

OpenTimelineIO

SIGGRAPH 2017

<http://opentimeline.io>



P I X A R
S O F T W A R E R & D

- Overview
- Status Update
- Use Case Demos
- Roadmap
- Discussion



Overview

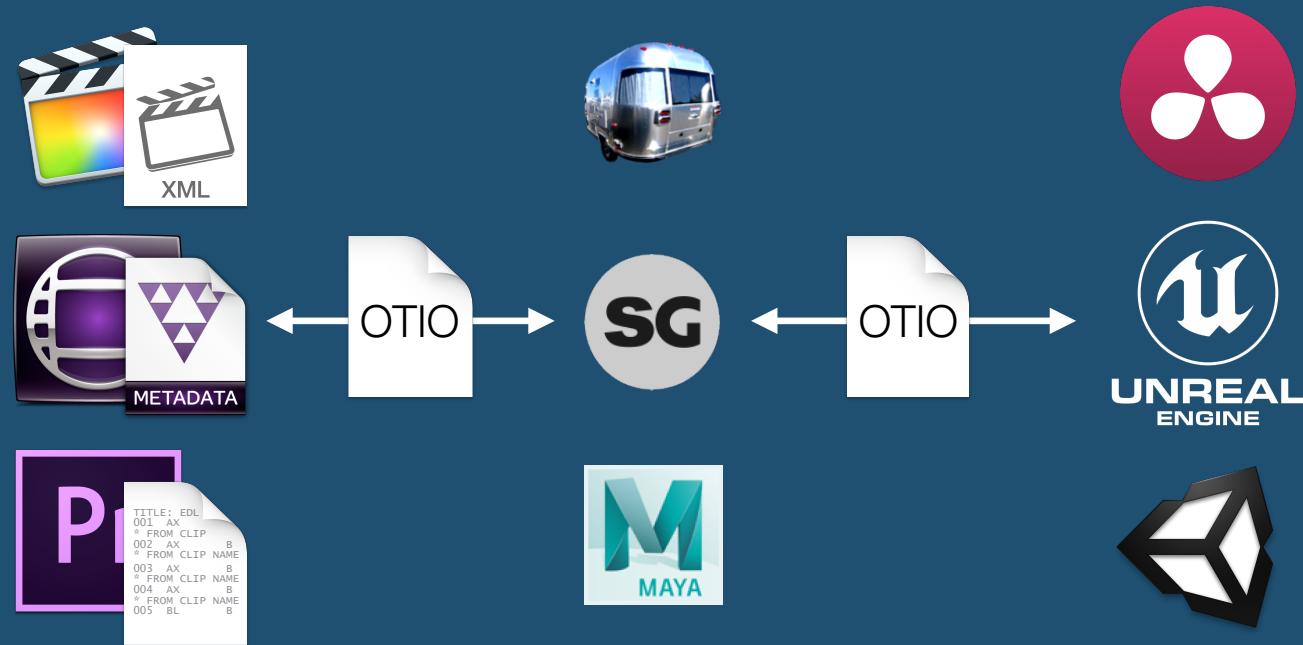


OTIO Overview

- Open Source API and interchange format for editorial timeline information.
- Converts between EDL, AAF, XML, etc.



Goal: Flexible Pipeline

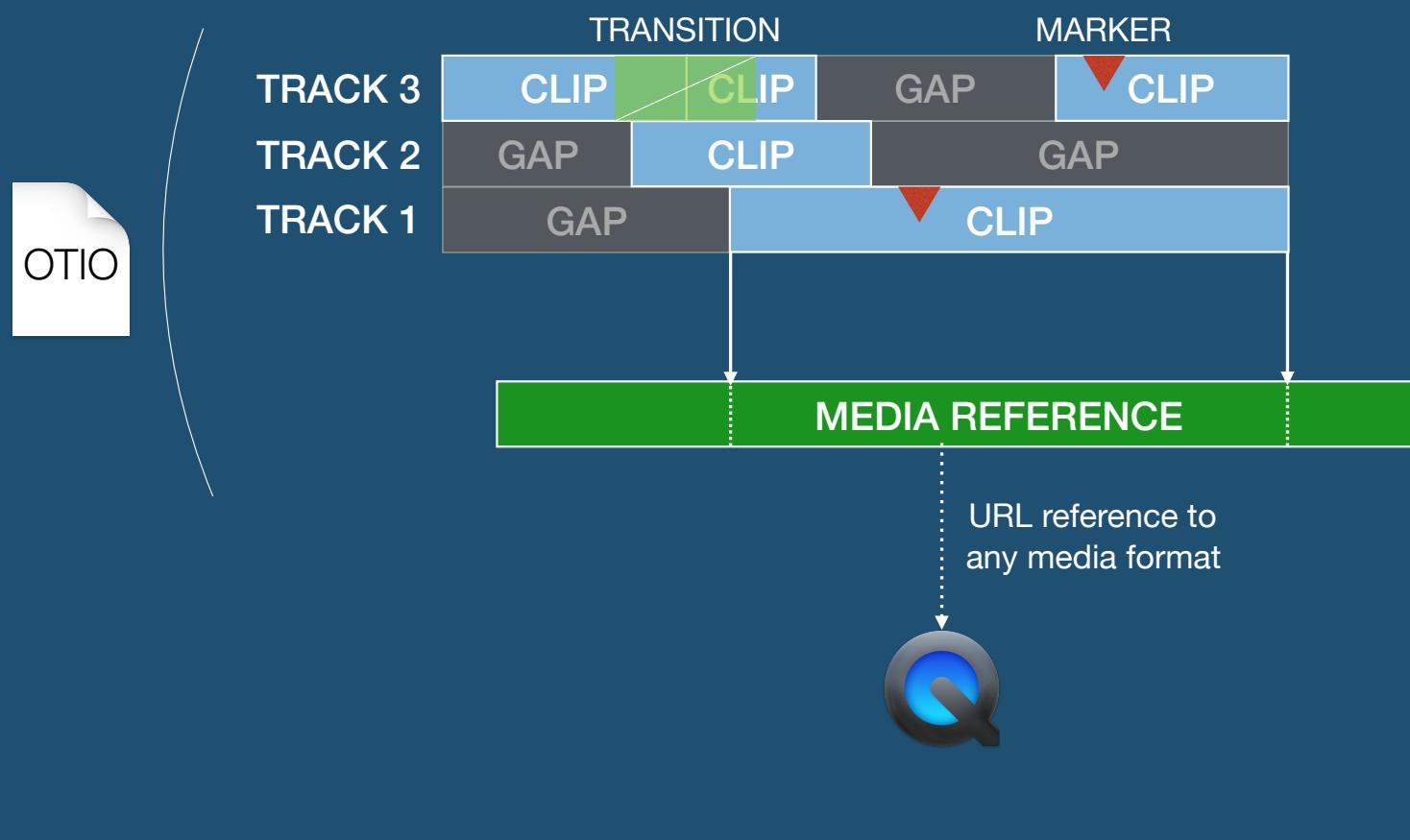


OTIO Overview

- Features:
 - JSON File Format
 - Python API
 - File Conversion Adapter Plugins
 - Media Linker Plugins
- No Embedded Media



OTIO Overview



OTIO File Format

```
1  "OTIO_SCHEMA": "Timeline.1",
2  "metadata": {},
3  "name": "CARS3_TLR1_Tools_Demo_2017.07.17.aaf",
4  "tracks": [
5      {
6          "OTIO_SCHEMA": "Stack.1",
7          "children": [
8              {
9                  "OTIO_SCHEMA": "Sequence.1",
10                 "children": [
11                     {
12                         "OTIO_SCHEMA": "Clip.1",
13                         "effects": [],
14                         "markers": [],
15                         "media_reference": {
16                             "OTIO_SCHEMA": "ExternalReference.1",
17                             "available_range": null,
18                             "metadata": {},
19                             "name": null,
20                             "target_url": "/shows/studio/diskfarm/TAKES_PXR_HeadLeader_AllRatios/take_1_mov/TAKES_PXR_HeadLeade
21                         },
22                         "metadata": {
23                             "pixar": {
24                                 "globaltake": "1",
25                                 "prod": "PXR",
26                                 "shot": "PXR_HeadLeader_AllRatios",
27                                 "unit": "studio"
28                             }
29                         },
30                         "name": "PXR_HeadLeader_AllRatios (stereo1)",
31                         "source_range": {
32                             "OTIO_SCHEMA": "TimeRange.1",
33                             "duration": {
34                                 "OTIO_SCHEMA": "RationalTime.1",
35                                 "rate": 24,
36                                 "value": 192
37                             },
38                             "start_time": {
39                                 "OTIO_SCHEMA": "RationalTime.1",
40                                 "rate": 24,
41                                 "value": 1
42                             }
43                         }
44                     }
45                 ]
46             }
47         ]
48     }
49 
```

Python API Example

```
113 ▼ def main():
114     args = parse_args()
115
116     timeline = otio.adapters.read_from_file(args.input)
117     _conform_timeline(timeline, args.folder)
118     otio.adapters.write_to_file(timeline, args.output)
119
120 ▼ def _conform_timeline(timeline, folder):
121     """
122         Look for replacement media for each clip in the given timeline.
123         The clips are relinked in place if media with a matching name is found.
124     """
125     for clip in timeline.each_clip():
126         # look for a media file that matches the clip's name
127         new_path = _find_matching_media(clip.name, folder)
128
129         # if we found one, then relink to the new path
130         if new_path:
131             clip.media_reference = otio.media_reference.External(
132                 target_url="file://" + new_path,
133                 available_range=None    # we don't know the available range
134             )
```



OTIO Adapters

Core



OpenTimelineIO



EDL



FCP7 XML

Contrib



HTTP Live Stream



RV Session



Maya Sequencer

Planned



AAF



Your Format



Another Format?



Status Update



OTIO Status Update

- Since last SIGGRAPH
 - 17 pre-release participant groups
 - 5 alpha releases
- Used in production
 - Pixar, Marvel Studios, Lucasfilm Animation, PIX System, and a few more



OTIO Status Update

- Public Beta as of today
 - <https://github.com/PixarAnimationStudios/OpenTimelineIO>
 - <http://opentimeline.io>



License

- Pixar Open Source License
 - Modified Apache 2.0 License
 - Same as OpenSubdiv & USD
- Need a Contributor License Agreement (CLA) to contribute code



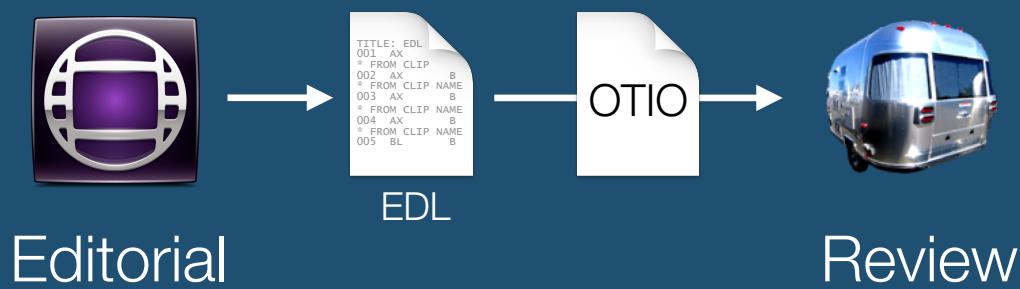
Use Case Demos



P X A R
ANIMATION STUDIOS



OTIO Use Case: Pixar



OTIO Use Case: Pixar

- Avid EDL to RV
- Relink media to latest renders
- Transitions



**THE FOLLOWING PREVIEW HAS BEEN APPROVED TO
ACCOMPANY THIS FEATURE
BY THE MOTION PICTURE ASSOCIATION OF AMERICA, INC.**

www.filmratings.com

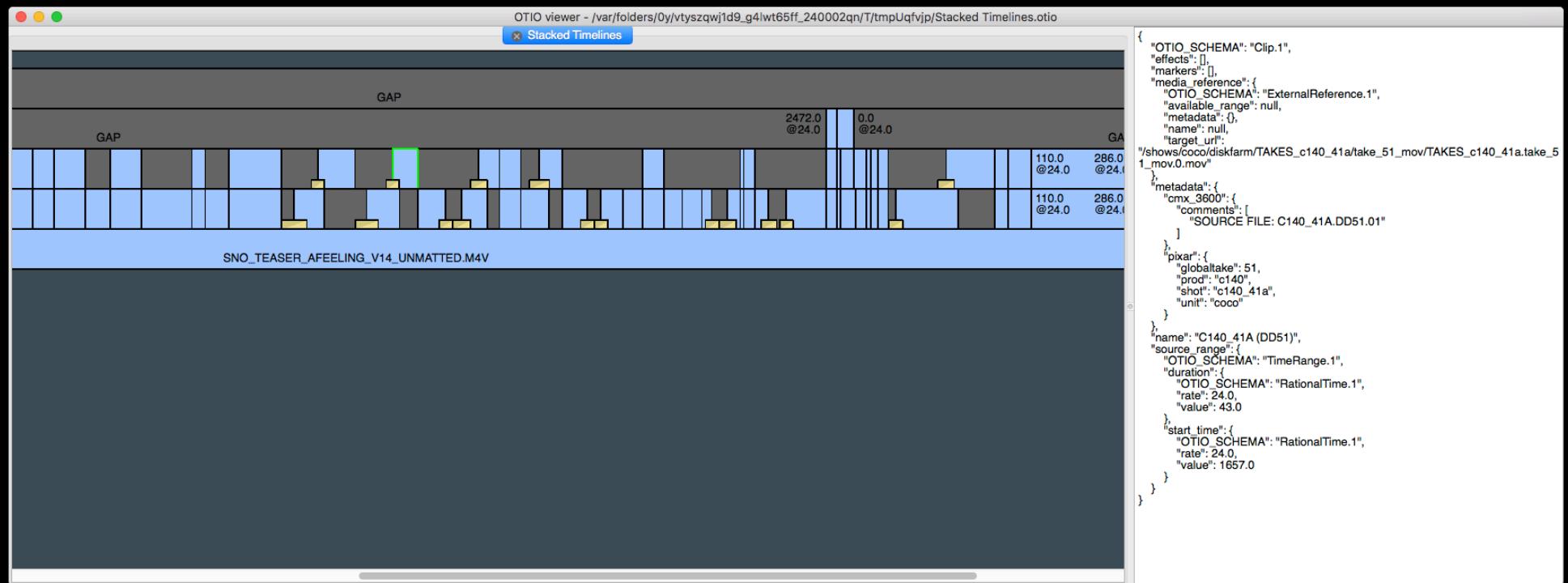
www.mpaa.org

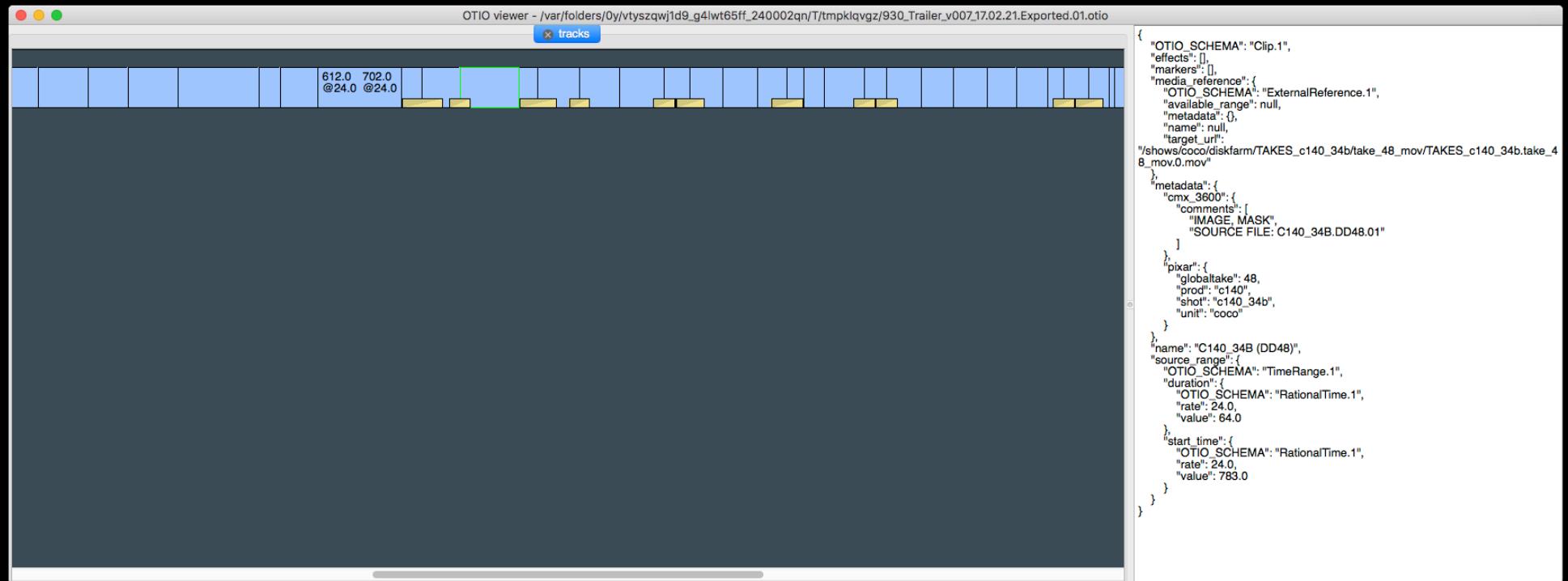
Disney · PIXAR

coco



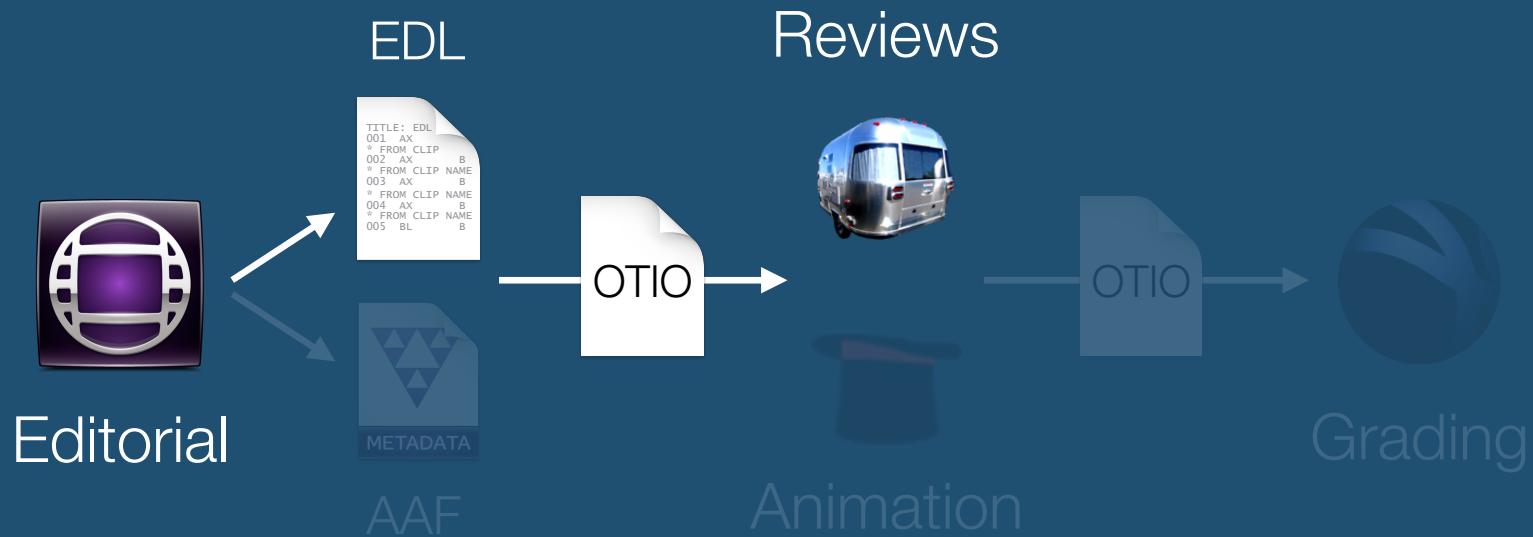






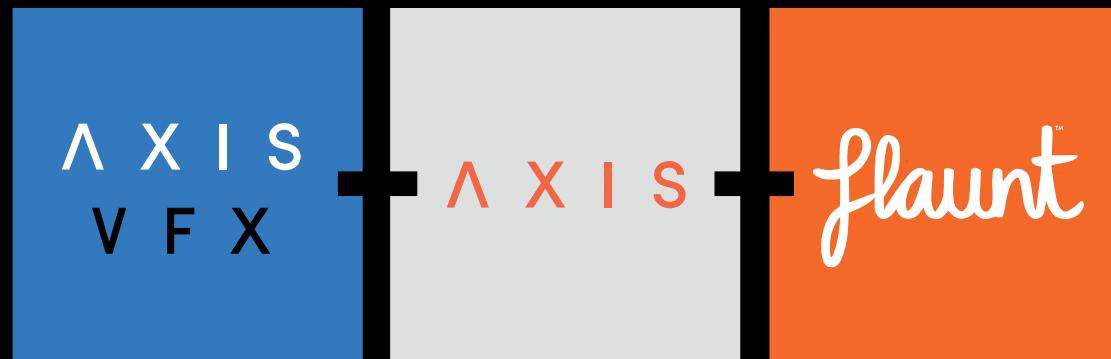


OTIO Use Case: Pixar



OTIO Use Case: Pixar





www.axisstudiosgroup.com

OTIO Use Case: Axis Studios

- Motivation: Editorial pipeline overhaul 2017
- Project types vary wildly at Axis (trailer, cut-scene, theme park, TV, film)
- We require:
 - Flexibility
 - Scalability
 - History
 - Portability

OTIO Use Case: Axis Studios

- Use case: Premiere Pro to Studio (multiple applications)
- Axis contribution (Bas Hesen):
 - FCP XML adapter ... instead of PRPROJ adapter
 - OTIO View ... for debugging during development (and beyond!)
- Principal usage: Python API to Editorial data (but still store XML, may change)

PIX | SYSTEM

Eric Reinecke
Sr. Software Engineer, Video Pipeline

```
from opentimelineio import opentime
```

```
>>> from opentimelineio.opentime import to_seconds
>>> import pixmediainfo
>>> container = pixmediainfo.container_from_file_path(
...     "002E_13_B.mov"
... )
>>> print(container.streams[0])
<MediaStream MediaType.Video index:0 at 0x102772390>
>>> print(container.streams[0].duration)
RationalTime(1141140, 24000)
>>> print(to_seconds(container.streams[0].duration))
47.5475
>>> last_frame = container.streams[0].frames[-1]
>>> print(last_frame.time_range)
TimeRange(RationalTime(1140139, 24000), RationalTime(1001, 24000))
```

```
>>> from opentimelineio.opentime import to_seconds
>>> import pixmediainfo
>>> container = pixmediainfo.container_from_file_path(
...     "002E_13_B.mov"
... )
>>> print(container.streams[0])
<MediaStream MediaType.Video index:0 at 0x102772390>
>>> print(container.streams[0].duration)
RationalTime(1141140, 24000)
>>> print(to_seconds(container.streams[0].duration))
47.5475
>>> last_frame = container.streams[0].frames[-1]
>>> print(last_frame.time_range)
TimeRange(RationalTime(1140139, 24000), RationalTime(1001, 24000))
```

HTML



HLS

mpeg-DASH

The logo features the word "mpeg-DASH" in a bold, black, sans-serif font. To the right of the word "DASH" are five small blue squares of varying shades, arranged horizontally.

```

#EXT-X-VERSION:7
#EXT-X-INDEPENDENT-SEGMENTS
#EXT-X-MEDIA-SEQUENCE:1
#EXT-X-PLAYLIST-TYPE:VOD
#EXT-X-TARGETDURATION:6
#EXT-X-MAP:BYTERANGE="616@0",URI="main.mp4"
#EXTINF:5.99467,
#EXT-X-BYTERANGE:121090@616
main.mp4
#EXTINF:5.99467,
#EXT-X-BYTERANGE:121201@121706
main.mp4

...

```



```

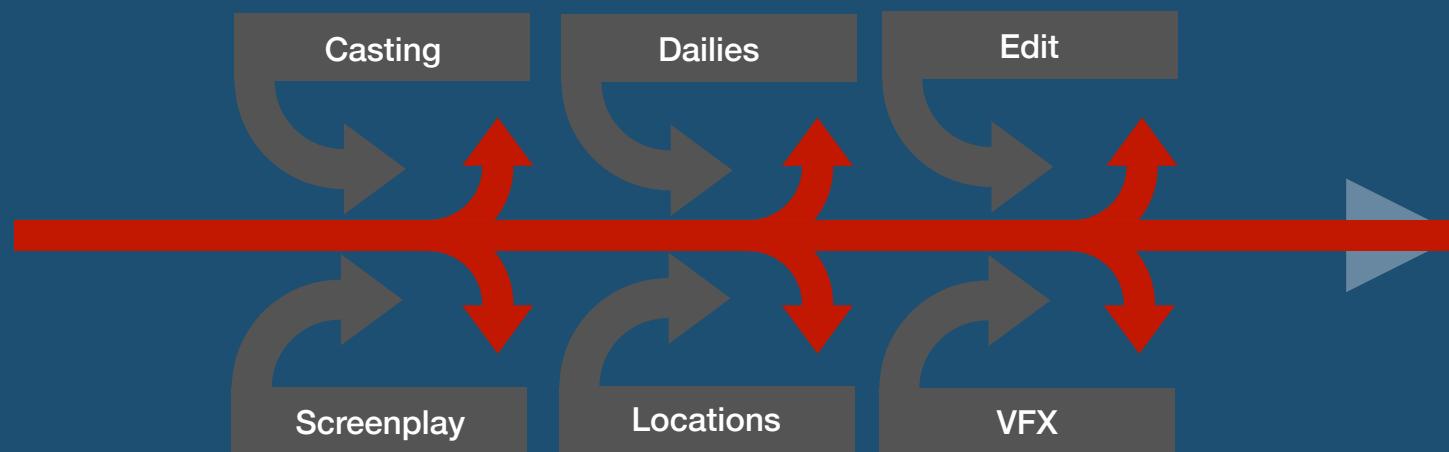
<?xml version="1.0"?>
<MPD xmlns="urn:mpeg:dash:schema:mpd:2011" mediaPresentationDuration="PT10M0.042667S" minBufferTime="PT1S"
profiles="urn:mpeg:dash:profile:isoff-on-demand:2011" type="static">
<Period>
  <AdaptationSet mimeType="audio/mp4" segmentAlignment="true">
    <Representation audioSamplingRate="..." bandwidth="..." codecs="..." id="...">
      <AudioChannelConfiguration schemeIdUri="..." value="2"/>
      <SegmentList duration="287744" timescale="48000">
        <Initialization range="0-615" sourceURL="main.mp4"/>
        <SegmentURL media="main.mp4" mediaRange="616-121705"/>
        <SegmentURL media="main.mp4" mediaRange="121706-242906"/>

      ...
    </SegmentList>
    </Representation>
  </AdaptationSet>
</Period>
</MPD>

```

```
{  
    "OTIO_SCHEMA": "Clip.1",  
    "source_range": {  
        "OTIO_SCHEMA": "TimeRange.1",  
        "duration": {  
            "OTIO_SCHEMA": "RationalTime.1",  
            "value": 287744,  
            "rate": 48000  
        },  
        "start_time": {  
            "OTIO_SCHEMA": "RationalTime.1",  
            "rate": 1,  
            "value": 0  
        }  
    },  
    "media_reference": {  
        "OTIO_SCHEMA": "ExternalReference.1",  
        "available_range": {  
            "OTIO_SCHEMA": "TimeRange.1",  
            "duration": {  
                "OTIO_SCHEMA": "RationalTime.1",  
                "value": 287744,  
                "rate": 48000  
            },  
            "start_time": {  
                "OTIO_SCHEMA": "RationalTime.1",  
                "rate": 1,  
                "value": 0  
            }  
        },  
        "metadata": {  
            "streaming": {  
                "media_byterange": {  
                    "byte_count": 121090,  
                    "byte_offset": 616  
                },  
                "init_byterange": {  
                    "byte_count": 616,  
                    "byte_offset": 0  
                },  
                "init_url": "main.mp4"  
            },  
            "target_url": "main.mp4"  
        }  
    }  
}
```

Production Pipeline



PIX | SYSTEM

Roadmap



OTIO Roadmap

- Driven by studio use cases
- Community contributions



OTIO Roadmap

[PixarAnimationStudios / OpenTimelineIO](#) Private

Unwatch 36 Star 10 Fork 9

Code Issues 29 Pull requests 2 Projects 0 Wiki Settings Insights

Filters is:issue is:open Labels Milestones New issue

	Author	Labels	Projects	Milestones	Assignee	Sort
<input type="checkbox"/> ① 29 Open ✓ 38 Closed						
<input type="checkbox"/> ⓘ Transition support in otioview	#124 opened 5 hours ago by jminor	Public Beta 1				
<input type="checkbox"/> ⓘ Drop frame support in OTIO	#123 opened 7 days ago by ssteinbach					
<input type="checkbox"/> ⓘ Rename "Filler" to "gap" bug	#120 opened 8 days ago by ssteinbach	Public Beta 1				1
<input type="checkbox"/> ⓘ interface for passing arguments to adapters	enhancement #119 opened 9 days ago by ssteinbach					
<input type="checkbox"/> ⓘ Rename Sequence to Track	#112 opened 22 days ago by jminor					
<input type="checkbox"/> ⓘ Quick-start instructions for otioview	help wanted #106 opened on Jun 1 by jminor	SIGGRAPH 2017				
<input type="checkbox"/> ⓘ IMF CPL Adapter	help wanted needs discussion #104 opened on May 12 by ssteinbach					
<input type="checkbox"/> ⓘ Transition support in the CMX EDL adapter writer	enhancement help wanted #103 opened on May 5 by ssteinbach	SIGGRAPH 2017				
<input type="checkbox"/> ⓘ RV Adapter Marker support	enhancement help wanted #102 opened on May 5 by ssteinbach	Public Beta 1				
<input type="checkbox"/> ⓘ Transition support in the FCP XML adapter	enhancement #100 opened on May 3 by ssteinbach	Public Beta 1				
<input type="checkbox"/> ⓘ XMP/UMC Support	help wanted					



OTIO Roadmap

- Next Steps:
 - AAF Adapter
 - C/C++ API



C API Draft

```
45▼ typedef struct {  
46    double time_value; /* Number of frames / samples (may not be an integer) */  
47    double time_scale; /* Number of frames per second, again may not be an even number. Example 29.9  
48▲ } OTIOTime;  
49  
50#ifndef OTIO_INTERNAL  
51  
52typedef void OTI0Object; /* Markers can be stored in Tracks or Timelines. */  
53  
54/* Common functionality that can be used on all objects (Timelines, Tracks, Sequences, Clips, Transitions). */  
55  
56extern OTI0Object *otio_load(char *string); /* takes a string containing the Json Description of an object */  
57extern int otio_save(char *path, OTI0Object *object); /* Takes a Object and saves it to a file */  
58extern OTI0Object *otio_object_create(OTI0ObjectType type, char *name); /* Creates a new empty object */  
59extern OTI0Object *otio_object_clone(OTI0Object *object, uint recursivly); /* Clones an existing object */  
60extern void otio_object_free(OTI0Object *object); /* free an object, and its children. if a sequence, free all its tracks */  
61  
62  
63extern OTI0ObjectType otio_object_type_get(OTI0Object *object); /* get the type of an object (if you have an object pointer) */  
64extern char *otio_object_name_get(OTI0Object *object); /* Get the name of an object. Pointer to a string */  
65extern void otio_object_name_set(OTI0Object *object, char *name); /* Set the name of the object */  
66extern void *otio_object_parent_get(OTI0Object *object); /* Get the parent object, of one item in a sequence */  
67extern void *otio_object_next_get(OTI0Object *object); /* get the next object in the sequence */  
68extern void *otio_object_previous_get(OTI0Object *object); /* get the previous object in the sequence */  
69extern void otio_object_detach(OTI0Object *object); /* Detaches the object from its parent. */  
70extern void otio_object_insert_before(OTI0Object *parent, OTI0Object *object, OTI0Object *before); /* Insert an object before another */  
71extern void otio_object_insert_after(OTI0Object *parent, OTI0Object *object, OTI0Object *after); /* Insert an object after another */  
72extern void otio_object_user_data_set(OTI0Object *object, void *user_data); /* Attach a pointer to user data */  
73extern void *otio_object_user_data_get(OTI0Object *object); /* Get the attached user pointer */  
74  
75  
76/* Functions only applicable to composable objects. (OTIO_OT_TRACK, OTIO_OT_SEQUENCE, OTIO_OT_CLIP, OTIO_OT_TRANSITION) */  
77  
78/* OTIO_OT_TRACK and OTIO_OT_SEQUENCE objects can have children of any composable type. OTIO_OT_CLIP and OTIO_OT_TRANSITION objects can have children of any type. */
```

Thanks
Eskil Steenberg
eskil@quelsolaar.com

```
72 extern void>
73 extern void>
74 ->
75 ->
76 /* Functions
77 ->
78 /(* OTTQ OT T
79 <-->
```



Contributions



OTIO Call for Contributions

- Use cases written up on the wiki
- RationalTime test cases to illustrate problem with floating point value/rate
- Sample EDLs, AAFs, XMLs, etc.
- Feedback on C/C++ API for native support in 3rd party tools



OTIO Call for Contributions

- Support for timing effects
- Adapters for IMF/CPL, ALE, etc.
- Change lists



Discussion



Follow up

- We're available right after this (bottom of the escalator)
- 1-on-1 meetings all week
- To schedule something, contact opentimelineio@pixar.com



Thank You

- Joshua Minor - joshm@pixar.com - @jminor
- Stephan Steinbach - steinbach@pixar.com - @stephan_gfx
- Kyle McDaniel - kmcdaniel@pixar.com
- opentimelineio@pixar.com
- <http://opentimeline.io>

