TimeMapper using animated SVG in a WMS to visualise moving object data

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http://geoserver.itc.nl/TimeMapper/

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real-world phenomena are *dynamic*

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we need tools to explore and see them *dynamically*

our focus:

our focus:
vector animations

our focus:
vector animations
on the web

our focus:
vector animations
on the web
generated automatically
from the data

our choice:

our choice:

our choice:

Scalable Vector Graphics

SVG:

XML / Open Web

SVG:

XML / Open Web Open Standard (W3C)

SVG:

XML / Open Web Open Standard (W3C) supported by all major browsers now (IE9!)

SVG:

standard includes

SMIL
declarative animation

(Opera +, Webkit/FireFox ±)

Prototype:

Prototype:

moving object data

Prototype:

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moving object data

case-study on icebergs movements in Antarctica

Prototype based on:

ITC SDI^{light} OSGEO stack

RIMapperWMS

SDI light

.....?

SDI

SU

SDI

ILWIS open 3.6

52north exploring horizons

+

OpenLayers

+

GeoServer

MapServer

Java

+

stack

RIMapperWMS:

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spatial database back-end (postGIS)

spatial and attribute data

Web Mapping Service configuration

RIMapperWMS:

spatial database back-end (postGIS)

spatial and attribute data

Web Mapping Service configuration

server application (Java)

responds to WMS compliant requests

provides output in SVG

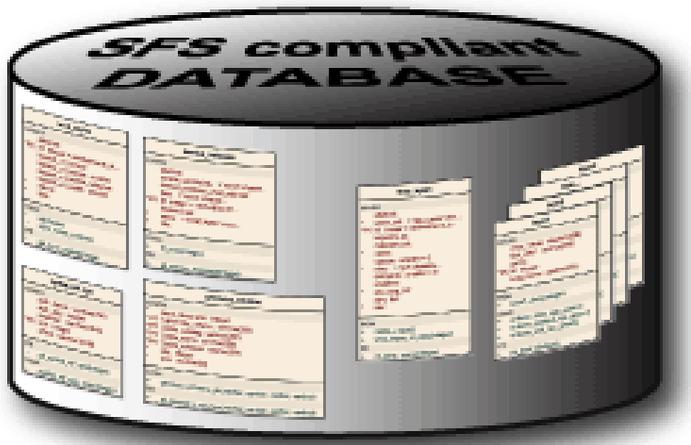
TIMEMAPPER

External WMS's

External WMS's

External WMS's

Mapserver, Geoserver, etc...



gui.js

JavaScript for standard
WMS gui:
zoom pan, etc...
layers on/off
identify

(from RIMapperWMS)

anim.js

JavaScript for **animation**:
speed- and timeslider
time legends

(re)generation of SMIL attributes
begin / end / dur

TimeMapper Servlets

WMSGetMap,WMSGetCapabilities,
MakeSVG, MakeGUI, DBConn, etc...

SVG file

```
<svg id="completeEnv" >
   <scripts>
  </scripts>

      ... standard gui svg elements ...
      ... anim gui elements ...

   <svg id="MapWindow">
      <image src="external WMS layers" />
      <svg static SVG layer" />
      <svg  animated SVG layer />
   </svg>
</svg>
```

workflow:

workflow:

Storing temporal data
Designing SMIL animations
Converting temporal component
Developing animated mapping GUI

workflow:

Storing temporal data

->	Icebergs			
->	ID	TIME_ISO	TIME_SECs1970	GEOM
->	string	wkt	integer	wkt
	A35B	2009-01-08	3440534400	POINT(-56,-34.2)
	A35B	2009-01-15	3441139200	POINT(-55,-32.3)
	A35B	2009-01-17	3441312000	POINT(-53.7,-35)
	A35B	2009-02-11	3443472000	POINT(-51.7,-31.6)
	A36	2008-12-07	3438892800	POINT(-70.4,-62.3)
	A36	2008-12-20	3437769600	POINT(-73.7,-61.4)

ISO 8601 extended format:

Schema: ccyy-mm-ddThh:mm:ss.sssZ
Example: 2009-01-28T13:53:41.007Z

->	Icebergs			
->	ID	TIME_ISO	TIME_SECs1970	GEOM
->	string	wkt	integer	wkt
	A35B	2009-01-08	3440534400	POINT(-56,-34.2)
	A35B	2009-01-15	3441139200	POINT(-55,-32.3)
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workflow:

Designing SMIL animations

workflow:

Designing SMIL ani

```
<circle id="IB_A35B" r="25">
  <animate id="XanimIB_A35B_0"
     attributeName="cx"
     from="-56.4" to="-51.3"
     begin="2.56s"
     dur="1.41s"
     calcMode="discrete"
     repeatCount="none"
     fill="freeze" />

  <animate id="YanimIB_A35B_0"
     attributeName="cy"
     from="-76.6" to="-84.2"
     begin="2.56s"
     dur="1.41s"
     calcMode="discrete"
     repeatCount="none"
     fill="freeze" />
</circle>
```

workflow:

Designing SMIL ani

movement

```
<circle id="IB_A35B" r="25">
  <animate id="XanimIB_A35B_0"
     attributeName="cx"
     from="-56.4" to="-51.3"
     begin="2.56s"
     dur="1.41s"
     calcMode="discrete"
     repeatCount="none"
     fill="freeze" />

  <animate id="YanimIB_A35B_0"
     attributeName="cy"
     from="-76.6" to="-84.2"
     begin="2.56s"
     dur="1.41s"
     calcMode="discrete"
     repeatCount="none"
     fill="freeze" />
</circle>
```

workflow:

Designing SMIL ani

timing

```
<circle id="IB_A35B" r="25">
  <animate id="XanimIB_A35B_0"
     attributeName="cx"
     from="-56.4" to="-51.3"
     begin="2.56s"
     dur="1.41s"
     calcMode="discrete"
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  <animate id="YanimIB_A35B_0"
     attributeName="cy"
     from="-76.6" to="-84.2"
     begin="2.56s"
     dur="1.41s"
     calcMode="discrete"
     repeatCount="none"
     fill="freeze" />
</circle>
```

workflow:

Converting temporal component

workflow:

Converting temporal component

OGC

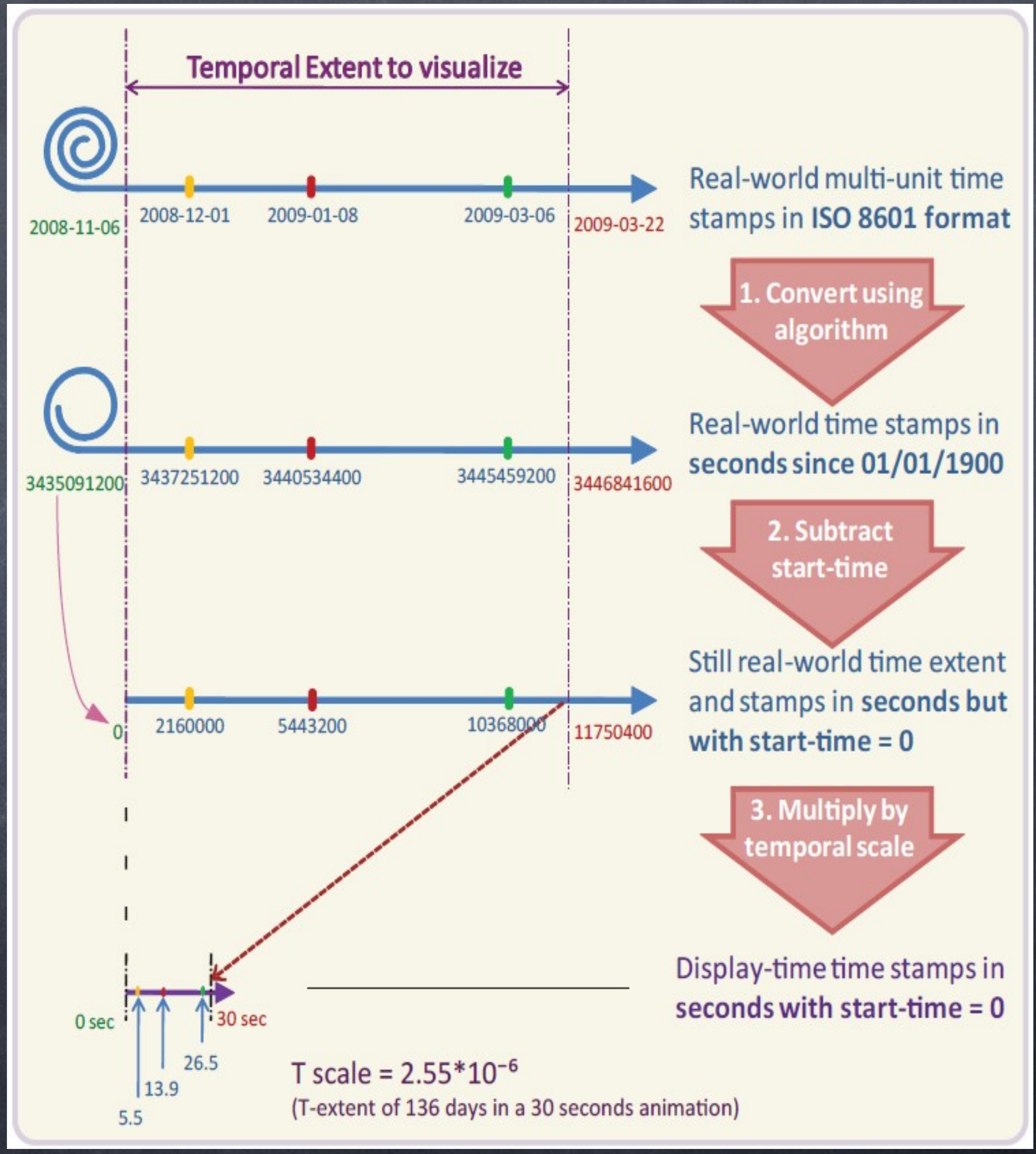
2009-01-28T13:53:41Z

SMIL

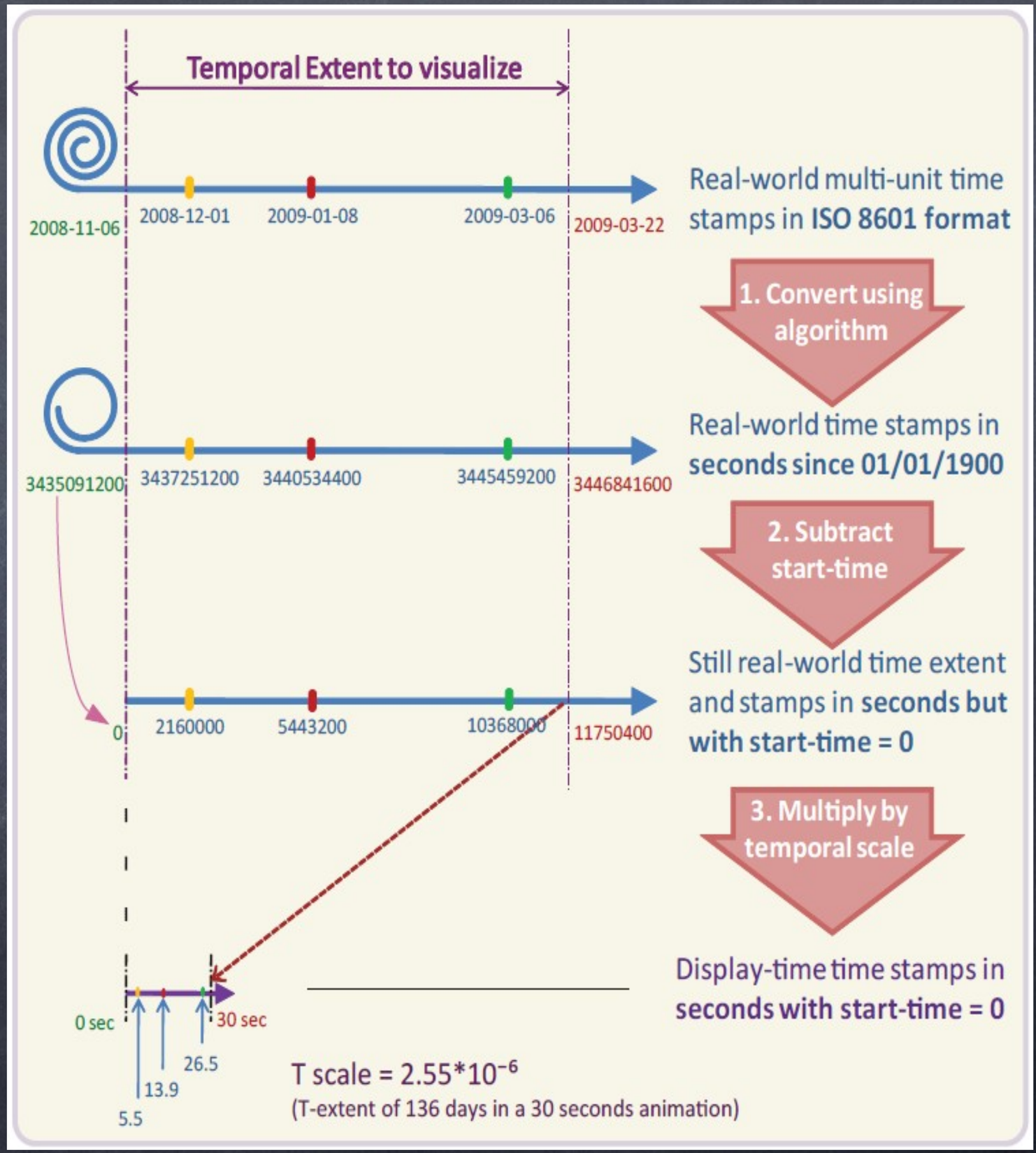
```
begin="2.56s"

dur="1.41s"
```

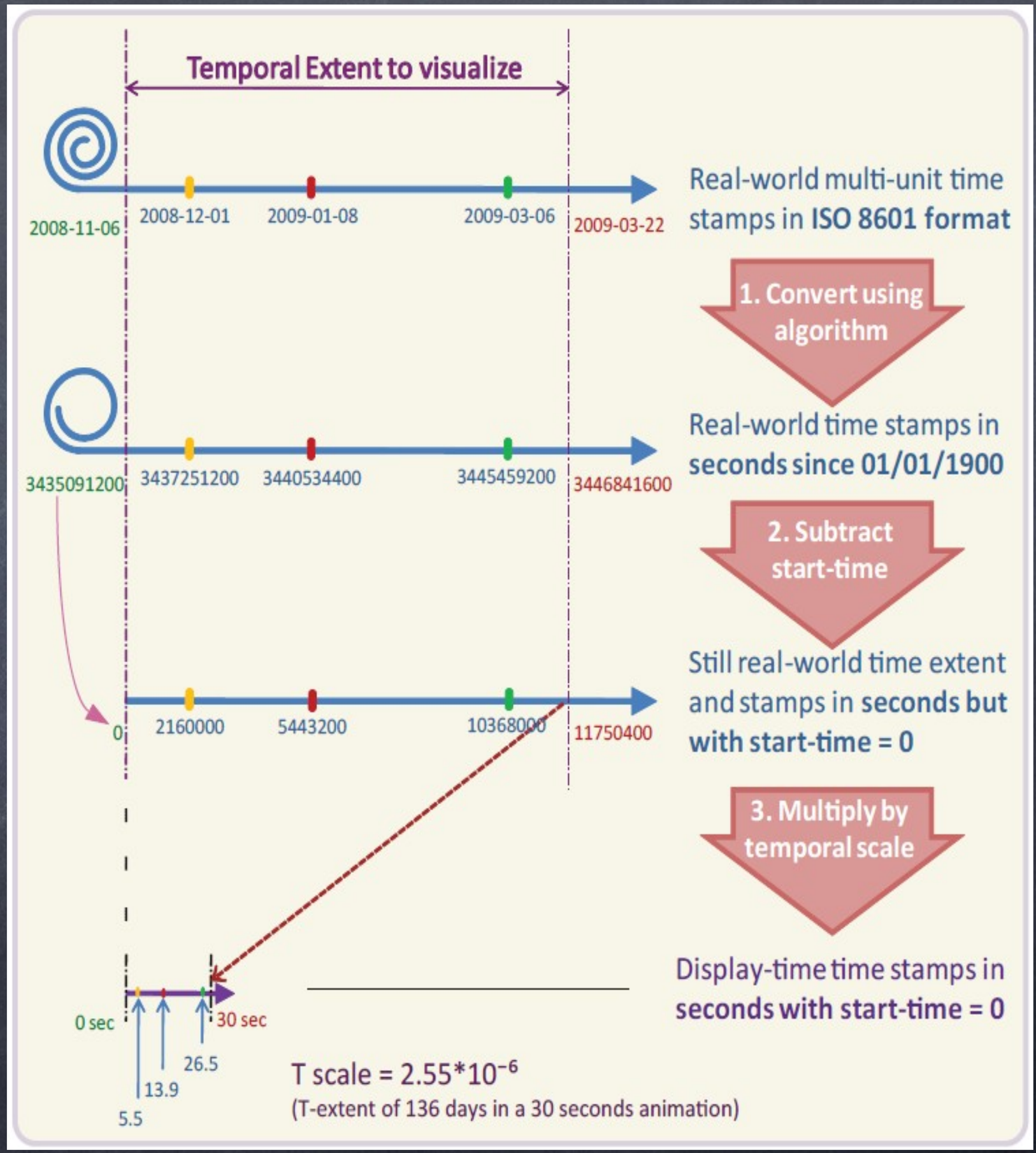
- ISO 8601 to seconds since epoch



- ISO 8601 to seconds since epoch
- subtract start-time



- ISO 8601 to seconds since epoch
- subtract start-time
- multiply by temporal scale



workflow:

Developing animated mapping GUI

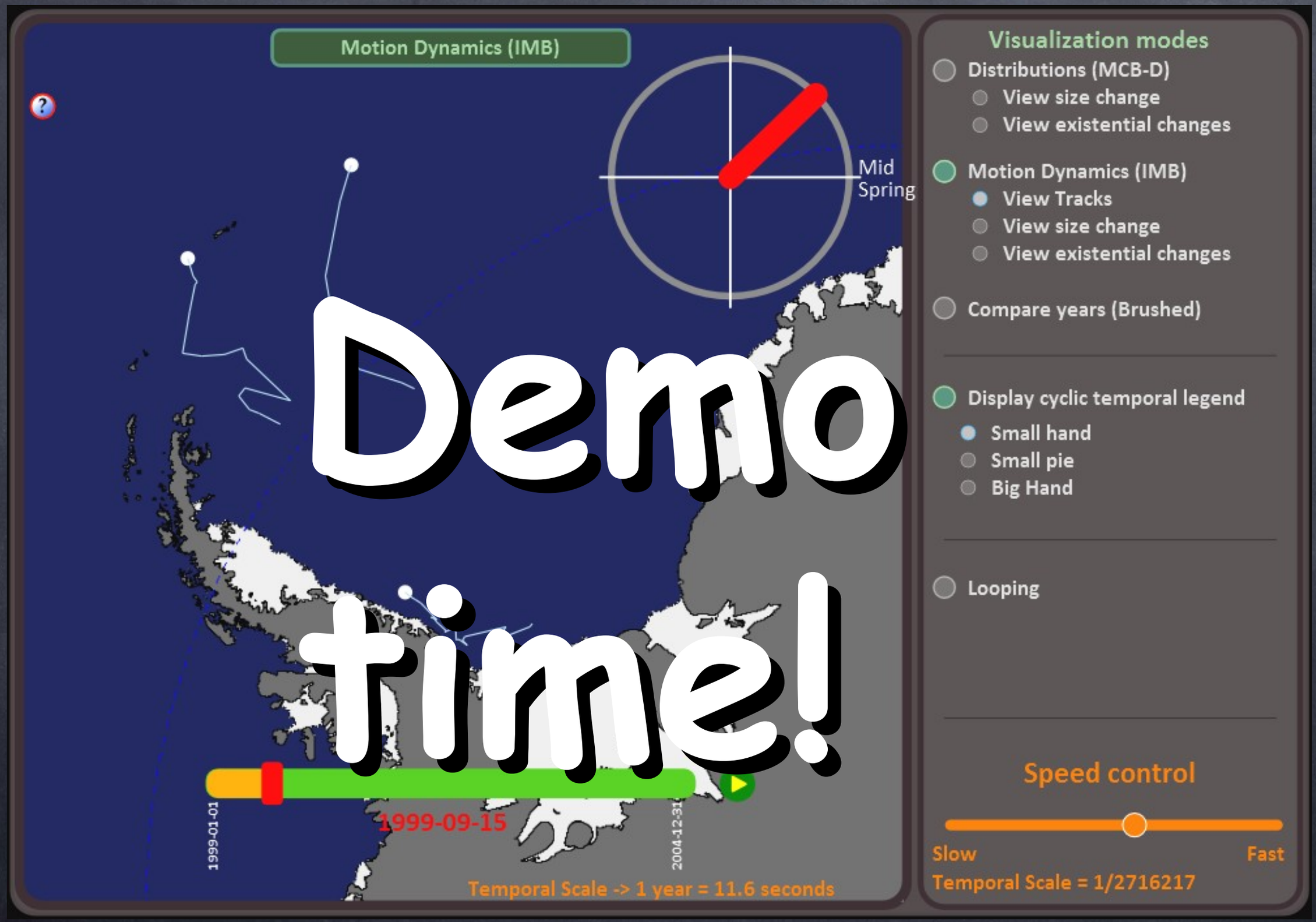
Animated mapping GUI

Temporal legends

- Cyclic
- Digital clock
- Time-bar

Interactive functionalities

- User choices
- Functions to control the temporal dimension
  - Play/Pause
  - Time-slider
  - Looping
  - Speed-slider


Motion Dynamics (IMB)
Mid
Spring
Demo
time!
1999-09-15
1999-01-01
2004-12-31
Temporal Scale -> 1 year = 11.6 seconds
Visualization modes
Distributions (MCB-D)
View size change
View existential changes
Motion Dynamics (IMB)
View Tracks
View size change
View existential changes
Compare years (Brushed)
Display cyclic temporal legend
Small hand
Small pie
Big Hand
Looping
Speed control
Slow
Fast
Temporal Scale = 1/2716217

Acknowledgments:
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Questions?

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