

The Timeline Ontology

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Introduction

This document describes the Timeline ontology developed in the [Centre for Digital Music](#) in [Queen Mary, University of London](#). The first draft of the ontology was written in November, 2004. Further details about the Timeline ontology, related ontologies, and the technologies on which this ontology is founded, please see the [reference section](#).

This ontology is centered around the notion of *timeline*, seen here as a way to identify a temporal *backbone*. A timeline may support a signal, a video, a score, a work, etc. A particular instance of a timeline is the physical one, on which *the 29th of October, 2007* is defined.

This ontology, used with the [Event ontology](#), can be used to annotate sections of a signal, a video, or any *temporal* object. For example, it can be used to express:

1. This shot holds between this frame and that frame, in this video
2. This performance happened at that particular date
3. In this song, the first chorus is before the second verse

4. A new structural segment starts at 2 minutes and 43 seconds, on this signal
5. This signal is a sampled version of this one
6. This part of the score corresponds to this section in an actual performance (in progress...)

Some tools to manipulate data from this ontology can be found in the [motools project on Sourceforge](#).

This documentation page is a first draft. All feedback on either the ontology or this page is welcomed! The best place to do so are the [Event ontology mailing list](#) or the [Music ontology mailing list](#), for music-related use cases. Or feel free to email the authors mentioned above.

The design and layout of this ontology document is based on the [Music Ontology](#) and [FOAF Vocabulary](#) specification documents.

Namespaces

Several namespaces will be assumed to have been defined for the remainder of this document. These are as follows :

Prefix	XML Namespace	Description
tl	http://purl.org/NET/c4dm/timeline.owl#	The Timeline Ontology
time	http://www.w3.org/2006/time#	OWL-Time

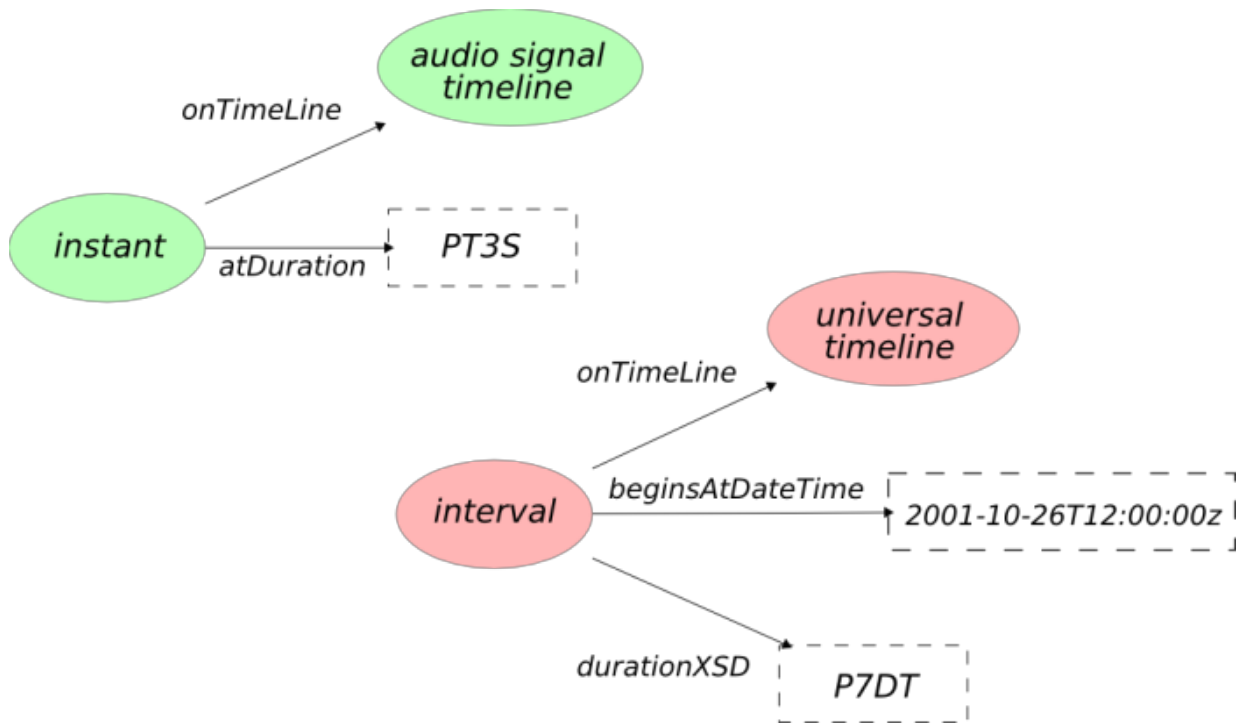
The Timeline Model

This ontology defines the **TimeLine** concept, representing a coherent backbone for addressing temporal information. Each *temporal* object (signal, video, performance, work, etc.) can be associated to such a timeline. Then, a number of **Interval** and **Instant** can be defined on this timeline, using the **tl:onTimeLine** property.

A timeline is associated to one or several **coordinate systems**, allowing to address a particular point on them. Here, we use XML-Schema datatypes to define these systems. Therefore, an instant defined on a timeline may be linked to a literal in the corresponding XSD datatype. Such restrictions are captured within the ontology, using sub-properties (constrained to one particular datatype) of the **tl:at** property.

Two timelines may be linked together, using the **TimeLineMap** concept. For example, the **UniformSamplingMap** concept subsumes **TimeLineMap**, and captures the fact that a digital timeline is a sampled version of an analog timeline (and holds information about the sampling frequency). Another example is the **ShiftMap**, which captures a simple translation between timelines.

An instant on a signal timeline ([Smells like teen spirit, as published on the Nevermind album](#)), and an interval on the physical timeline can be depicted as follows:



The corresponding RDF/N3 code is the following:

```

@prefix event: <http://purl.org/NET/c4dm/event.owl#>.
@prefix tl: <http://purl.org/NET/c4dm/timeline.owl#>.

:instant
  a tl:Instant;
  tl:timeline <http://zitgist.com/music/signal/6da76448-982a-4a01-b65b-9a710301c9c9>
  tl:at "PT3S"^^xsd:duration;
  .

:interval
  a tl:Interval;
  tl:timeline tl:universaltimeline;
  tl:start "2001-10-26T12:00:00Z"^^xsd:dateTime;
  tl:duration "P7DT";
  .

```

Overview of Terms

An alphabetical index of the ontology terms, divided into classes, properties and individuals. All the terms are hyperlinked to their detailed description for quick reference.

Classes: | [AbstractInstant](#) | [AbstractInterval](#) | [AbstractTimeLine](#) | [ContinuousTimeLine](#) | [DiscreteInstant](#) | [DiscreteInterval](#) | [DiscreteTimeLine](#) | [Instant](#) | [Interval](#) | [OriginMap](#) | [PhysicalTimeLine](#) | [RelativeInstant](#) | [RelativeInterval](#) | [RelativeTimeLine](#) | [ShiftMap](#) | [TimeLine](#) | [TimeLineMap](#) | [UTInstant](#) | [UTInterval](#) | [UniformSamplingMap](#) | [UniformSamplingWindowingMap](#) | [UniformWindowingMap](#) |

Properties: | [after](#) | [at](#) | [atDate](#) | [atDateTime](#) | [atDuration](#) | [atInt](#) | [atReal](#) | [atYear](#) | [atYearMonth](#) | [before](#) | [beginsAtDateTime](#) | [beginsAtDuration](#) | [beginsAtInt](#) | [contains](#) | [delay](#) | [domainTimeLine](#) | [duration](#) | [durationInt](#) | [durationXSD](#) | [during](#) | [end](#) | [endsAtDateTime](#) | [endsAtDuration](#) | [endsAtInt](#) | [equals](#) | [finishedBy](#) | [finishes](#) | [hopSize](#) |

[meets](#) | [metBy](#) | [origin](#) | [overlappedBy](#) | [overlaps](#) | [rangeTimeLine](#) | [sampleRate](#) | [start](#) | [startedBy](#) | [starts](#) | [timeline](#) | [windowLength](#) |

Individuals: | [universaltimeline](#) |

Ontology Terms

Classes

Class: **timeline:AbstractInstant** - stable -

AbstractInstant - An instant defined on an abstract timeline

sub-class-of: [Instant](#)

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Class: **timeline:AbstractInterval** - stable -

AbstractInterval - An interval defined on an abstract time-line.

sub-class-of: [Interval](#)

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Class: **timeline:AbstractTimeLine** - stable -

AbstractTimeLine - Abstract time lines may be used as a backbone for Score, Works, ...
This allows for TimeLine maps to relate works to a given performance (this part was played at this time).

sub-class-of: [TimeLine](#)

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Class: **timeline:ContinuousTimeLine** - stable -

ContinuousTimeLine - A continuous timeline, like the universal one, or the one backing an analog signal

sub-class-of: [TimeLine](#)

[\[back to top\]](#)

Class: **timeline:DiscreteInstant** - stable -

DiscreteInstant - An instant defined on a discrete timeline

[\[back to top\]](#)

Class: timeline:DiscreteInterval - stable -

DiscreteInterval - An interval defined on a discrete timeline, like the one backing a digital signal

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Class: timeline:DiscreteTimeLine - stable -

DiscreteTimeLine - A discrete time line (like the time line backing a digital signal)

sub-class-of: [TimeLine](#)

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Class: timeline:Instant - stable -

Instant - An instant (same as in OWL-Time)

in-domain-of: [at timeline](#)

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Class: timeline:Interval - stable -

Interval - An interval (same as in OWL-Time). Allen's relationships are defined in OWL-Time.

in-domain-of: [at timeline](#) [start](#) [end](#) [duration](#)

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Class: timeline:OriginMap - stable -

OriginMap - A timeline map linking a physical timeline to a relative one (originating at some point on the physical timeline)

in-domain-of: [origin](#)

sub-class-of: [TimeLineMap](#)

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Class: timeline:PhysicalTimeLine - stable -

PhysicalTimeLine - A "physical" time-line (the universal time line (UTC)) is an instance of this class. Other time zones consists in instances of this class as well, with a "shifting" time line map relating them to the universal time line map.

sub-class-of: [ContinuousTimeLine](#)

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Class: timeline:RelativeInstant - stable -

RelativeInstant - An instant defined on a relative timeline

[\[back to top\]](#)

Class: timeline:RelativeInterval - stable -

RelativeInterval - an interval defined on a relative timeline

[\[back to top\]](#)

Class: **timeline:RelativeTimeLine** - stable -

RelativeTimeLine - Semi infinite time line...canonical coordinate system --> addressed through xsd:duration since the instant 0.

sub-class-of: [ContinuousTimeLine](#)

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Class: **timeline:ShiftMap** - stable -

ShiftMap - a map just shifting one timeline to another

in-domain-of: [delay](#)

sub-class-of: [TimeLineMap](#)

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Class: **timeline:TimeLine** - stable -

TimeLine - Represents a linear and coherent piece of time -- can be either abstract (such as the one behind a score) or concrete (such as the universal time line).

Two timelines can be mapped using timeline maps.

in-range-of: [domainTimeLine](#) [rangeTimeLine](#) [timeline](#)

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Class: **timeline:TimeLineMap** - stable -

TimeLineMap - Allows to map two time lines together

in-domain-of: [domainTimeLine](#) [rangeTimeLine](#)

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Class: **timeline:UTInstant** - stable -

UTInstant - This concept expresses that an instant defined on the universal timeline must be associated to a dateTime value

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Class: **timeline:UTInterval** - stable -

UTInterval - an interval defined on the universal time line

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Class: **timeline:UniformSamplingMap** - stable -

UniformSamplingMap - Describe the relation between a continuous time-line and its sampled equivalent

in-domain-of: [sampleRate](#)

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sub-class-of: [TimeLineMap](#)

Class: timeline:UniformSamplingWindowingMap - stable -

UniformSamplingWindowingMap - Describes the relation between a continuous time-line, and a time-line that corresponds to its sampled and windowed equivalent

in-domain-of: [windowLength](#) [hopSize](#) [sampleRate](#)

[\[back to top\]](#)

sub-class-of: [TimeLineMap](#)

Class: timeline:UniformWindowingMap - stable -

UniformWindowingMap - Describes the relation between a discrete time line and its windowed equivalent

in-domain-of: [windowLength](#) [hopSize](#)

[\[back to top\]](#)

sub-class-of: [TimeLineMap](#)

Properties

Property: timeline:at - stable -

at - refers to a point or an interval on the time line, through an explicit datatype

Domain: [Instant](#) [Interval](#)

Range:

Property: timeline:atDate - stable -

atDate - A subproperty of :at, allowing to address a date (beginning of it for an instant, all of it for an interval)

Domain:

Range: [xsd:date](#)

Sub-property-of: [at](#)

Property: timeline:atDateTime - stable -

atDateTime - This property links an instant defined on the universal time line to an XSD date/time value

Domain:

Range: [xsd:dateTime](#)

Sub-property-of: [at](#)

Property: timeline:atDuration - stable -

atDuration - A property enabling to adress a time point P through the duration of the interval [0,P] on a continuous timeline

Domain:

Range: [xsd:duration](#)

Sub-property-of: [at](#)

Property: timeline:atInt - stable -

atInt - A subproperty of :at, having as a specific range xsd:int

Domain:

Range: [xsd:int](#)

Sub-property-of: [at](#)

Property: timeline:atReal - stable -

atReal - subproperty of :at, having xsd:float as a range

Domain:

Range: [xsd:float](#)

Sub-property-of: [at](#)

Property: timeline:atYear - stable -

atYear - A subproperty of :at, allowing to address a year (beginning of it for an instant, all of it for an interval)

Domain:

Range: [xsd:gYear](#)

Sub-property-of: [at](#)

Property: timeline:atYearMonth - stable -

atYearMonth - A subproperty of :at, allowing to address a year/month (beginning of it for an instant, all of it for an interval)

Domain:

Range: [xsd:gYearMonth](#)

Sub-property-of: [at](#)

Property: timeline:beginsAtDateTime - stable -

beginsAtDateTime - A subproperty of :beginsAt, allowing to address the beginning of an interval as a date/time

Domain:

Range: [xsd:dateTime](#)
Sub-property-of: [start](#)

Property: **timeline:beginsAtDuration** - stable -

beginsAtDuration - A property enabling to address a start time point P of an interval [P,E] through the duration of the interval [0,P] on a continuous timeline

Domain:
Range: [xsd:duration](#)
Sub-property-of: [start](#)

Property: **timeline:beginsAtInt** - stable -

beginsAtInt - A subproperty of :beginsAt, having xsd:int as a range

Domain:
Range: [xsd:int](#)
Sub-property-of: [start](#)

Property: **timeline:delay** - stable -

delay - associate a shift map to a particular delay

Domain: [ShiftMap](#)
Range:

Property: **timeline:domainTimeLine** - stable -

domainTimeLine - associates a timeline map to its domain timeline

Domain: [TimeLineMap](#)
Range: [TimeLine](#)

Property: **timeline:duration** - stable -

duration - the duration of a time interval

Domain: [Interval](#)
Range:

Property: **timeline:durationInt** - stable -

durationInt - A subproperty of :duration, having xsd:int as a range

Domain:
Range: [xsd:int](#)

Sub-property-of: [duration](#)

Property: **timeline:durationXSD** - stable -

durationXSD - A subproperty of :duration, having xsd:duration as a range

Domain:

Range: [xsd:duration](#)

Sub-property-of: [duration](#)

Property: **timeline:end** - stable -

end - refers to the end of a time interval, through an explicit datatype. time:hasEnd can be used as well, if you want to associate the end of the interval to an explicit time point resource

Domain: [Interval](#)

Range:

Property: **timeline:endsAtDateTime** - stable -

endsAtDateTime - A subproperty of :endsAt, allowing to address the end of an interval as a date/time

Domain:

Range: [xsd:dateTime](#)

Sub-property-of: [end](#)

Property: **timeline:endsAtDuration** - stable -

endsAtDuration - A property enabling to adress an end time point P of an interval [S,P] through the duration of the interval [0,P] on a continuous timeline

Domain:

Range: [xsd:duration](#)

Sub-property-of: [end](#)

Property: **timeline:endsAtInt** - stable -

endsAtInt - A subproperty of :endsAt, having xsd:int as a range

Domain:

Range: [xsd:int](#)

Sub-property-of: [end](#)

Property: **timeline:hopSize** - stable -

hopSize - hop size, associated to a uniform windowing map

Domain: [UniformSamplingWindowingMap](#) [UniformWindowingMap](#)

Range: [xsd:int](#)

Property: timeline:origin - stable -

origin - associate an origin map to its origin on the domain physical timeline

Domain: [OriginMap](#)

Range: [xsd:dateTime](#)

Property: timeline:rangeTimeLine - stable -

rangeTimeLine - associates a timeline map to its range timeline

Domain: [TimeLineMap](#)

Range: [TimeLine](#)

Property: timeline:sampleRate - stable -

sampleRate - associates a sample rate value to a uniform sampling map

Domain: [UniformSamplingWindowingMap](#) [UniformSamplingMap](#)

Range: [xsd:int](#)

Property: timeline:start - stable -

start - refers to the beginning of a time interval, through an explicit datatype. time:hasBeginning can be used as well, if you want to associate the beginning of the interval to an explicit time point resource

Domain: [Interval](#)

Range:

Property: timeline:timeline - stable -

timeline - Relates an interval or an instant to the timeline on which it is defined.

The 29th of August, 2007 would be linked through this property to the universal timeline, whereas "from 2s to 5s on this particular signal" would be defined on the signal' timeline.

Domain: [Interval](#) [Instant](#)

Range: [TimeLine](#)

Property: timeline>windowLength - stable -

windowLength - window length, associated to a uniform windowing map

Domain: [UniformSamplingWindowingMap](#) [UniformWindowingMap](#)

Range: [xsd:int](#)

Deprecated: timeline:beginsAt

Equivalent to - [timeline:start](#)

Deprecated: timeline:endsAt

Equivalent to - [timeline:end](#)

Deprecated: timeline:onTimeLine

Equivalent to - [timeline:timeline](#)

References

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