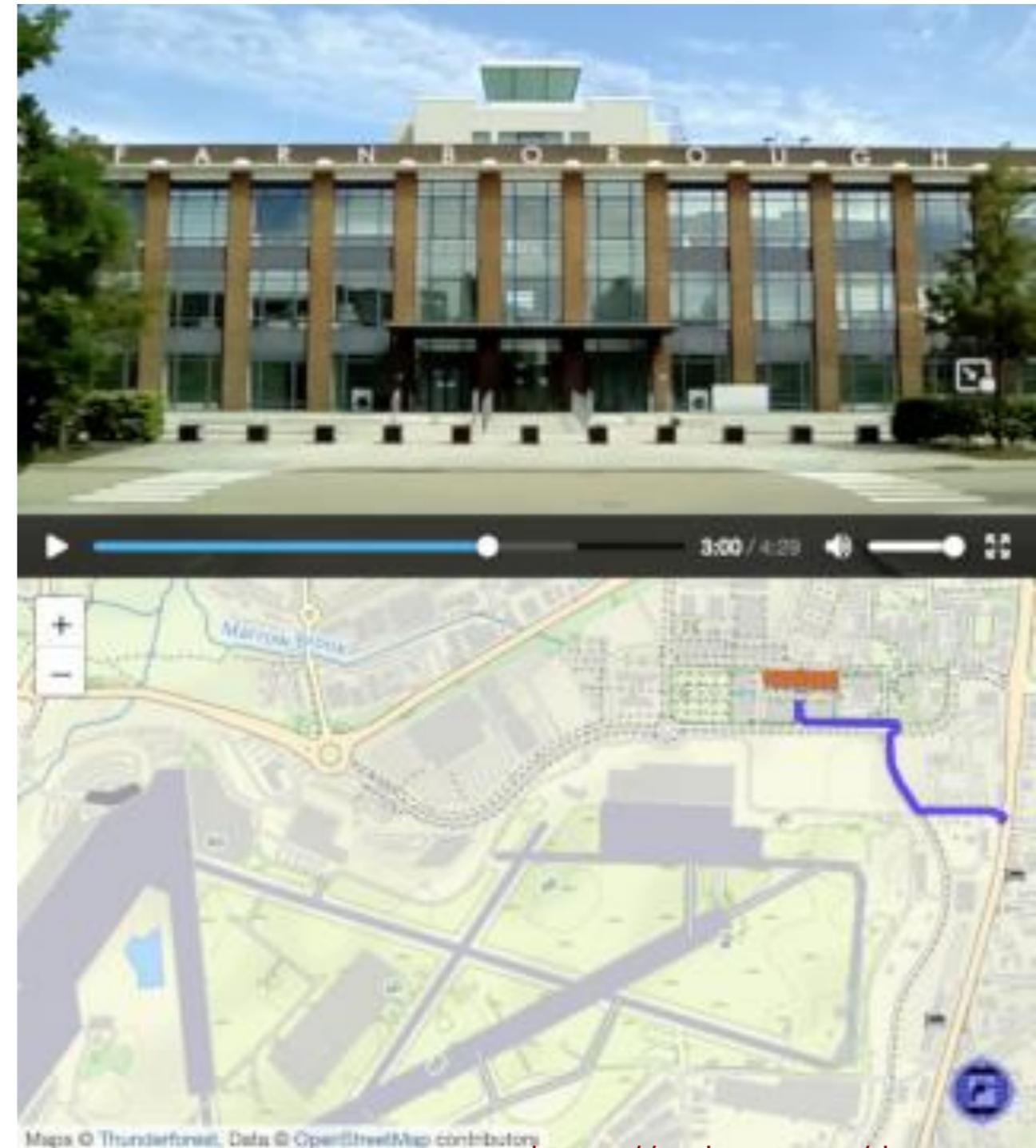
Topics for tonight

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- Archive case
 - WebVMT / DataCue API

What's WebVMT ?

- WebVMT
 - the Video Map Track format
 - External metadata track in connection with <track>
 - <https://www.w3.org/TR/webvmt/>

```
<video controls width="640" height="360">  
  <source src="video.mp4" type="video/mp4">  
  <track src="maptrack.vmt" kind="metadata" for="vmt-map" ti  
  Your browser does not support the video tag.  
</video>
```



<https://webvmt.org/demos>

Sample of WebVMT file

```
WEBVMT

MEDIA
url:TowerBridge.mp4
mime-type:video/mp4

MAP
lat:51.506 lng:-0.076
rad:250

00:00:02.000 --> 00:00:05.000
{ "move-to":
  { "lat": 51.504362, "lng": -0.076153 }
}
{ "line-to":
  { "lat": 51.506646, "lng": -0.074651 }
}
```

DataCue API

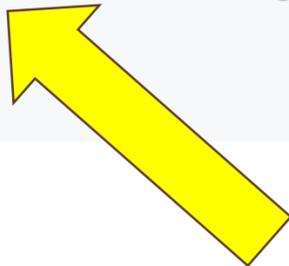
- Web API for timed metadata
 - Metadata that is synchronized to audio and video
 - Extends the HTML5 DataCue API
 - <https://github.com/WICG/datacue/tree/main>

```
const video = document.getElementById('video');
const textTrack = video.addTrack('metadata');
// Create a cue from 5 secs to end of media
const data = { "moveto": { "lat": 51.504362, "lng": -0.076153 } };
const cue = new DataCue(5.0, Infinity, data, 'org.webvmt');
textTrack.addCue(cue);
```

Arbitrary data support



Type of metadata



My proposal

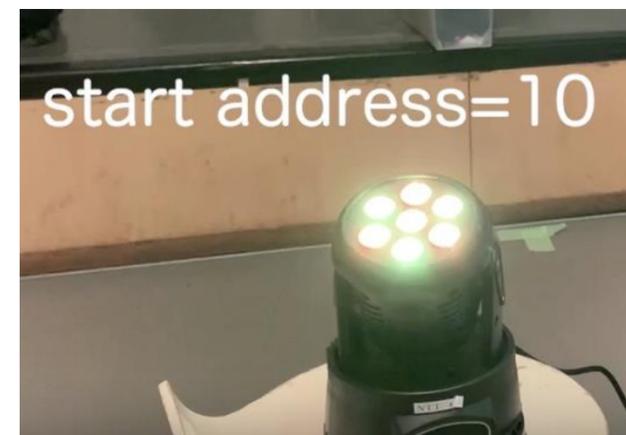
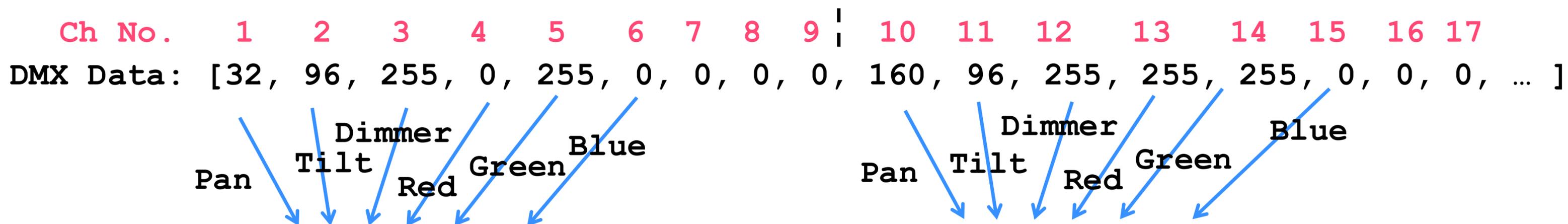
- Metadata format of **Lighting Device** for WebVMT / DataCue API



```
<div className="media-controller">
  <video style={{width: "50vw", visibility: 'hidden'}} controls ref={_videoRef}>
    <source src="/assets/angle_brackets_rise.m4a" type="audio/mpeg" />
    <track ref={_trackRef} src="/assets/lyric.vtt" kind="subtitles" srcLang="en" label="English" default />
    <track src="/assets/dmx-left.vmt" kind="metadata" for="left" default/>
    <track src="/assets/dmx-right.vmt" kind="metadata" for="right" default/>
  </video>
```

Brief introduction of DMX

- DMX
 - Standard Digital communication networks, commonly used to control lighting device.
- Data Format
 - Maximum of 512 bytes binary data
 - Value of each byte -> applied to the channel of DMX device



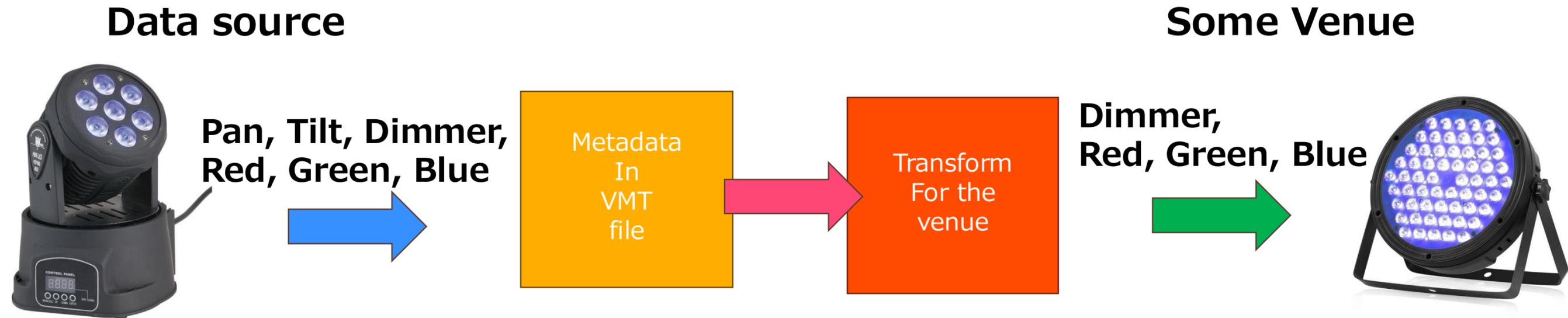
DMX Chart

- Mapping table of the DMX lighting device
 - Each DMX lighting product has **specific** DMX Chart
 - With **DMX Chart** and **Start address setting**, operator can control each lighting device in the venue.
- Example
 - 1 : Pan
 - 2 : Tilt
 - 3 : Dimmer
 - 4 : Red
 - 5 : Green
 - 6 : Blue
 - 7 : White
 - 8 : Speed
 - 9 : Control channel



Our Challenge

- Metadata of VMT file should be transformed for each venues.



- Approach 1:
 - Use binary format (Base64) of DMX data as is.
 - Hard to understand
 - Difficult to transform
- Approach 2:
 - Use Abstracted data format (JSON object)
 - Easy to understand
 - Easy to transform

Proposal

- Use approach 2
 - Abstracted data generate from DMX data using DMX chart and start address.
 - Human readable, easy to understand and transform
 - Can be applied to other smart lighting device.

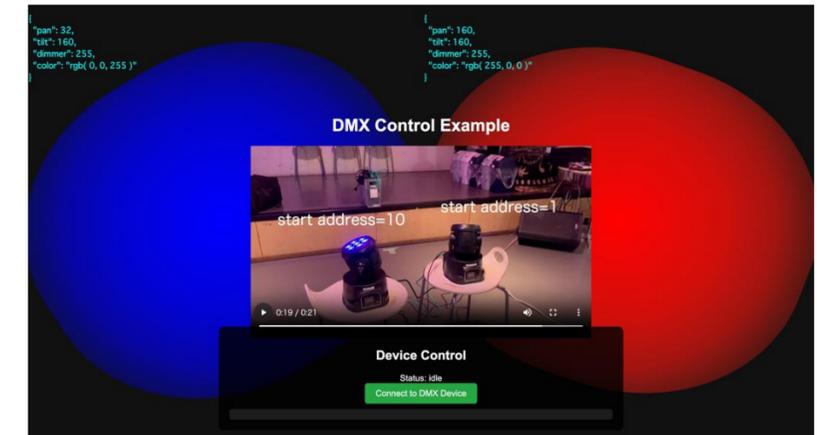
```
00:00:09.000 --> 00:00:10.000
{
  "sync":
  { "type": "org.webvmt.example.lighting", "id": "light1", "data":
    { "pan": 192, "tilt": 72, "dimmer": 0, "color": "▣rgb( 128, 128, 128 )" }
  }
}

00:00:10.000 --> 00:00:13.000
{
  "sync":
  { "type": "org.webvmt.example.lighting", "id": "light1", "data":
    { "pan": 150, "tilt": 72, "dimmer": 255, "color": "▣rgb( 0, 0, 255 )" }
  }
}
```

For more detail

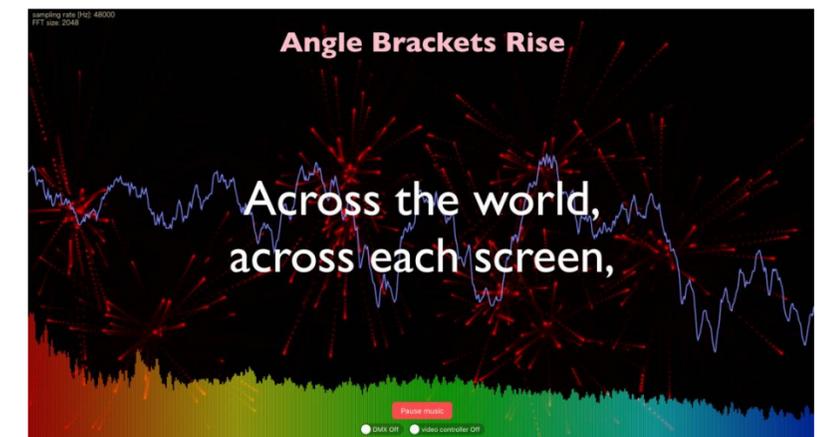
- Simple demo

- <https://dmx-control-example.netlify.app/>
- Repo : <https://github.com/KensakuKOMATSU/dmx-control-example>



- Angle Brackets Rise

- <https://song4kobedevmeetup.netlify.app/>
- Repo : <https://github.com/KensakuKOMATSU/angle-brackets-rise>

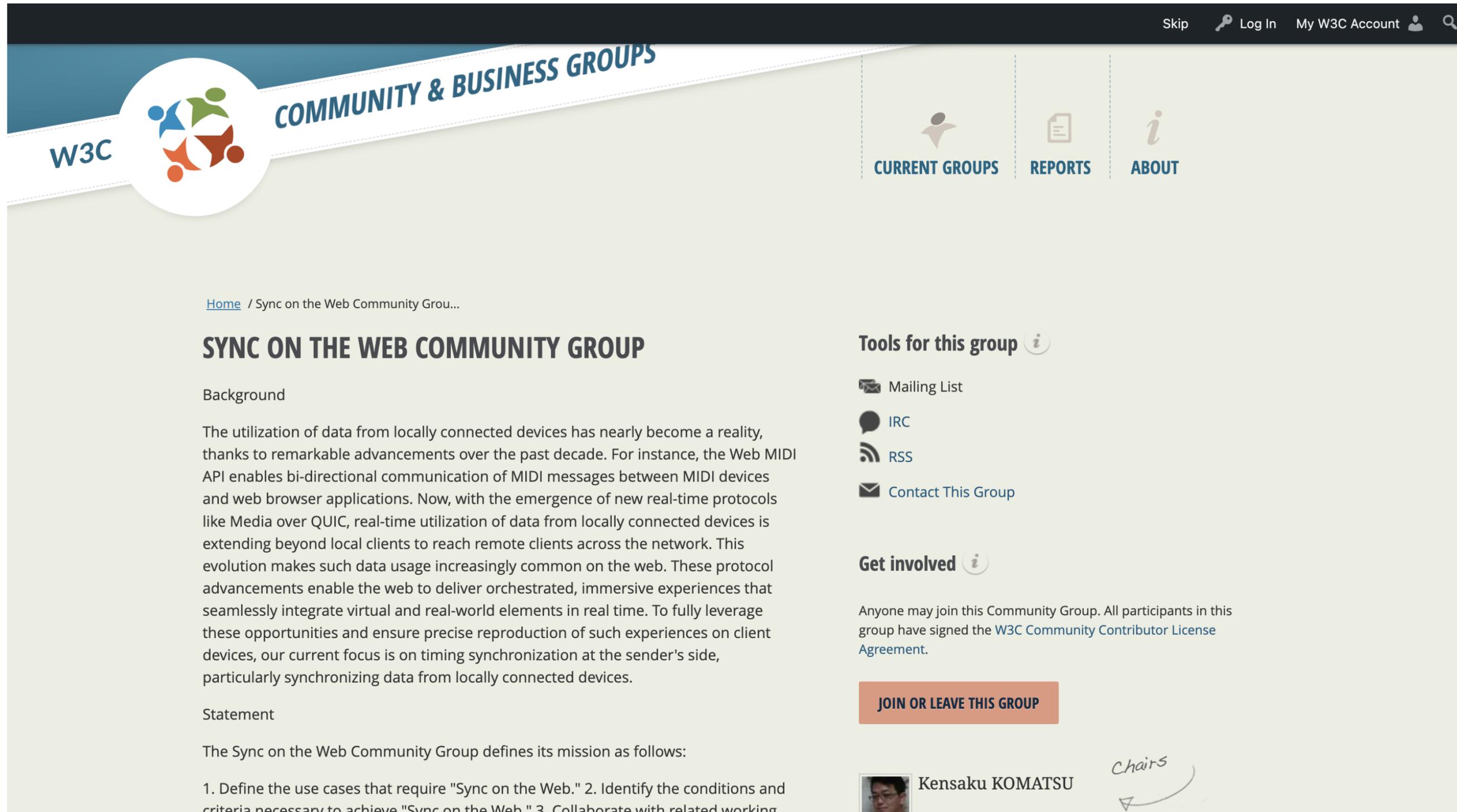


- **Non-device orchestration** : works on Any browsers, small pollyfill works well.
- **For device orchestration** : Chromium based browser only (due to **WebUSB API**)
 - Now, only **ENTTEC DMX USB Pro** is supported.

Sync on the Web Community Group

つながり。驚きを。幸せを。





The screenshot shows the website for the Sync on the Web Community Group. At the top, there is a navigation bar with links for 'Skip', 'Log In', and 'My W3C Account'. Below this is a banner with the W3C logo and the text 'COMMUNITY & BUSINESS GROUPS'. The main content area features a breadcrumb trail 'Home / Sync on the Web Community Grou...', a title 'SYNC ON THE WEB COMMUNITY GROUP', and a 'Background' section. The background text discusses the utilization of data from locally connected devices and the emergence of new real-time protocols like Media over QUIC. To the right of the main text, there are sections for 'Tools for this group' (including Mailing List, IRC, RSS, and Contact This Group) and 'Get involved', which includes a 'JOIN OR LEAVE THIS GROUP' button and a list of chairs, with a handwritten note 'Chairs' and an arrow pointing to the list.

W3C COMMUNITY & BUSINESS GROUPS

Skip Log In My W3C Account

Home / Sync on the Web Community Grou...

SYNC ON THE WEB COMMUNITY GROUP

Background

The utilization of data from locally connected devices has nearly become a reality, thanks to remarkable advancements over the past decade. For instance, the Web MIDI API enables bi-directional communication of MIDI messages between MIDI devices and web browser applications. Now, with the emergence of new real-time protocols like Media over QUIC, real-time utilization of data from locally connected devices is extending beyond local clients to reach remote clients across the network. This evolution makes such data usage increasingly common on the web. These protocol advancements enable the web to deliver orchestrated, immersive experiences that seamlessly integrate virtual and real-world elements in real time. To fully leverage these opportunities and ensure precise reproduction of such experiences on client devices, our current focus is on timing synchronization at the sender's side, particularly synchronizing data from locally connected devices.

Statement

The Sync on the Web Community Group defines its mission as follows:

1. Define the use cases that require "Sync on the Web."
2. Identify the conditions and criteria necessary to achieve "Sync on the Web."
3. Collaborate with related working

Tools for this group

- Mailing List
- IRC
- RSS
- Contact This Group

Get involved

Anyone may join this Community Group. All participants in this group have signed the [W3C Community Contributor License Agreement](#).

JOIN OR LEAVE THIS GROUP

 Kensaku KOMATSU *Chairs*

<https://www.w3.org/community/sync-on-the-web/>

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Thank you!!

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