Data-independent Sequencing
with the Timing Object

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EU FP7 MediaScape
Browsers + Global Timing
Demo: http://goo.gl/EqN40F

http://mcorp.no/pres/vegas16
Multi-device Timing Community Group

https://www.w3.org/community/webtiming/
Timing Object

- Represents **motion** through media
  - ... playback, progress, navigation, timer, media clock.
  - Position, velocity, acceleration related to axis/timeline
- **Timing & Control**
  - `timingObject.update({position: X, velocity: Y});`
  - Play, pause, time-shift, fast-forward, reverse, accelerate ...
Purpose of Timing Object (1/2)

- Temporal interoperability
  - Common interface
- Shared, external timing & control
  - Independent, internal synchronization
Purpose of Timing Object (2/2)

- **Gateway to multi-device media!**
  - Shared timing & control across Internet
  - Global timing & (remote) control
- **Timing Objects**
  - Proxies to online timing objects
- **Separation of concern**
  - Web programmers work with timing objects
  - Timing providers deal with timing
- **Temporal interoperability - distributed**
  - Reusability, integration, extensibility, flexibility,...
Multi-device Timing Community Group

https://www.w3.org/community/webtiming/

- Web and TV Interest Groups
  - https://www.w3.org/2011/webtv/
- Timing Object : Standard Draft Proposal
  - http://webtiming.github.io/timingobject/
- Timingsrc : Implementation (GitHub)
  - http://webtiming.github.io/timingsrc/
  - Timing Object
  - MediaSync - synchronization of HTML5 Media Elements
  - Sequencer - synchronization of timed data
- Online Timing Provider
  - Motion Corporation http://www.motioncorporation.com
Sequencing

- Activating and deactivating media items at the correct time
- Target: Web
  - Framework or Text Track?

- CONTENT
  - Data-independent sequencing
  - Generic programming tool
  - Any data any purpose

- MOTION
  - Avoid dependence on HTML5 video/audio as motion
  - Sequencing driven by Timing Object
Sequencer

- Generic tool for sequencing discrete media in single and multi-device timed Web applications.
  - Loading and unloading videos?
  - Collaborative viewing of anything Web?
  - Personalized ad-insertions?
  - Secondary device as a Web page?
  - Time-shifting live Web content?
  - Visualizing and replaying system logs or timed user interaction?
  - Timed prefetching of data?
  - Correct timestamping of captured media?
Details

- addCue(); removeCue(); -> (key, interval)
- Emit events -> enter, exit
- Timing Object
- Active keys
- Cue changes during playback
1. Create Sequencer

```html
1 <!DOCTYPE html>
2 <html>
3   <head>
4     <script text="javascript" src="http://github.com/webtiming/timingsrc/lib/timingsrc.js"></script>
5     <script text="javascript">
6       var init = function () {
7         // create timing object
8         var to = new TIMINGSRC.TimingObject();
9         // create sequencer
10        var s = new TIMINGSRC.Sequencer(to);
11      
12      if (document.readyState === "complete") init();
13     else window.onload = init;
14     </script>
15   </head>
16   <body>
17   </body>
18 </html>
```
2. Register cues

```javascript
// Timed data
var array = [
    { data: 'A', start: 0, end: 1 },
    { data: 'B', start: 2, end: 3 },
    { data: 'C', start: 4, end: 5 },
    { data: 'D', start: 6, end: 7 },
    { data: 'E', start: 8, end: 9 },
    { data: 'F', start: 10, end: 11 },
    { data: 'G', start: 12, end: 13 },
    { data: 'H', start: 14, end: 15 },
    { data: 'I', start: 16, end: 17 }
]

// Load timed data, use array indexes as keys into Sequencer
for (var i=0; i<array.length; i++) {
    var obj = array[i];
    s.addCue(i.toString(), new Interval(obj.start, obj.end));
}
```
3. Make a (simple) viewer

```javascript
var v = document.getElementById("viewer");

s.on("enter", function (e) {
    var i = parseInt(e.key);
    v.innerHTML = array[i].data;
});

s.on("exit", function (e) {
    v.innerHTML = "";
});
```
4. You’re done! Start playback

```javascript
document.getElementById('playButton').onclick = function () {
  timingObject.update({velocity:1.0});
};

document.getElementById('pauseButton').onclick = function () {
  timingObject.update({velocity:0.0});
};

document.getElementById('resetButton').onclick = function () {
  timingObject.update({position: 0.0});
};
```
Shared Motion Timing Provider

```javascript
var app = MCorp.app("your_appid");
app.run = function () {
    var timingProvider = app.motions["your_motion_name"];
    var to = new TimingObject({provider:timingProvider});
    // good to go!
};
app.init();
```

- Not limited to Web - anything IP
- And scalable too :)
Summary

- Web already excellent platform for precisely timed multimedia!
- With standardization - even better!
- Consider joining the Multi-device Timing CG
Thank you!
Integration
Media-centric -> Timing-centric
Default sequencing - Window sequencing
Implementation

● **Goals**
  ○ Precision, low resource consumption, correctness

● **setTimeout**
  ○ Precision typically down to a few milliseconds
  ○ Push for improvements in native setTimeout
Limitations

● **Goals**
  ○ simple concept - generic programming tool

● **No particular support for**
  ○ Relative timing statements
  ○ Repetitive patterns
  ○ Structured key-space

● **Avoid** - one sequencer that does it all.
● **Instead** - different sequencers suitable for different problems.