

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

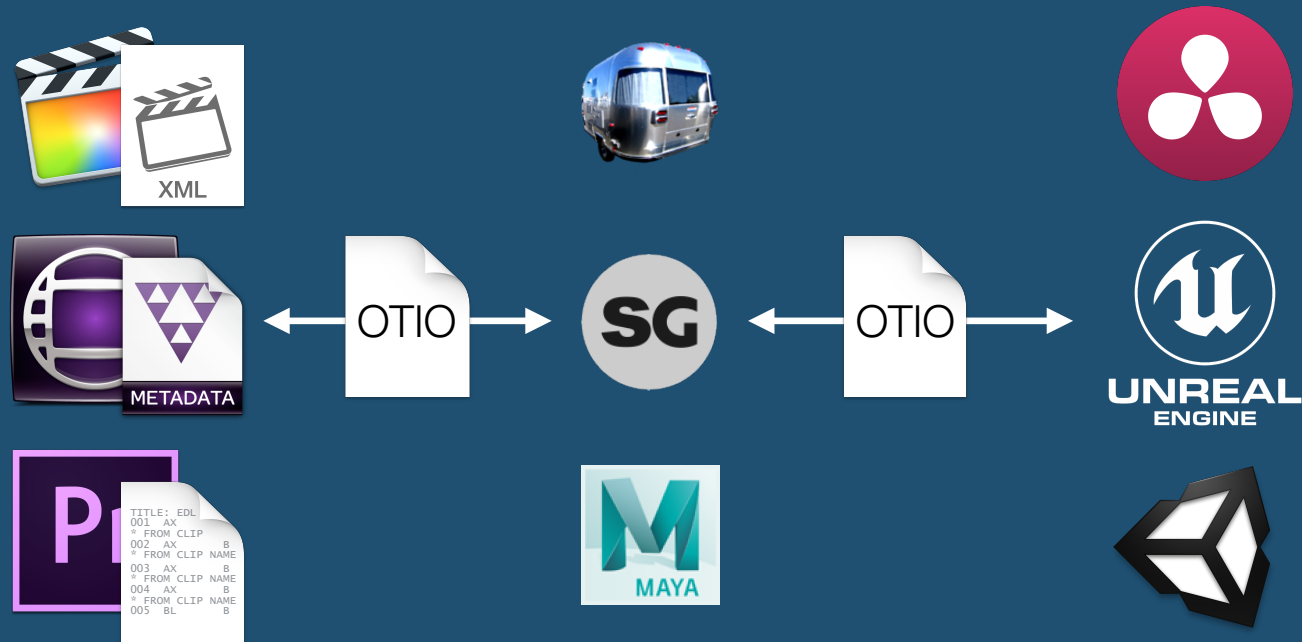


OTIO Overview

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



Goal: Flexible Pipeline

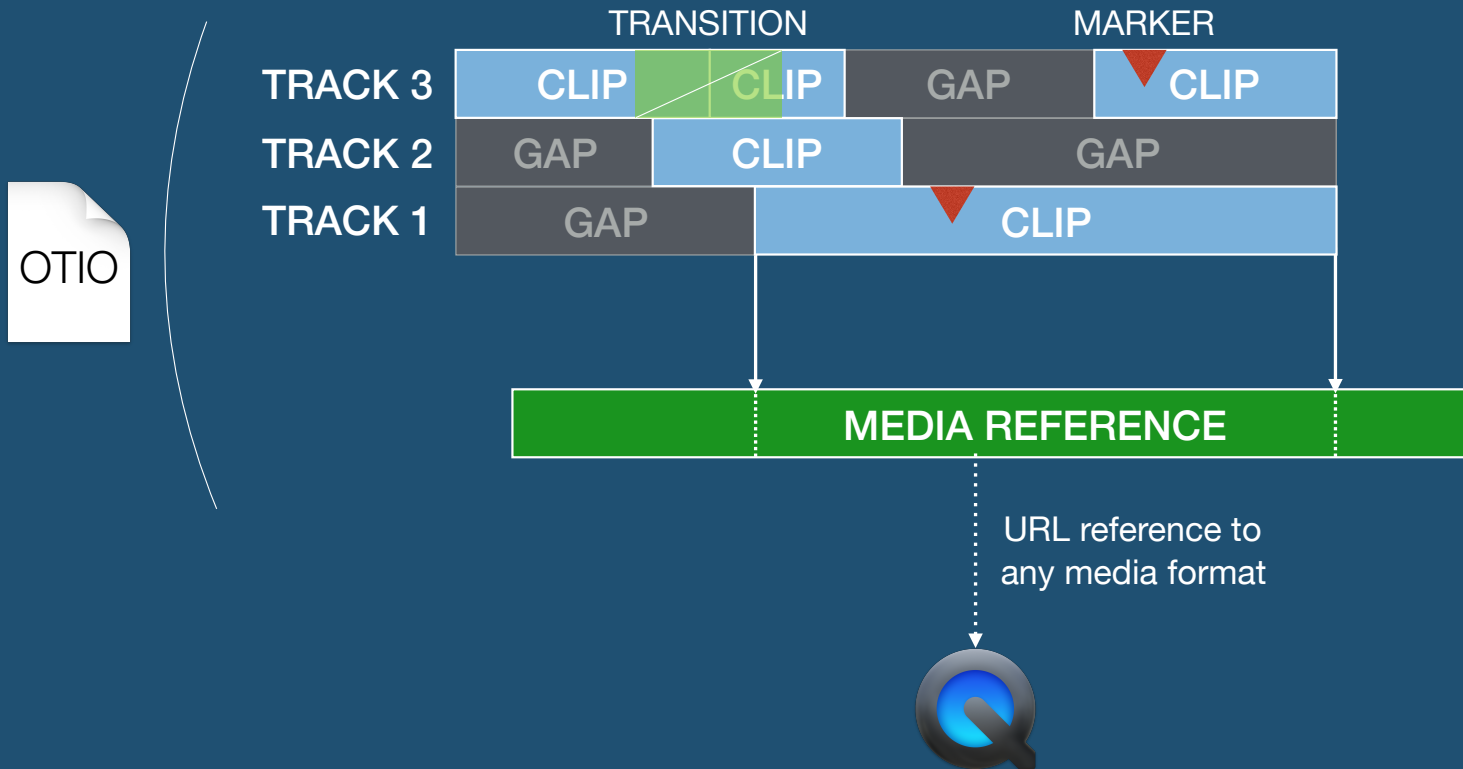


OTIO Overview

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



OTIO Overview



OTIO File Format

```
1 {
2   "OTIO_SCHEMA": "Timeline.1",
3   "metadata": {},
4   "name": "CARS3_TLR1_Tools_Demo_2017.07.17.aaf",
5   "tracks": {
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_HeadLeader_AllRatios_take_1.mov",
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 ▼     """ Look for replacement media for each clip in the given timeline.
122     The clips are relinked in place if media with a matching name is found.
123 ▲     """
124 ▼     for clip in timeline.each_clip():
125         # look for a media file that matches the clip's name
126         new_path = _find_matching_media(clip.name, folder)
127
128         # if we found one, then relink to the new path
129 ▼         if new_path:
130             clip.media_reference = otio.media_reference.External(
131                 target_url="file://" + new_path,
132                 available_range=None # we don't know the available range
133             )
134
```

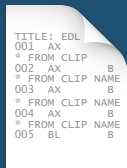


OTIO Adapters

Core



OpenTimelineIO



EDL



FCP7 XML

Contrib



HTTP Live Stream



RV Session



Maya Sequencer

Planned



AAF



Your Format



Another Format?

Simple

“Just Right”

Complex

EDL

OTIO

AAF



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



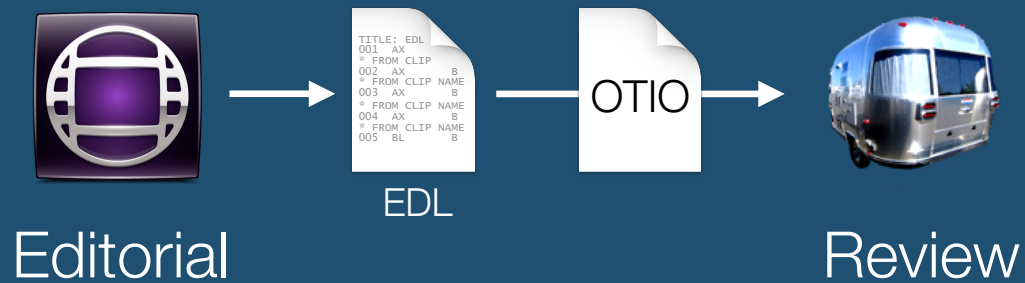
X

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.**

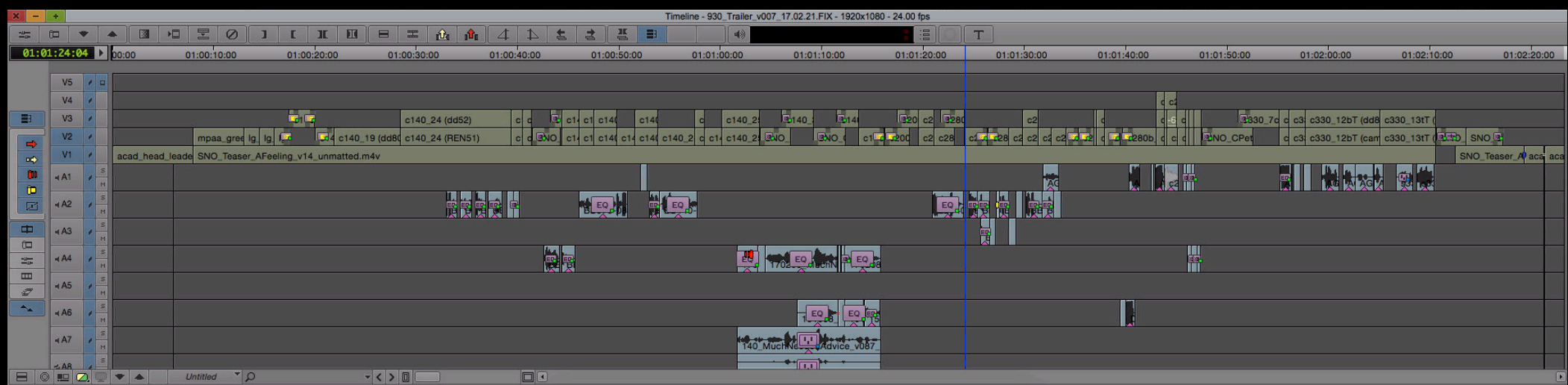
www.filmratings.com

www.mpaa.org

Disney · PIXAR

COCO





OTIO viewer - /var/folders/0y/vtyszqwj1d9_g4lwt65ff_240002qn/T/tmpUqfvjp/Stacked Timelines.otio

Stacked Timelines

GAP

GAP

2472.0
@ 24.0

0.0
@ 24.0

GA

110.0
@ 24.0

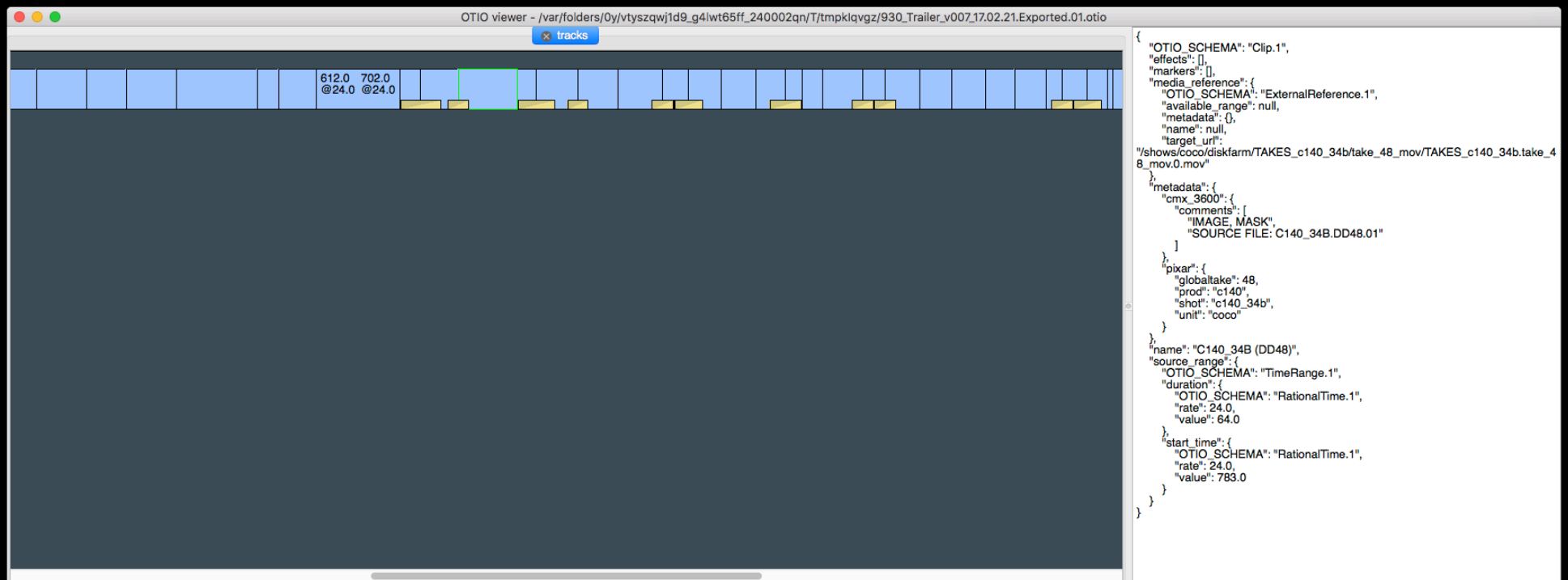
286.0
@ 24.0

110.0
@ 24.0

286.0
@ 24.0

SNO_TEASER_AFEELING_V14_UNMATTED.M4V

```
{
  "OTIO_SCHEMA": "Clip.1",
  "effects": [],
  "markers": [],
  "media_reference": {
    "OTIO_SCHEMA": "ExternalReference.1",
    "available_range": null,
    "metadata": {},
    "name": null,
    "target_url":
"/shows/coco/diskfarm/TAKES_c140_41a/take_51_mov/TAKES_c140_41a.take_5
1_mov.0.mov"
  },
  "metadata": {
    "cmx_3600": {
      "comments": [
        "SOURCE FILE: C140_41A.DD51.01"
      ]
    }
  },
  "pixar": {
    "globaltake": 51,
    "prod": "c140",
    "shot": "c140_41a",
    "unit": "coco"
  }
},
{
  "name": "C140_41A (DD51)",
  "source_range": {
    "OTIO_SCHEMA": "TimeRange.1",
    "duration": {
      "OTIO_SCHEMA": "RationalTime.1",
      "rate": 24.0,
      "value": 43.0
    },
    "start_time": {
      "OTIO_SCHEMA": "RationalTime.1",
      "rate": 24.0,
      "value": 1657.0
    }
  }
}
}
```



TAKES_c140_26b.take_53_fullmov.0.mov -- Frame 54

← V →

Name

▶ TAKES_acad_tailpop_239.take_2.* (2) (1)

SEQUENCES

▼

Default Sequence

STACKS

tracks

Default Stack

Inputs Edit

TAKES_acad_head_leader_239.take_1.*

blank,start=86400.0,end=86447.0,fps=24.0

TAKES_acad_head_leader_239.take_1.* (2)

blank,start=86449.0,end=86495.0,fps=24.0

TAKES_mpaa_green_preview_239.take_8_fullmov.0

TAKES_lg_black239.take_2_fullmov.0

TAKES_lg_disneysparkle_trailer239.take_3.*

TAKES_lg_pixarluxo_head239f.take_1_fullmov.0

TAKES_c140_17d.take_96_fullmov.0

C140_17D (DD96)

blank,start=86783.0,end=86783.0,fps=24.0

SNO_TEASER_AFEELING_V14_UNMATTED.M4V

TAKES_c140_18.take_64_fullmov.0 (2)

TAKES_c140_19.take_80_fullmov.0

TAKES_c140_24.take_52_fullmov.0

TAKES_c140_25d.take_66_fullmov.0

TAKES_c140_47b.take_43_fullmov.0

blank,start=87297.0,end=87297.0,fps=24.0

SNO TEASER AFEELING V14 UNMATTED.M4V

00:42:01 min

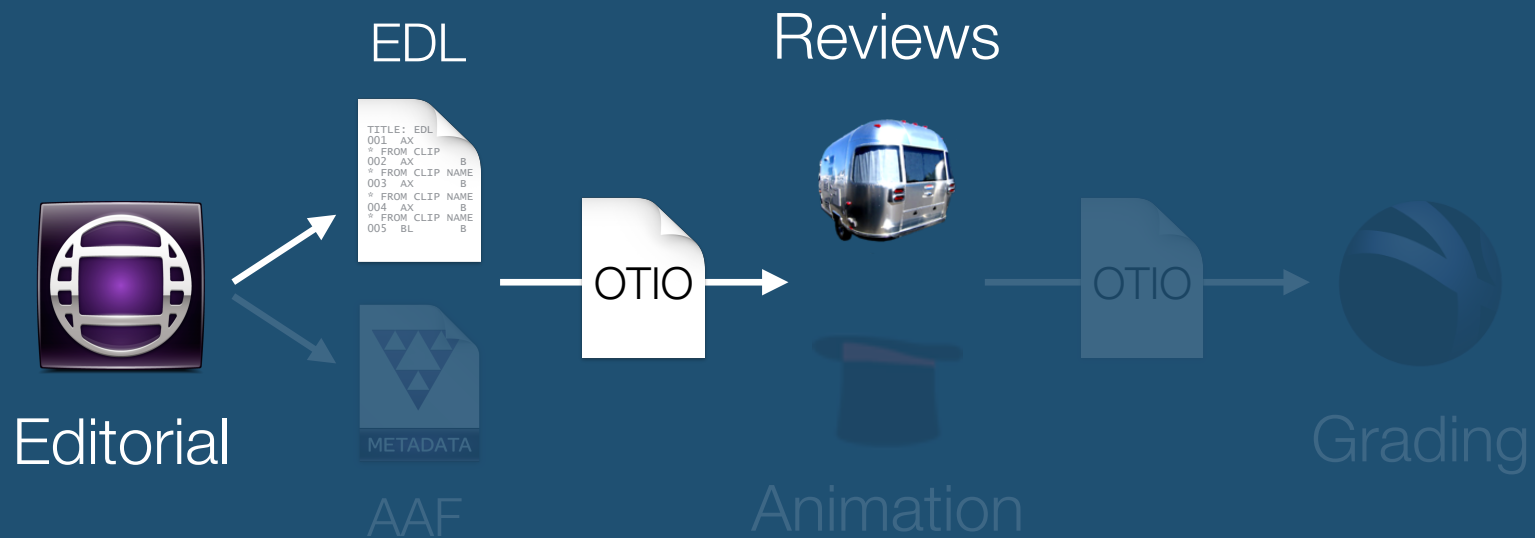


00:02:06

00:42:01 min

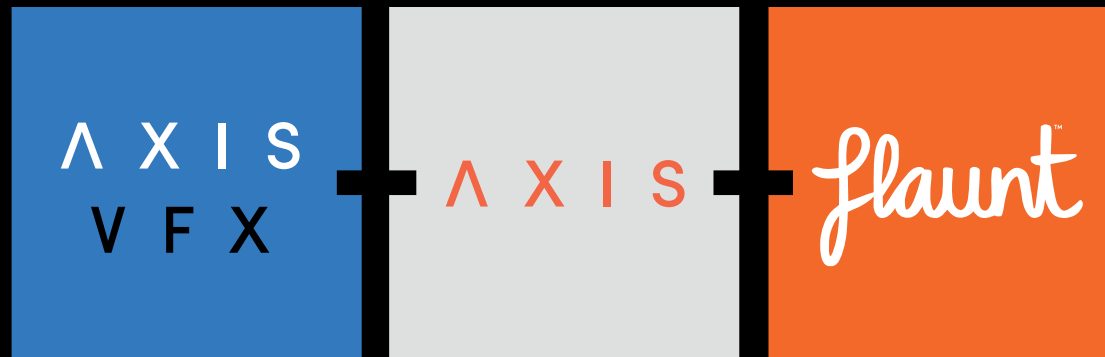
24.00 0.0 fps

OTIO Use Case: Pixar



OTIO Use Case: Pixar





www.axisstudiosgroup.com

OTIO Use Case: Axis Studios

- ✦ Movitation: 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
.....

```
#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>
```

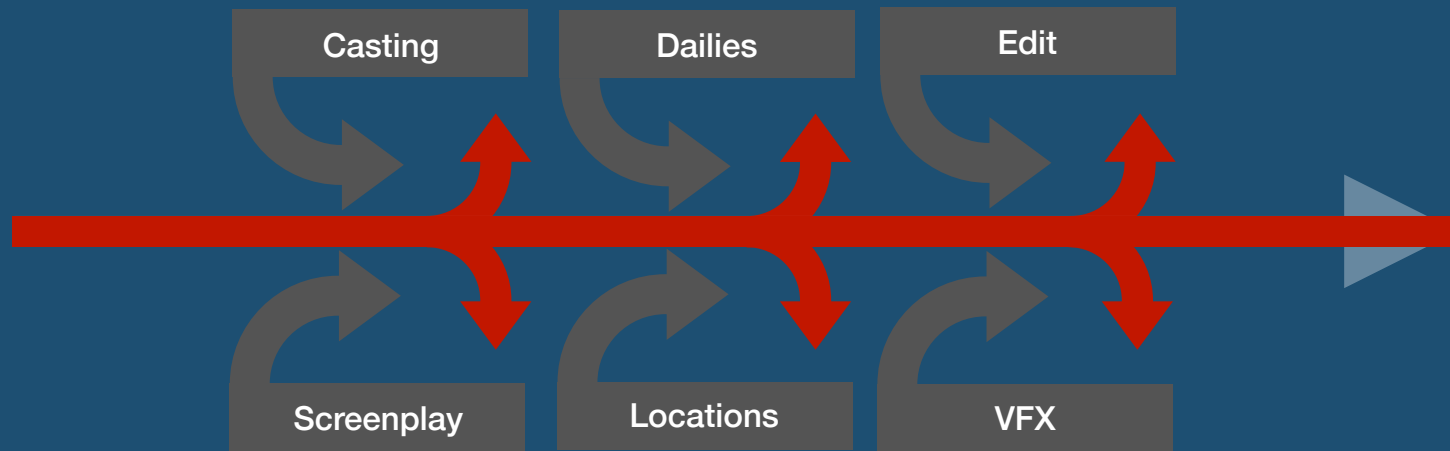


```

{
  "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

Labels Milestones

New issue

<input type="checkbox"/>	29 Open ✓ 38 Closed	Author	Labels	Projects	Milestones	Assignee	Sort
<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 29.97  
48 ▲ } OTIOTime;  
49  
50 #ifndef OTIO_INTERNAL  
51  
52 typedef void OTIOObject; /* Markers can be stored in Tracks or Timelines. */  
53  
54 /* Common functionality that can be used on all objects (Timelines, Tracks, Sequences, Clips, Tran  
55  
56 extern OTIOObject *otio_load(char *string); /* takes a string containing the Json Description of  
57 extern int *otio_save(char *path, OTIOObject *object); /* Takes a Object and saves it to a  
58 extern OTIOObject *otio_object_create(OTIOObjectType type, char *name); /* Creates a new empty ob  
59 extern OTIOObject *otio_object_clone(OTIOObject *object, uint recursively); /* Clones an existing  
60 extern void *otio_object_free(OTIOObject *object); /* free an object, and its children. if a  
61  
62  
63 extern OTIOObjectType otio_object_type_get(OTIOObject *object); /* get the type of an object (if yo  
64 extern char *otio_object_name_get(OTIOObject *object); /* Get the name of an object. Pointe  
65 extern void *otio_object_name_set(OTIOObject *object, char *name); /* Set the name of the ob  
66 extern void *otio_object_parent_get(OTIOObject *object); /* Get the parent object, of one i  
67 extern void *otio_object_next_get(OTIOObject *object); /* get the next object in the sequen  
68 extern void *otio_object_previous_get(OTIOObject *object); /* get the next object in the se  
69 extern void *otio_object_detach(OTIOObject *object); /* Detaches the object from its parent.  
70 extern void *otio_object_insert_before(OTIOObject *parent, OTIOObject *object, OTIOObject *b  
71 extern void *otio_object_insert_after(OTIOObject *parent, OTIOObject *object, OTIOObject *af  
72 extern void *otio_object_user_data_set(OTIOObject *object, void *user_data); /* Attach a poi  
73 extern void *otio_object_user_data_get(OTIOObject *object); /* Get the attached user pointe  
74  
75  
76 /* Functions only applicable to composable objects. (OTIO_OT_TRACK, OTIO_OT_SEQUENCE, OTIO_OT_CLIP,  
77  
78 /* OTIO_OT_TRACK and OTIO_OT_SEQUENCE objects can have children of any composable type. OTIO_OT_CL  
79  
80 extern int *otio_object_get_children_count(OTIOObject *object); /* Get the number of child
```

Thanks
Eskil Steenberg
eskil@quelsolar.com



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>

