

Enhanced Sign Language Service in HbbTV with WebAssembly

From the Idea to the Implementation

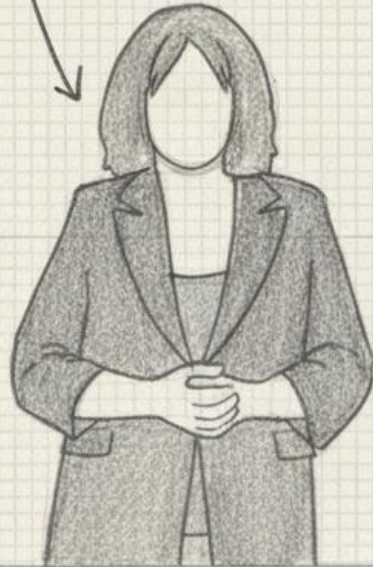
November - 2025



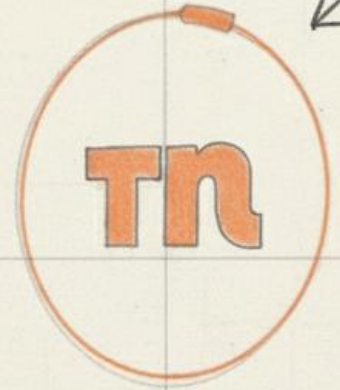
Designing the best Sign Language Service for DTT

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Sign Language Service








DTT



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Key idea

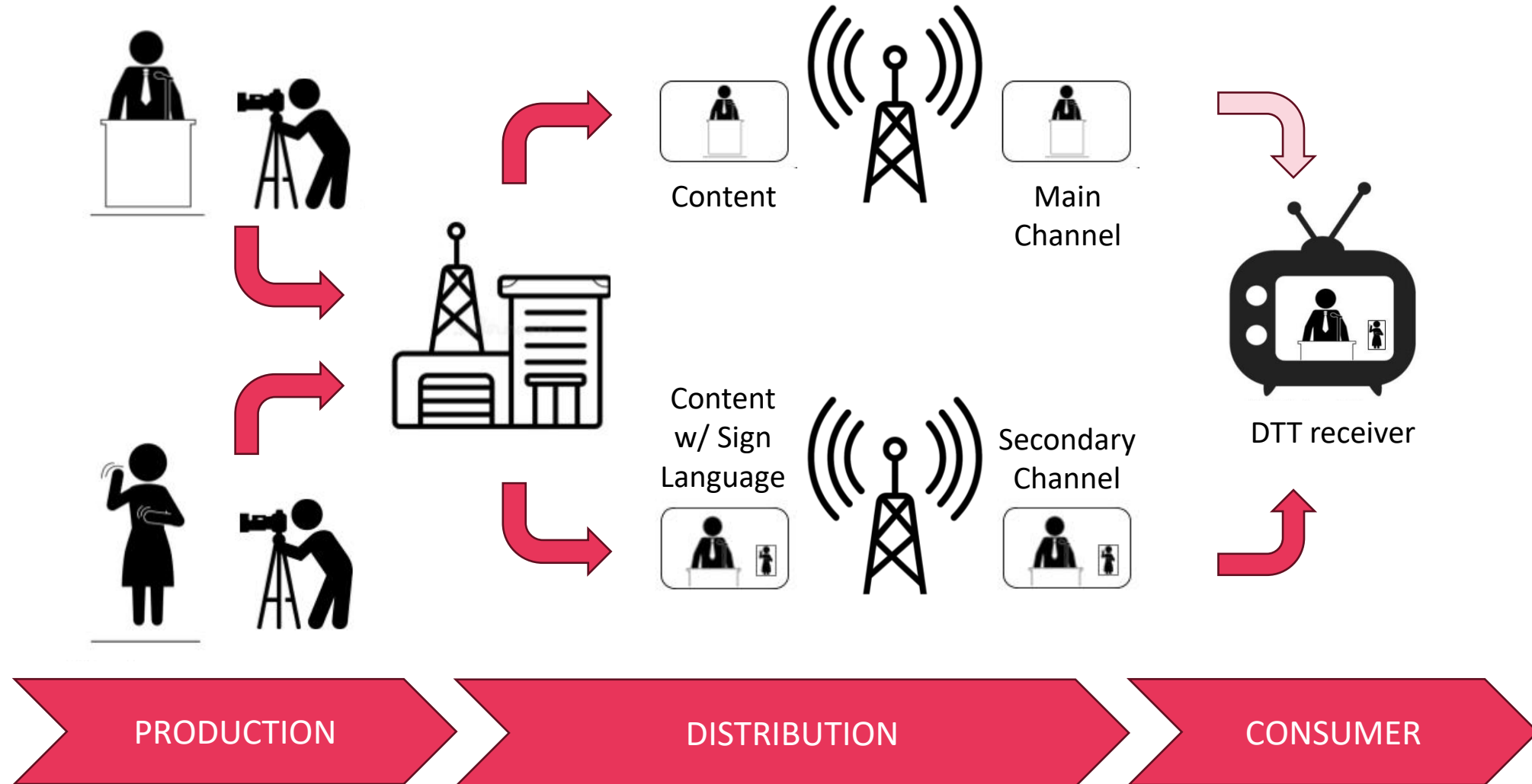
Our goal is to provide the same experience for **Sign Language** as for **Subtitles**

-  **Widely available:** Accessible on most devices
-  **Scalable:** Designed to adapt to the production capacity
-  **Discoverable:** Easy to find and identify when available
-  **Fast Access:** Can be enabled or disabled instantly, without missing a single moment of the content
-  **Personalizable:** Allows users to adjust position, size, layout... and even access a version that address different accessibility needs

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Current Architecture: **DTT parallel stream**

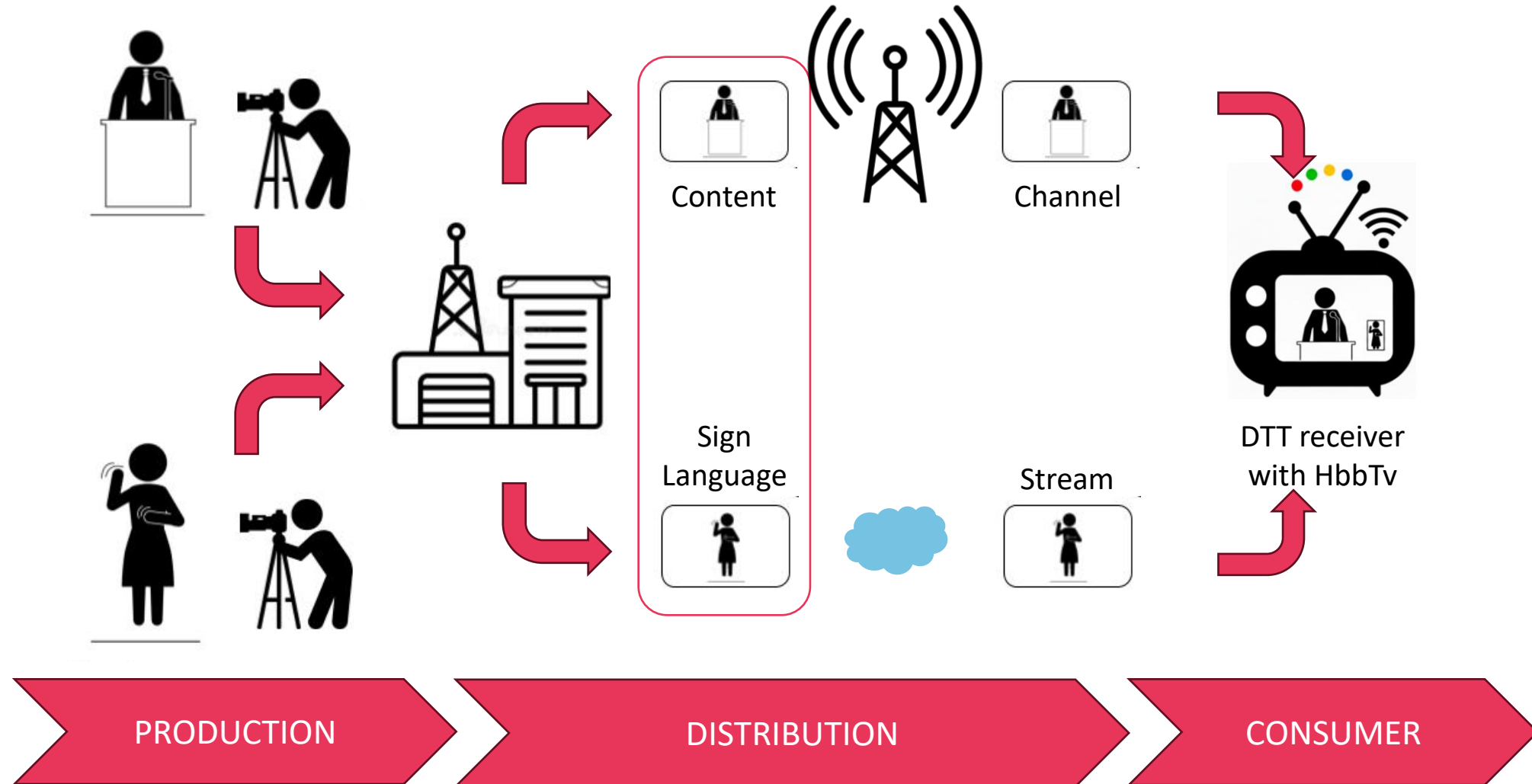
				
				



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Target Architecture: Sign Language in a Broadband Stream Synchronized with DTT



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Sign Language Stream



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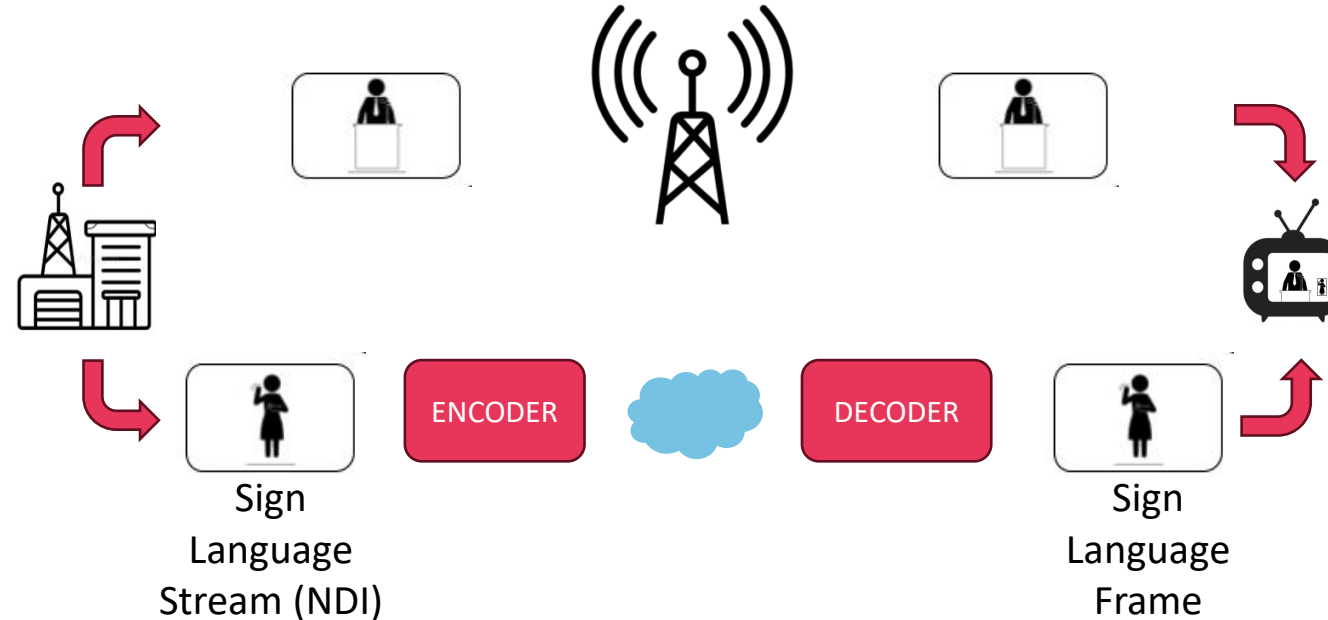
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The Challenges

1. Play the Sign Language stream **simultaneously** over the DTT
2. Ensure the Sign Language stream arrives **before** the DTT signal
3. **Synchronize** the DTT with the Sign Language stream

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Challenge I: Play the Sign Language stream simultaneously over the DTT



🎯 Our Choice

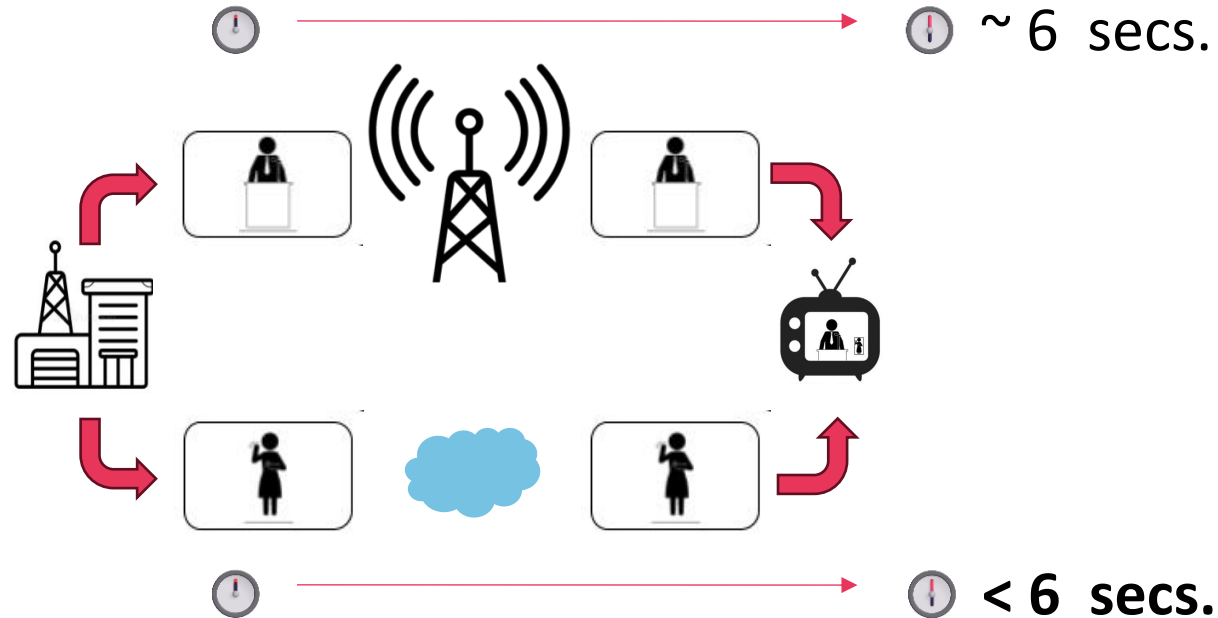
- Decode the second video stream by **software** using **WebAssembly**

💡 Why

- **Software decoding** is CPU-intensive, but video codecs are **optimized for delivery and playback**. The **quality level selected by users** (263×260, 25 fps, 500 Kbps) works well on **all devices**, even **low-end ones**.
- We rely on **standard**, well-tested and widely used **encoding** and **decoding** solutions (FFMPEG)

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Challenge II: Ensure the Sign Language stream arrives before the DTT signal



🎯 Our Choice

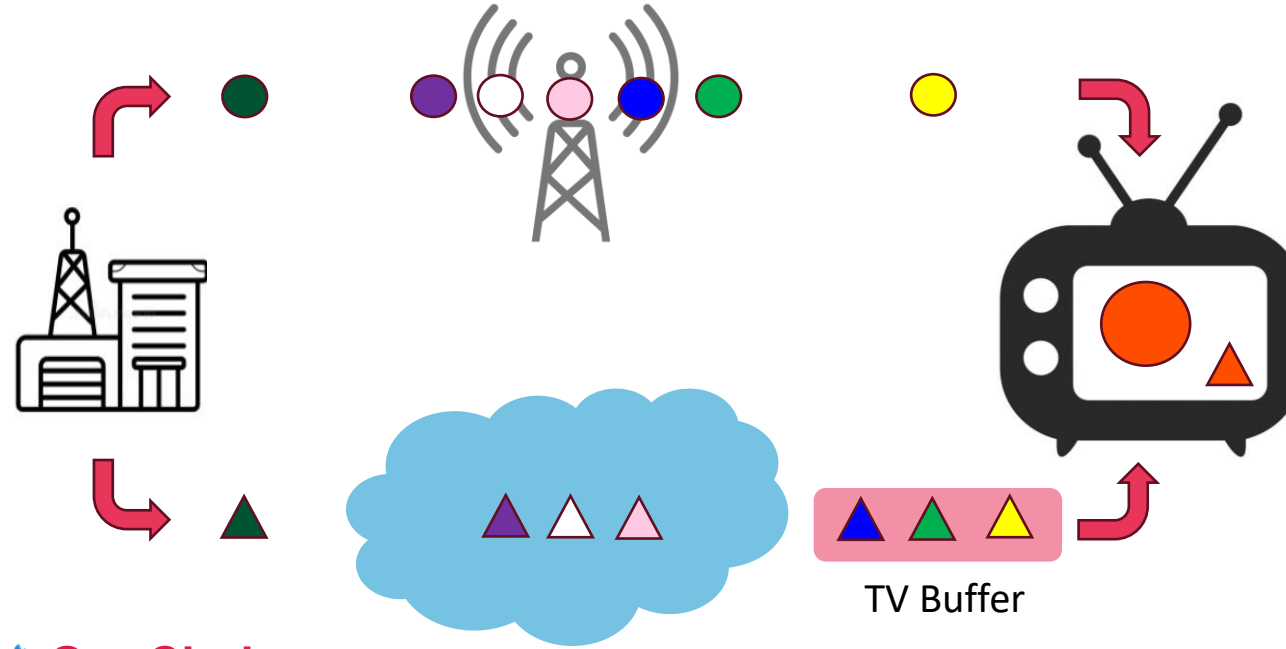
- Deliver the sign language stream using **MPEG DASH Low Latency**

💡 Why

- Provides an average delay between **2 and 6 seconds**, enough for this service
- Designed for **massive audiences** unlike WebRTC (or similar)
- A **standard solution**: Supported by existing players (we use **DASH.js**) and streaming providers

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Challenge III: Synchronize the DTT with the Sign Language stream



🎯 Our Choice

- Stamp both streams with the **same timecode** and embed the time in the DTT stream using **TEMI Timeline**. Additionally, use **Stream Events** to indicate the service availability

💡 Why

- The **TEMI Timeline** is the **most reliable and accurate synchronization mechanism** (< 200 ms / 5 frames)
- **Stream Events** enable us to **adjust the layout** when the service is **unavailable or already embedded in the content** (e.g., during ads or government broadcasts)

Wrap Up

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Wrap Up
Video Demonstration



Wrap Up

Conclusions

1. This solution makes the Sign Language service **discoverable, fast, and fully personalizable**, and therefore more **ACCESSIBLE**
 - It opens the door to offering **tailored streams that address different accessibility needs**
2. Works across **most scenarios** (DTT pre-recorded and pure live events, broadband, or VOD)
3. Built entirely on **open standards** for **production, delivery** and **consumption**
4. HbbTv **2.0.5** ensures full compatibility, but early tests show that there are compatible devices **from HbbTv 2.0.1**

Wrap Up Next Steps

We would like to get involved in an initiative to **treat Sign Language Service as additional media component**, just like Subtitles or Audio Description and to **standardize** both the **user experience** and the use of a **synchronized second stream** as the solution to deliver this service

Thank you!

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