Use case study from Sync on the Web CG, Live Screening with lighting device and Robot sync

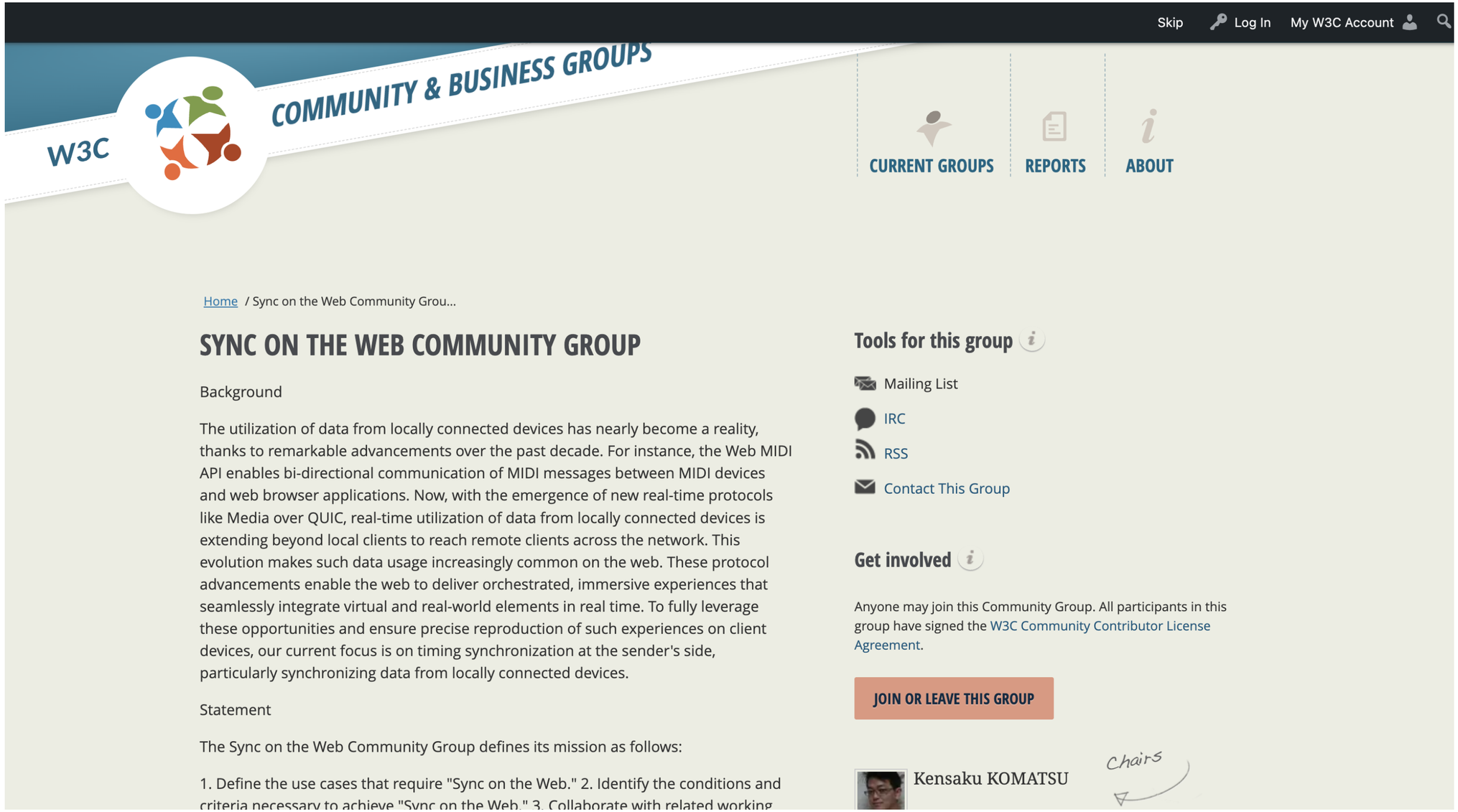
10 Nov, 2025

Kensaku KOMATSU

Chair, Sync on the Web CG

Sync on the Web Community Group

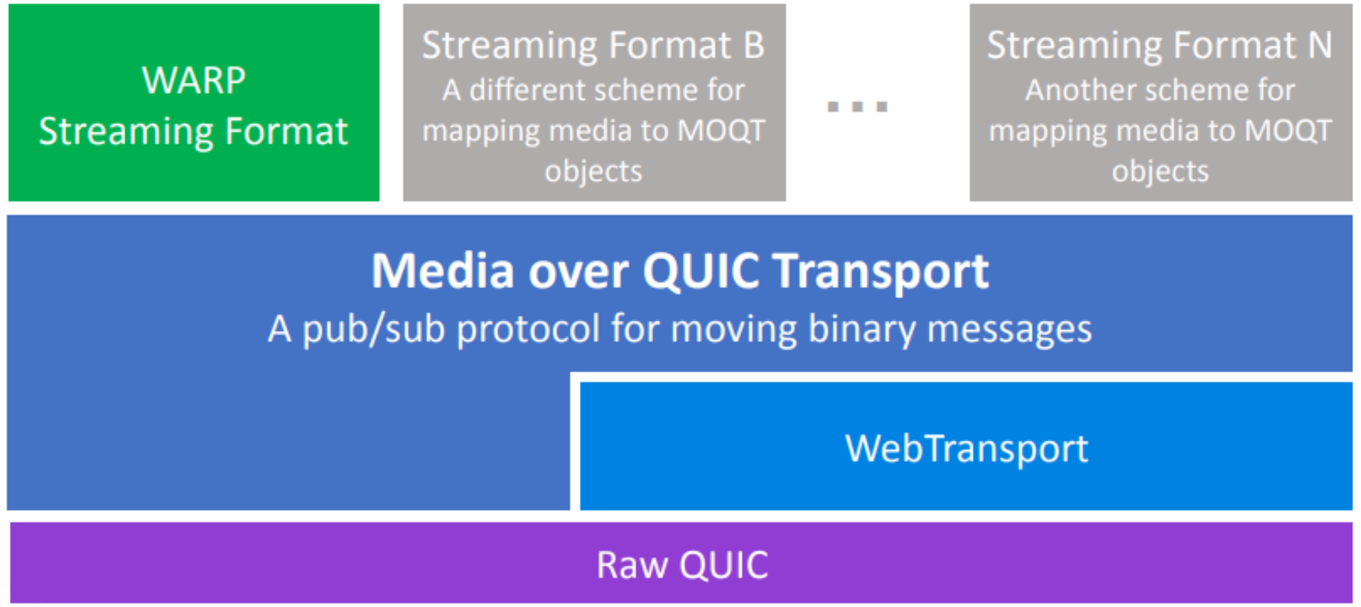
つなごう。驚きを。幸せを。
docomo Business



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

Media over QUIC

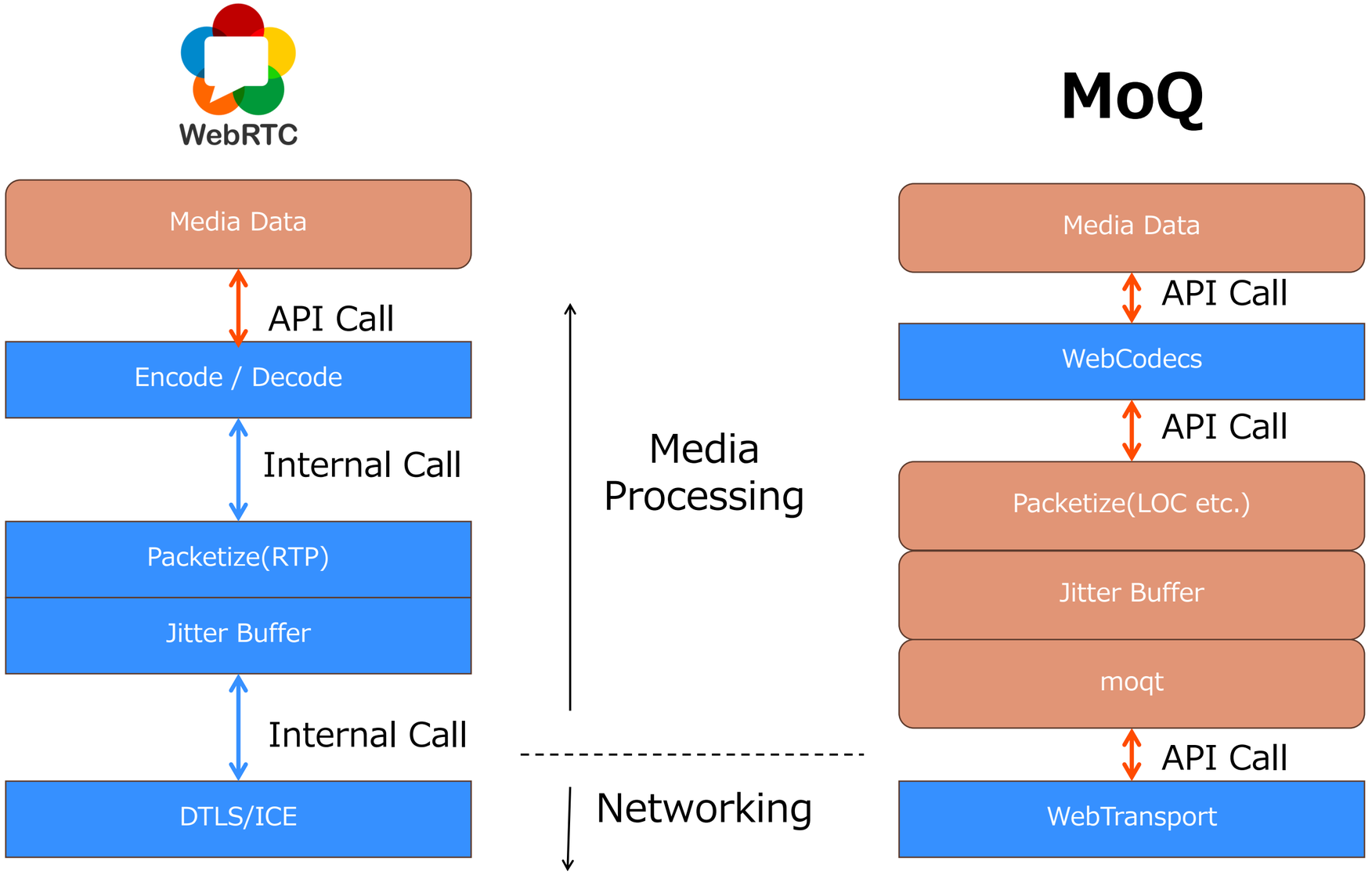
- QUIC
  - Underlay Protocol of HTTP3
  - Better TCP, Better UDP
- Media over QUIC
  - Media Transport over QUIC
  - Mainly discussed in IETF. Core protocol is moqt (protocol for Media over QUIC Transport)
  - For browser: WebTransport API, WebCodes API are used, mainly.



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

Comparison – WebRTC and MoQ

つなごう。驚きを。幸せを。
docomo Business



Which case, will MoQ be adequate?

つなごう。驚きを。幸せを。
docomo Business

- 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

つなごう。驚きを。幸せを。
docomo Business

Main venue

Live Streaming (Artist)
Video / Audio / DMX data

moqt

moqt relay

moqt

Live Streaming (Remote audience)
Cheers, Applause, Call and Response

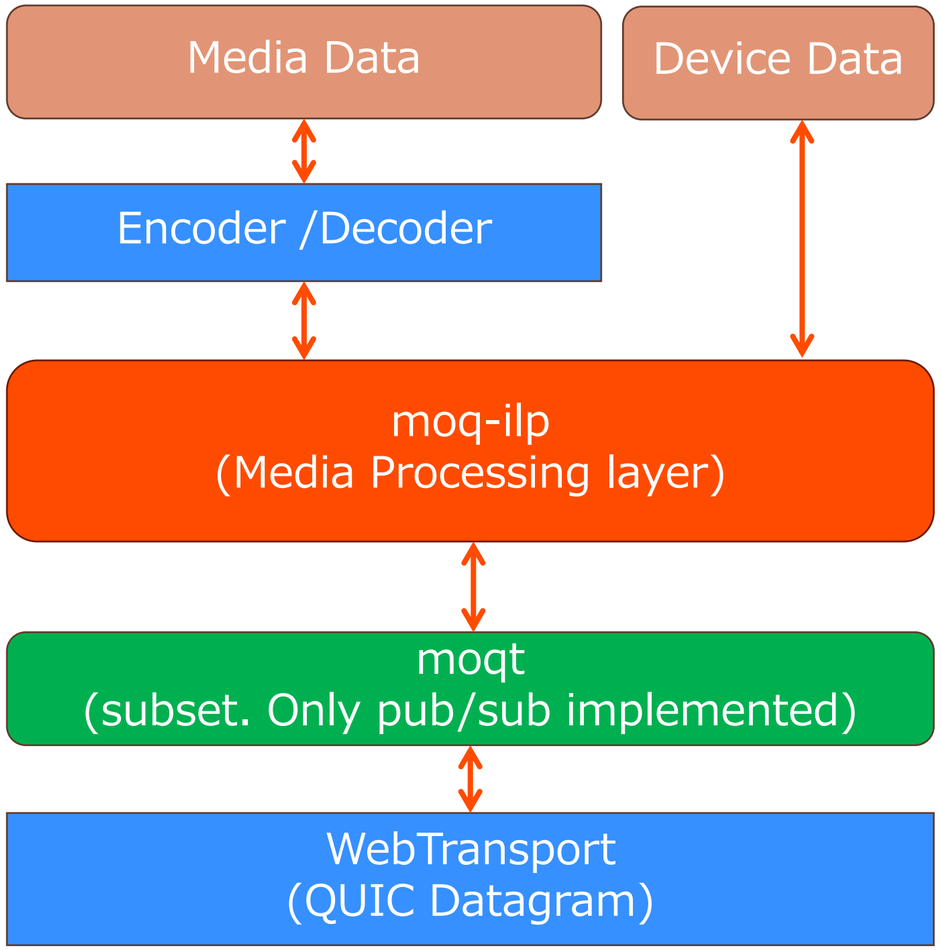
Satellite Venue

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

Stack for MoQ-ILS

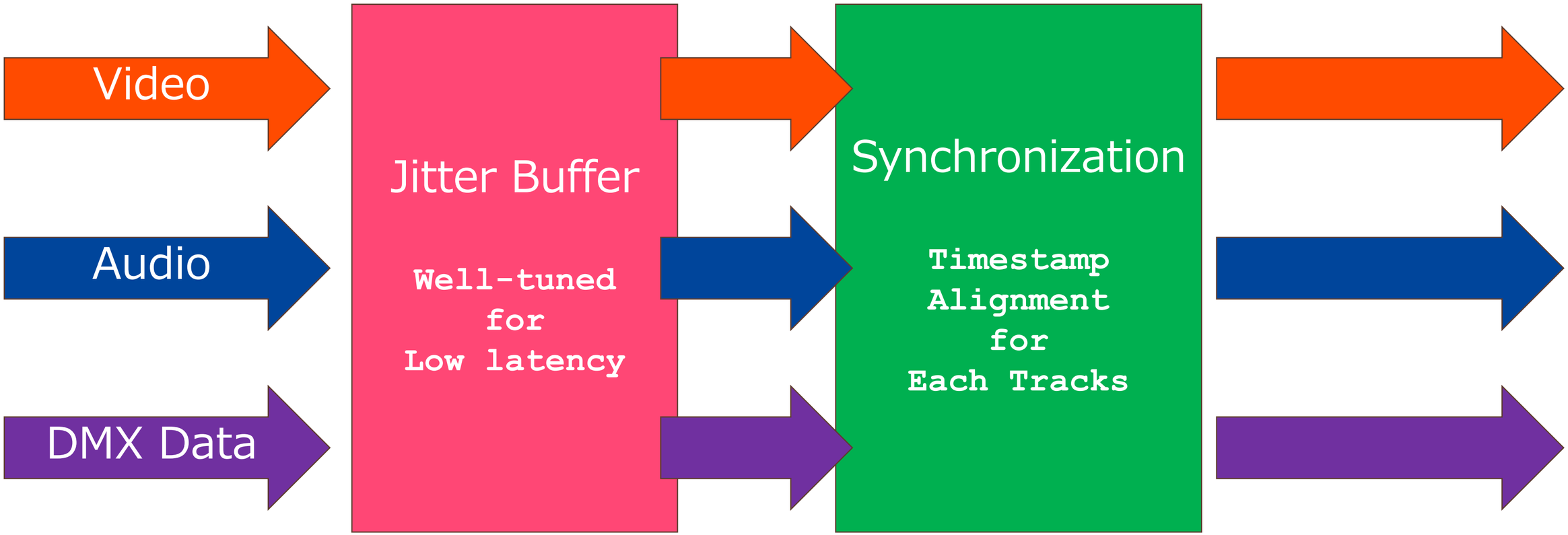
つなごう。驚きを。幸せを。
docomo Business

MoQ-ILS



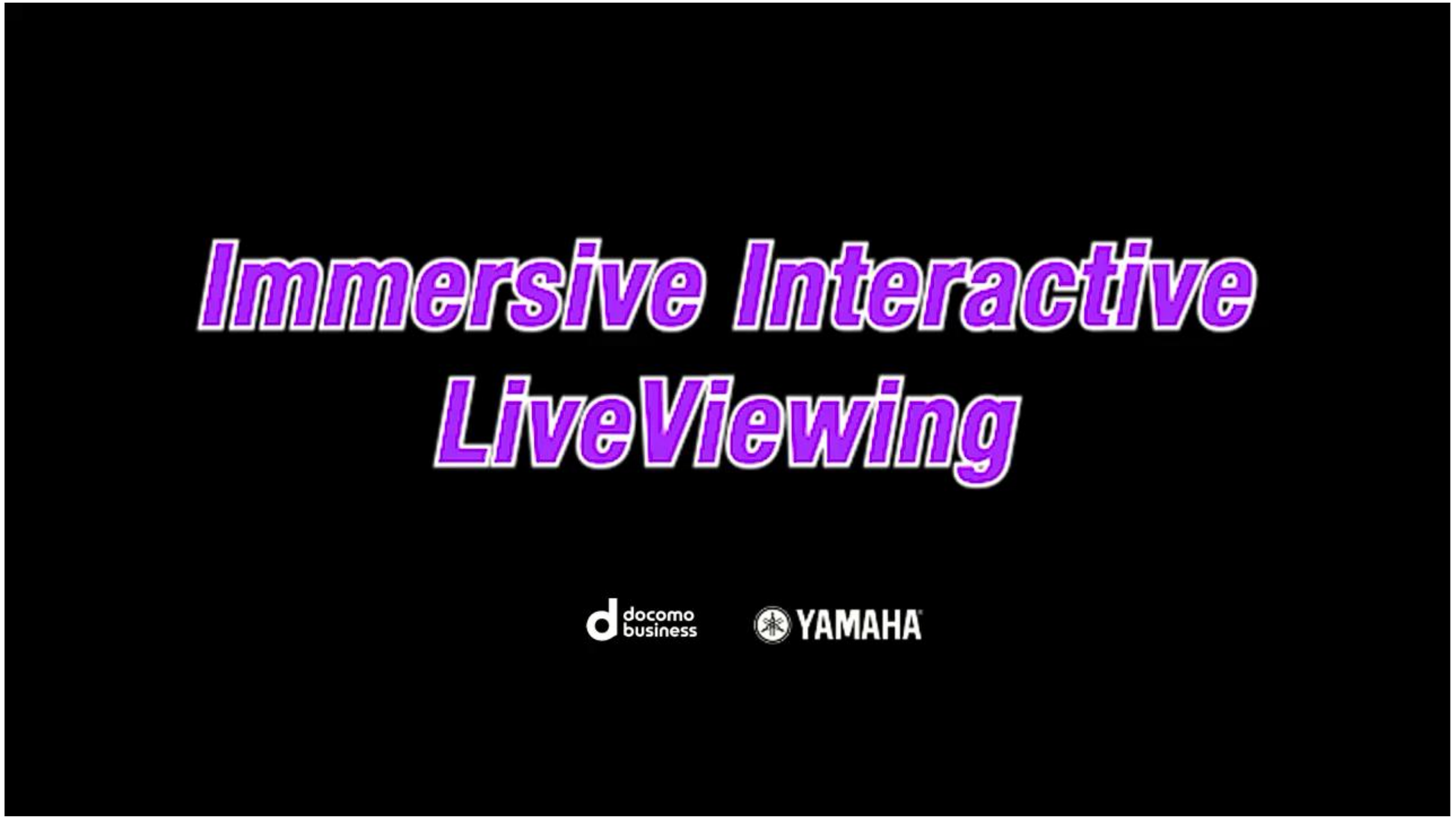
Our challenge

つなごう。驚きを。幸せを。
docomo Business



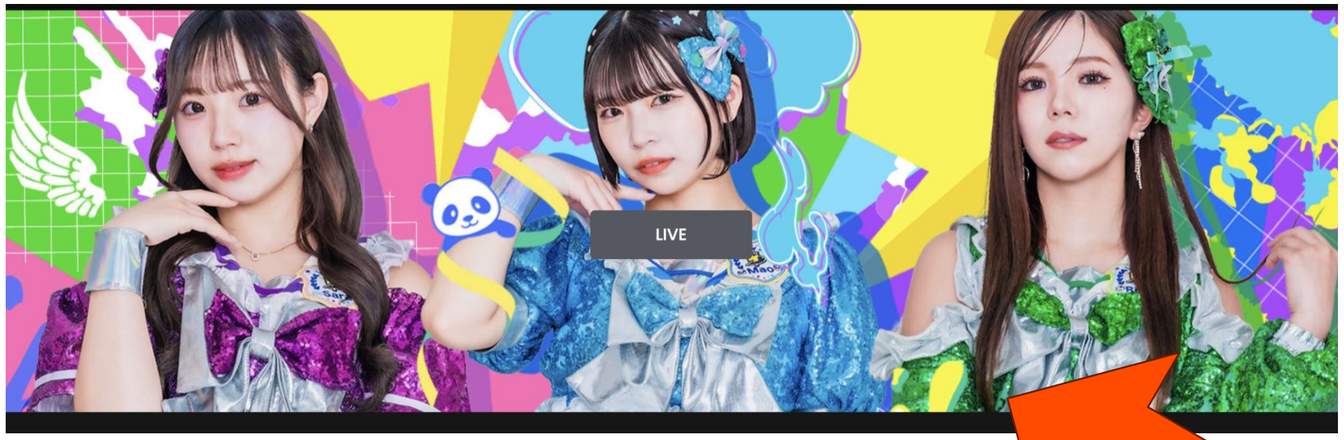
Video Demo

つなごう。驚きを。幸せを。
NTT docomo Business



Media and Robot Orchestration Case

つなごう。驚きを。幸せを。
NTT docomo Business

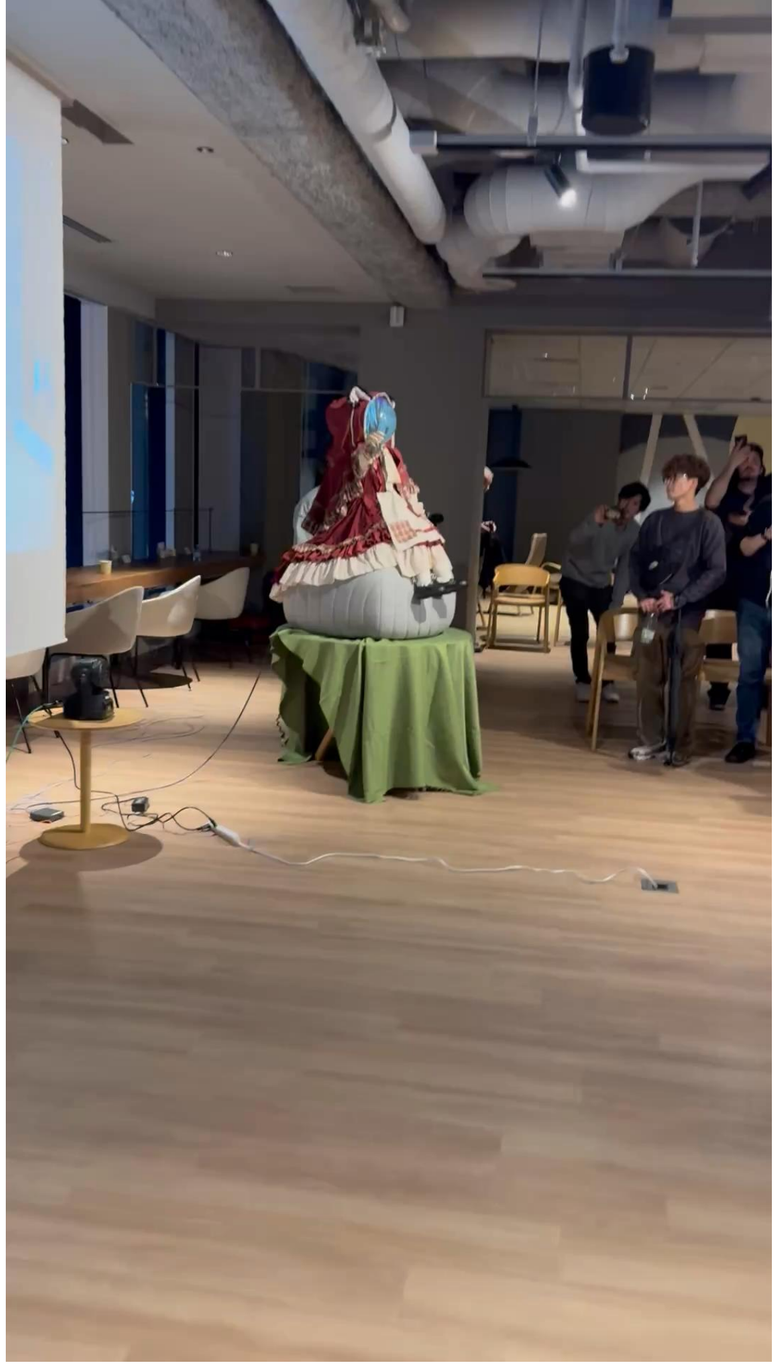


Asratec

Bilateral puppet robot control

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

Demo Movie



WebVMT and DataCue for lighting devices

10 Nov, 2025

Kensaku KOMATSU

WebVMT (Video Map Track)

つなごう。驚きを。幸せを。
NTT docomo Business

- 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

つなごう。驚きを。幸せを。
docomo Business

```
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 }
}
```

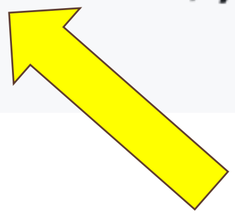
DataCue API

つなごう。驚きを。幸せを。
docomo Business

- Web API for timed metadata
  - Metadata that is synchronized to audio and video
  - Extends the VTTCue API
    - https://github.com/WICG/datacue/tree/main
  - Comparison-table
    - https://github.com/webvmt/vmt-sync-examples/tree/gh-pages?tab=readme-ov-file#webvtt-comparison

```
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);
```

Timed metadata support



Type of metadata

My proposal

つなごう。驚きを。幸せを。
docomo Business

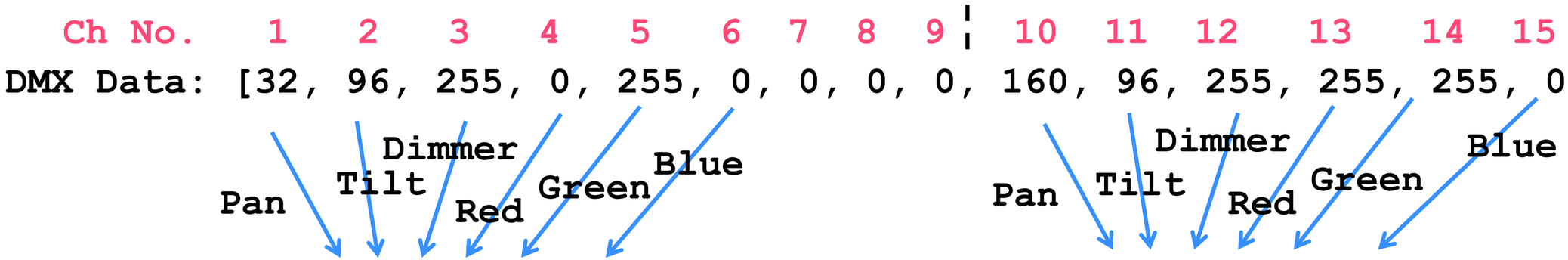
- Metadata format of **Lighting Device** for WebVMT / DataCue API


```
<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

つなごう。驚きを。幸せを。
docomo Business

- 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

つなごう。驚きを。幸せを。
docomo Business

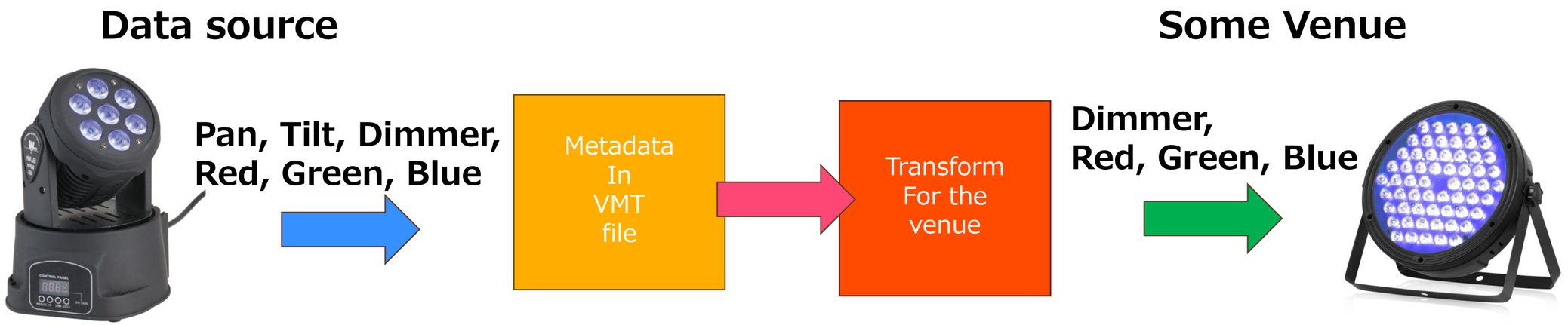
- Mapping table of the DMX lighting device
  - Each DMX lighting product has **specific** DMX Chart
  - With **DMX Chart** and **Start address setting**, operator can control each lighting device in the venue.

- Example
  - 1 : Pan
  - 2 : Tilt
  - 3 : Dimmer
  - 4 : Red
  - 5 : Green
  - 6 : Blue
  - 7 : White
  - 8 : Speed
  - 9 : Control channel

Our Challenge

つなごう。驚きを。幸せを。
docomo Business

- 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

つなごう。驚きを。幸せを。
docomo Business

- 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.

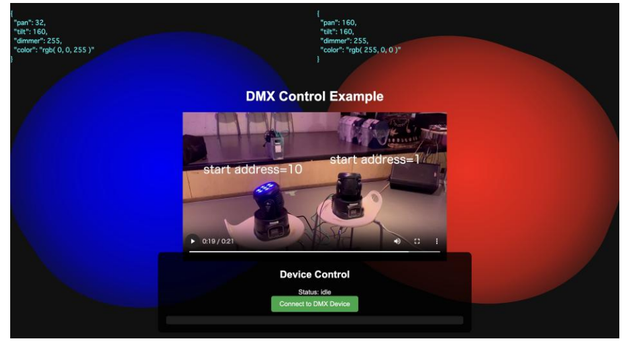
```
00:00:09.000 --> 00:00:10.000
{
    "sync":
    { "type": "org.webvmt.example.lighting", "id": "light1", "data":
        { "pan": 192, "tilt": 72, "dimmer": 0, "color": "rgb( 128, 128, 128 )" }
    }
}

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 )" }
    }
}
```

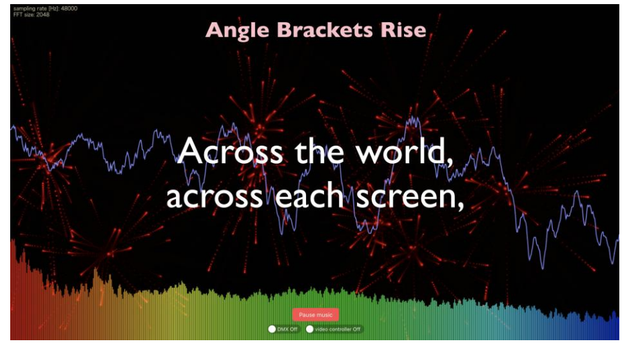
For more detail

つなごう。驚きを。幸せを。
NTT docomo Business

- **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.