

Space-Time Coordinate Metadata Update

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<http://hea-www.cfa.harvard.edu/~arots/nvometa/STC2004-05.pdf>



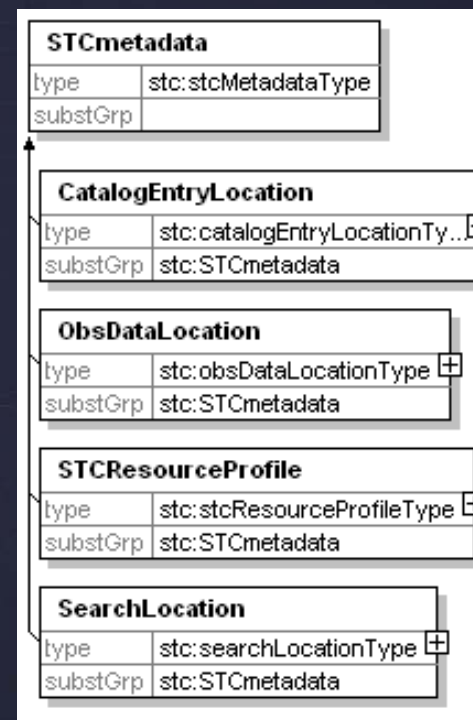
STC Metadata Definition

- Objective:
 - To provide a model to describe a position or volume in coordinate space that is:
 - Complete
 - Consistent
 - Intertwined coordinate axes:
 - Time
 - Space (position & velocity)
 - Spectrum
 - Redshift (includes Doppler velocity)

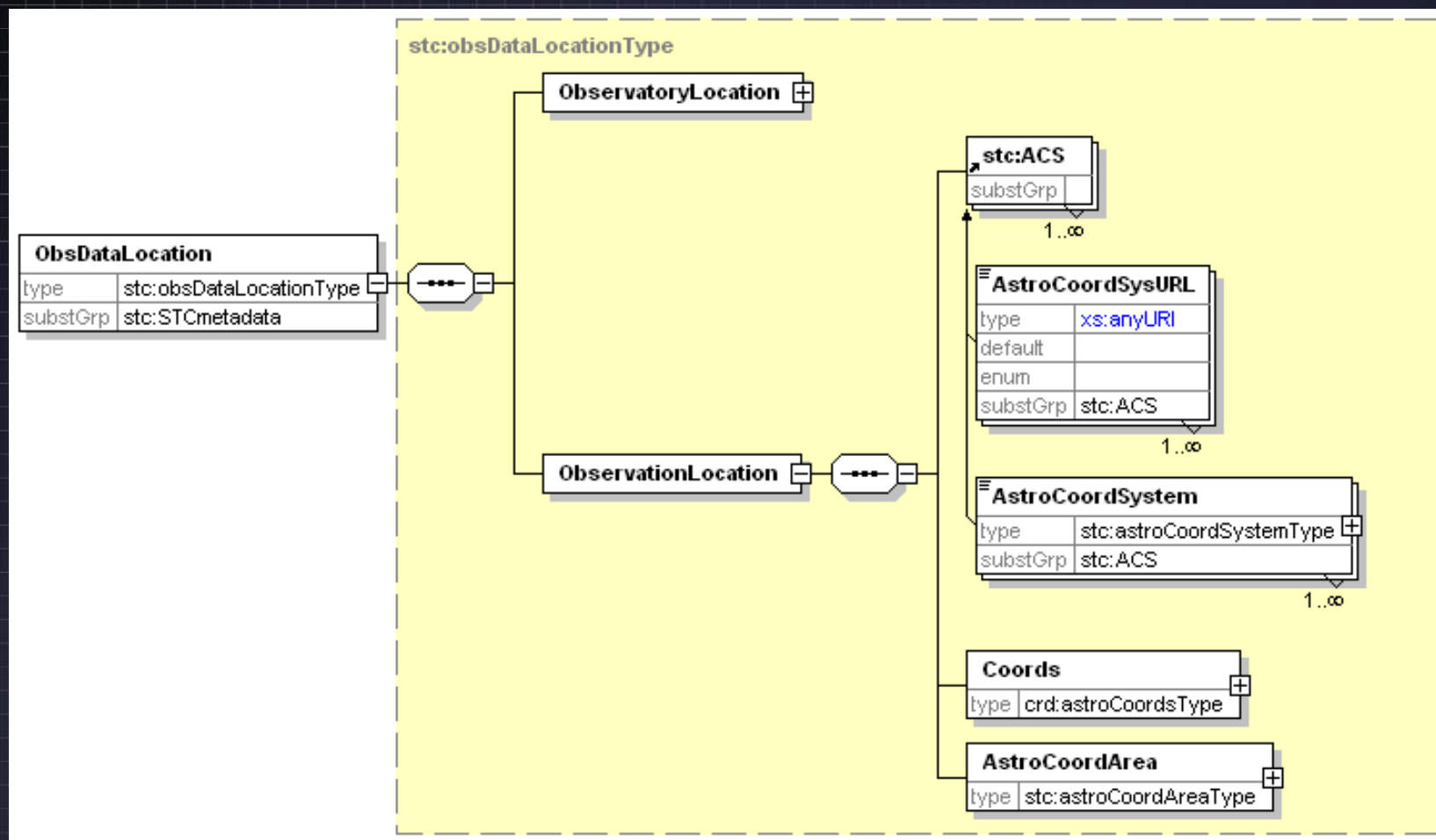


STC in Three Slides (1)

- STC metadata comes in four contexts:
 - STCResourceProfile
 - SearchLocation
 - CatalogEntryLocation
 - ObsDataLocation
 - ObservationLocation
 - ObservatoryLocation
- Three components:
 - CoordinateSystem
 - CoordinateArea
 - Coordinates



STC in Three Slides (2)



STC in Three Slides (3)

- Coordinates contain 6 components with common unit:
 - Name (UCD?)
 - Value
 - Error
 - Resolution
 - Size
 - Sampling size (pixel size)
- All may be
 - Value (scalar or vector numeric; string)
 - IDREF (values provided elsewhere, such as table column)



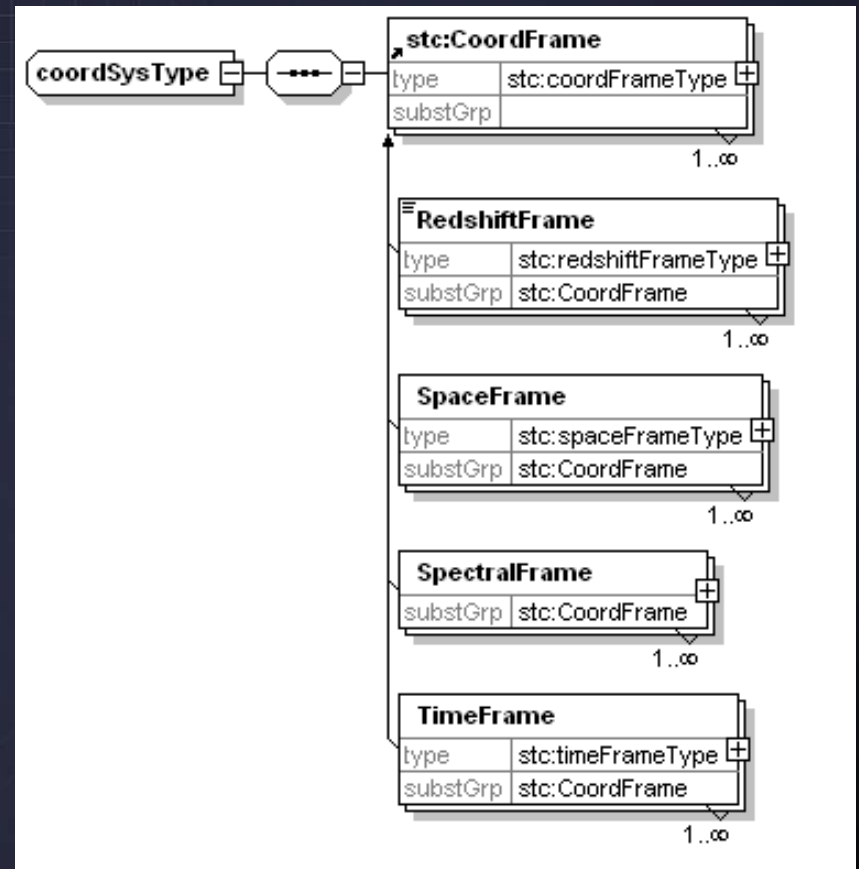
New Products

- Working draft version 0.51
 - Full description
 - UML representation included
- New schemata version 2.0
 - Choice groups → Substitution groups
 - Oops, XMLSpy's validation is defective – revision required
 - Generalized CoordSys and Coords
 - Unit restrictions/simplifications
 - Substitution through URL reference
- Examples

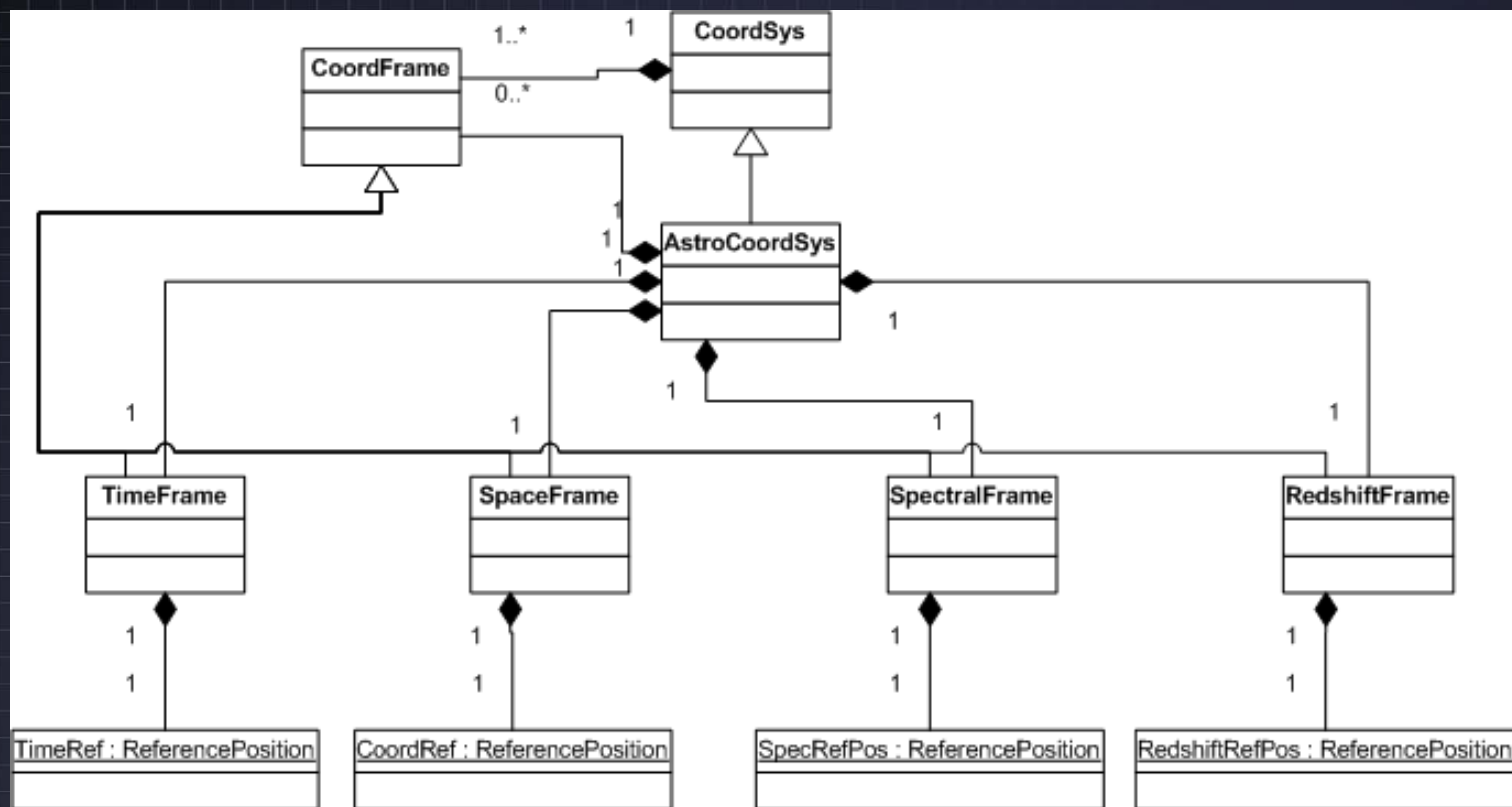


Generalized CoordSystem

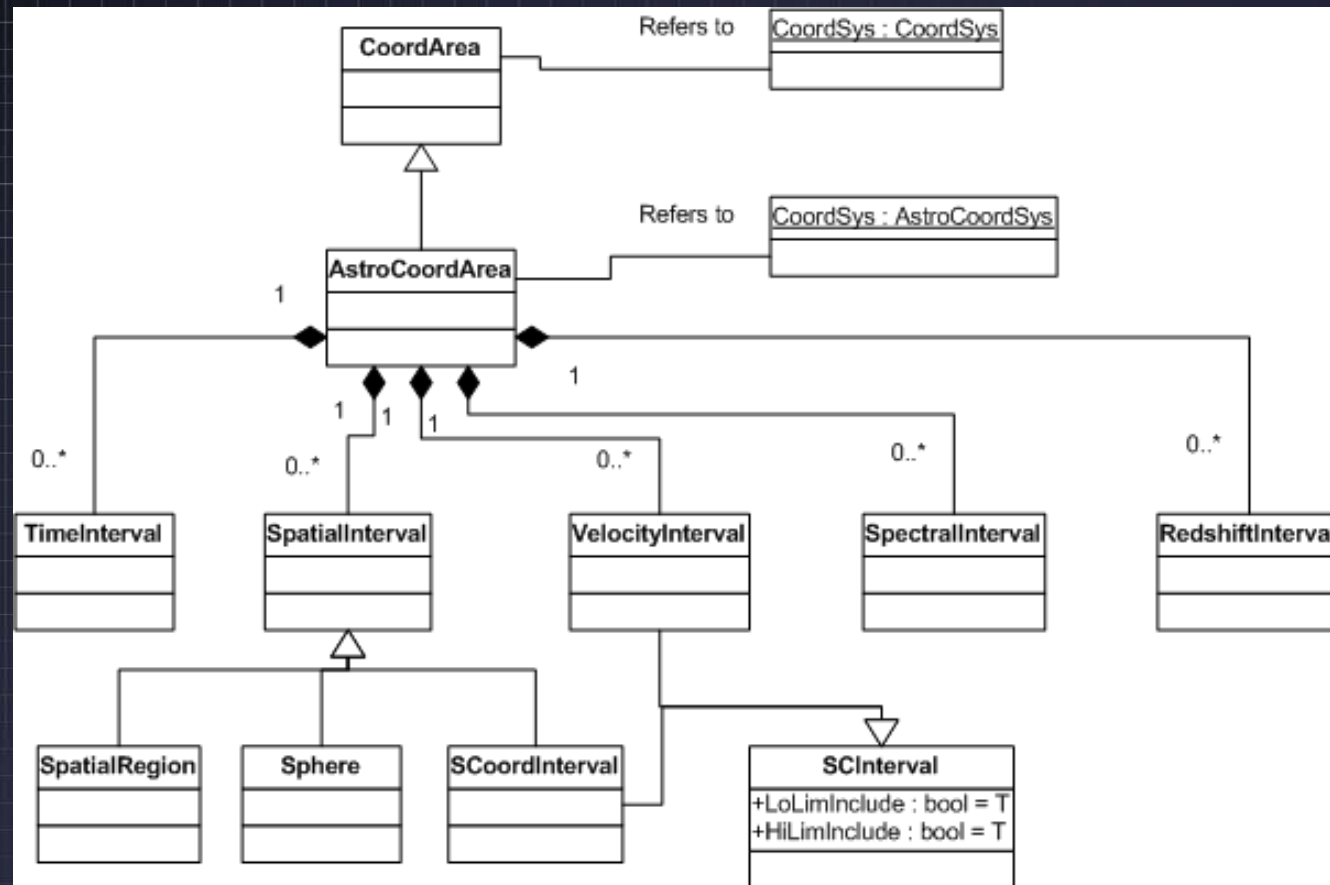
- Contains any number of Frames, of any kind
- AstroCoordSystem contains a specific set of frames plus optional generic ones
- Similarly with Coords and CoordIntervals



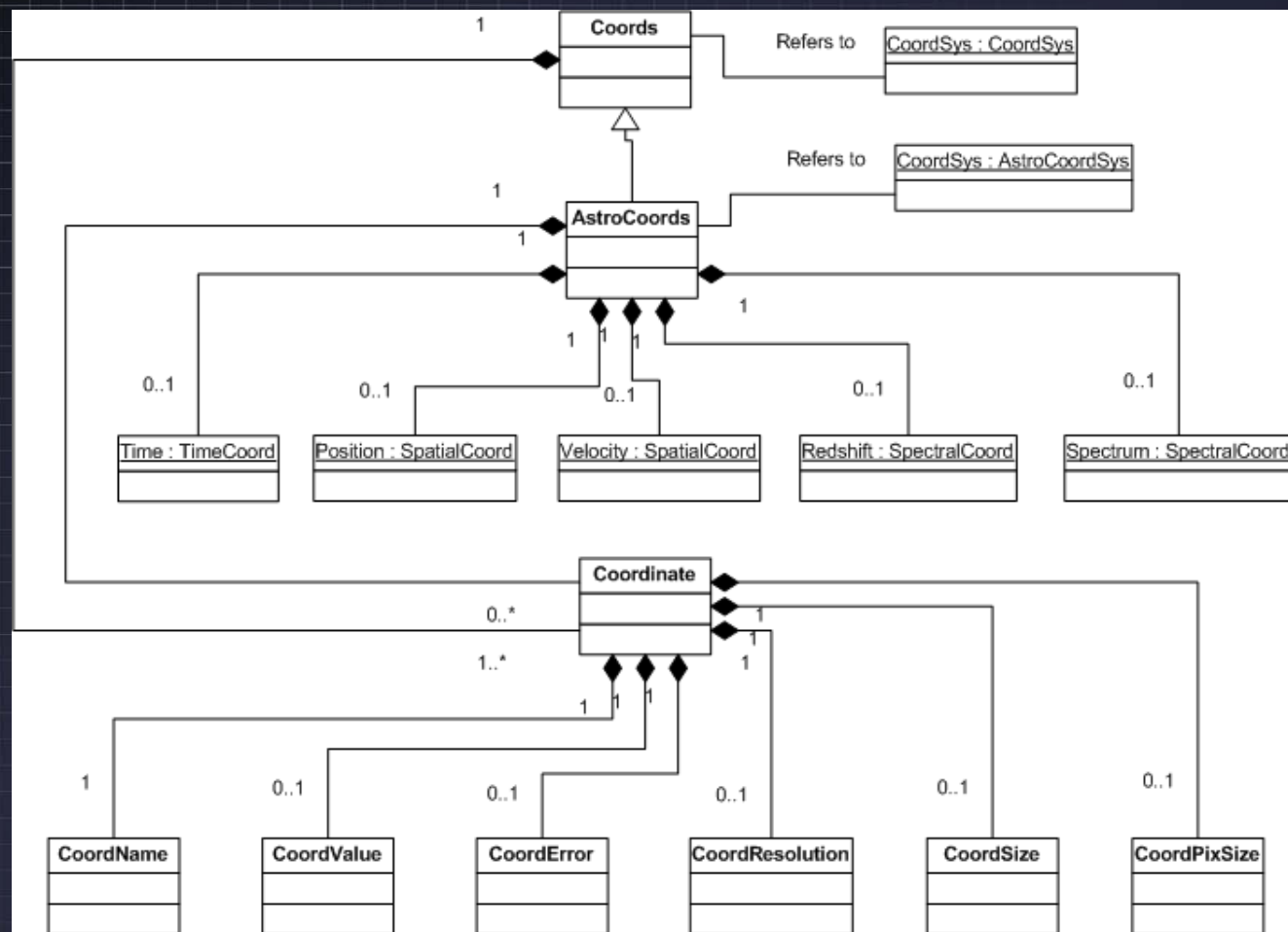
CoordSystem Contains Frames



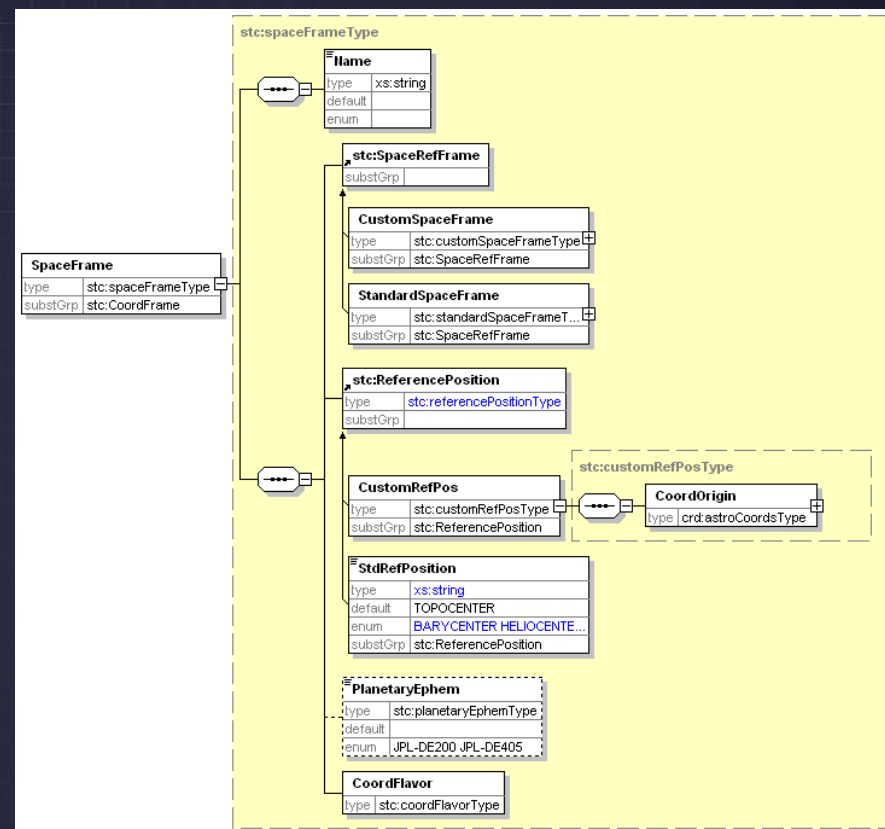
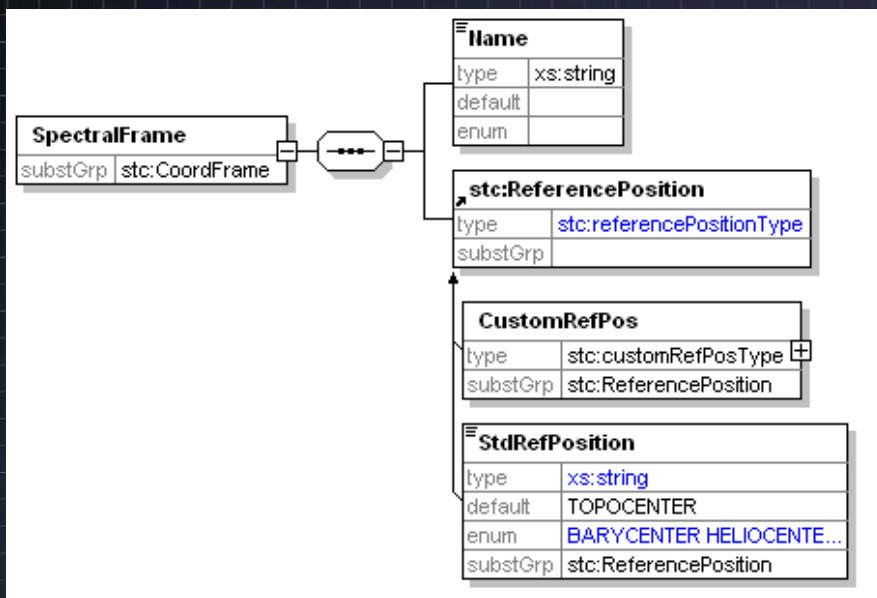
CoordArea Defines a Volume



Compound Coords

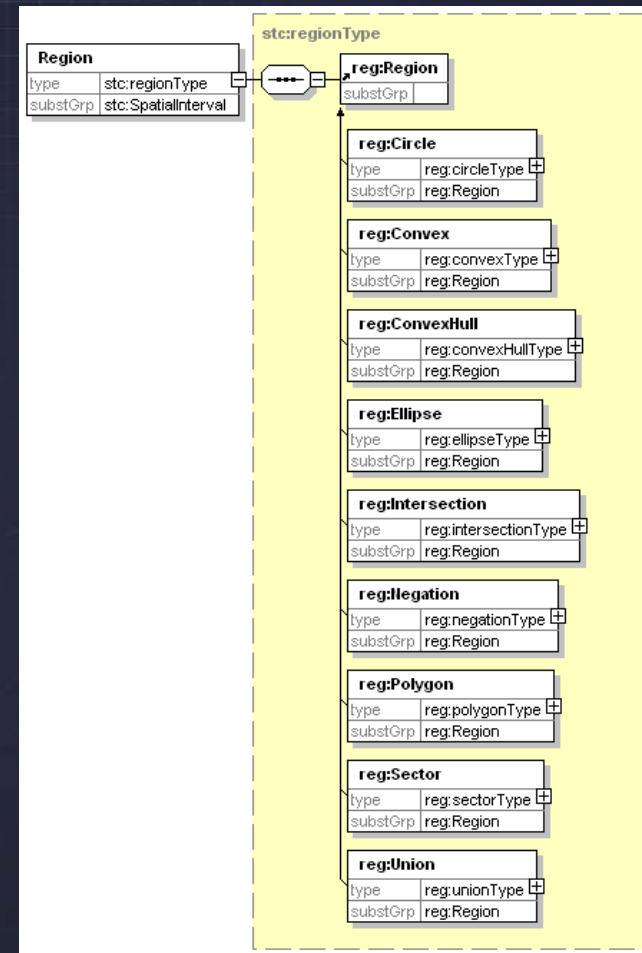


What's in Frames?



The Infamous Region

- A region may be a shape:
 - Circle
 - Ellipse
 - Polygon
 - Sector
 - Convex
 - ConvexHull
- Or the result of these operations on regions:
 - Negation
 - Intersection
 - Union



• Coordinate System

```
• <AstroCoordSystem ID="ChandraCoordSys">
•   <TimeFrame>
•     <Name>Time</Name>
•     <TimeScale>TT</TimeScale>
•     <StdRefPosition>TOPOCENTER</StdRefPosition>
•   </TimeFrame>
•   <SpaceFrame>
•     <Name>RA,Dec</Name>
•     <StandardSpaceFrame>
•       <RefSystem>ICRS</RefSystem>
•     </StandardSpaceFrame>
•     <StdRefPosition>TOPOCENTER</StdRefPosition>
•     <PlanetaryEphem>JPL-DE405</PlanetaryEphem>
•     <CoordFlavor coord_naxes="2" coord_type="SPHERICAL" coord_vel="false"/>
•   </SpaceFrame>
•   <SpectralFrame>
•     <Name>Energy</Name>
•     <StdRefPosition>TOPOCENTER</StdRefPosition>
•   </SpectralFrame>
• </AstroCoordSystem>
```



Chandra STCResourceProfile (2)

• Coverage

```
• <AstroCoordArea ID="ChandraCoverage" coord_system_id="ChandraCoordSys">
•   <TimeInterval start_include="true" fill_factor="0.7">
•     <StartTime>
•       <crd:ISOTime timescale="TT">1999-07-23T18:00:00</crd:ISOTime>
•     </StartTime>
•   </TimeInterval>
•   <PositionInterval unit="deg">
•     <Coord2VecInterval fill_factor="0.02" lo_include="true" hi_include="true">
•       <LoLimit2Vec>-90.0 0.0</LoLimit2Vec>
•       <HiLimit2Vec>90.0 360.0</HiLimit2Vec>
•     </Coord2VecInterval>
•   </PositionInterval>
•   <SpectralInterval lo_include="true" hi_include="true" fill_factor="1.0"
•     unit="keV">
•     <LoLimit>0.1</LoLimit>
•     <HiLimit>12.0</HiLimit>
•   </SpectralInterval>
• </AstroCoordArea>
```



- Coordinate properties in Resource

- ```
<CoordSpec coord_system_id="ChandraCoordSys">
```
- ```
  <crd:Time unit="s">
```
- ```
 <crd:Name>Time</crd:Name>
```
- ```
    <crd:Error>0.00005</crd:Error>
```
- ```
 <crd:Resolution>0.00002</crd:Resolution>
```
- ```
  </crd:Time>
```
- ```
 <crd:Position2D unit="deg">
```
- ```
    <crd:Name>ra dec</crd:Name>
```
- ```
 <crd:Error2>0.0003 0.0003</crd:Error2>
```
- ```
    <crd:Resolution2>0.0001 0.0001</crd:Resolution2>
```
- ```
 <crd:Size2>0.33 0.33</crd:Size2>
```
- ```
    <crd:PixSize2>0.0002 0.0002</crd:PixSize2>
```
- ```
 </crd:Position2D>
```
- ```
  <crd:Spectral unit="keV">
```
- ```
 <crd:Name>Energy</crd:Name>
```
- ```
    <crd:Error>0.01</crd:Error>
```
- ```
 <crd:Resolution>0.001</crd:Resolution>
```
- ```
  </crd:Spectral>
```
- ```
</CoordSpec>
```

