Abstract

This document provides a summary of the model for the description of the VO Space-Time Coordinate metadata. It shows the hierarchical relation between the various components with brief descriptions where needed. The Tables that are referred to may be found in the STC document. XML element names are shown in bold Courier font.

The objective is to provide a framework that allows a complete and internally consistent specification of coordinate metadata – primarily the intertwined temporal, spatial, spectral, and redshift coordinates – that is extensible to accommodate all future applications.
STC Model

Status of This Document

This is a Note. The first release of this document was 2007-12-04.

This is an IVOA Note expressing suggestions from and opinions of the authors. It is intended to share best practices, possible approaches, or other perspectives on interoperability with the Virtual Observatory. It should not be referenced or otherwise interpreted as a standard specification.

A list of current IVOA Recommendations and other technical documents can be found at http://www.ivoa.net/Documents/.
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1 STC Metadata Description

An STC metadata description element consists of three components:

1. Coordinate System
2. Coordinates
3. Coordinate area

Missing components or subcomponents shall be considered UNKNOWN; this is to be interpreted as: it is up to the client to decide whether or not to accept the metadata, and to assign a sensible default value if the component is relevant.

1.1 Coordinate System (CoordSys, AstroCoordSystem, PixelCoordSystem)

A Coordinate System consists of one or more Coordinate Frames.

A Coordinate Frame typically consists of a Reference Frame (orientation) and a Reference Position (or Origin), but some Frames contain more, or less, information. There are six kinds of Frames.

The three kinds of Coordinate System are:

1. (Generic) CoordSys; contains:
   a. One or more Generic Coordinate Frames
2. AstroCoordSystem; may contain:
   a. One or more Generic Coordinate Frames
   b. One Time Frame
   c. One Space Frame
   d. One Spectral Frame
   e. One Redshift Frame
3. PixelCoordSystem; may contain:
   a. One or more Generic Coordinate Frames
   b. One or more Pixel Coordinate Frames
1.1.1 Generic Coordinate Frame (CoordFrame)
 Allows specifying metadata for non-STC coordinates.
 A CoordFrame contains a Coordinate Flavor and may contain a Coordinate Reference Frame and/or a Coordinate Reference Position; it requires a frame_id.

1.1.1.1 Reference Position (CoordRefPos)
 A CoordRefPos consists of a Coordinate.

1.1.1.2 Generic Coordinate Reference Frame (CoordRefFrame)
 There are four types of Coordinate Reference Frame:
 (All Transformation elements contain a projection attribute, using values from Table 4)

1.1.1.2.1 ScalarRefFrame
 Contains:
  1. Scale

1.1.1.2.2 Cart2DRefFrame
 Contains one of:
  1. Transform2
  2. Transform2Matrix

1.1.1.2.3 Cart3DRefFrame
 Contains one of:
  1. Transform3
  2. Transform3Matrix

1.1.1.2.4 SphericalRefFrame
 Contains:
  1. Frame
  2. Pole_Zaxis
  3. Xaxis

1.1.1.3 Coordinate Flavor (CoordFlavor)
 CARTESIAN, SPHERICAL, UNITSPHERE, POLAR, CYLINDRICAL, HEALPIX, or STRING; contains: dimensionality.
1.1.2 Time Frame (TimeFrame)
A TimeFrame contains a Reference Position and a Time Scale, and may contain a Time Reference Direction.

1.1.2.1 Reference Position (ReferencePosition)
A Reference Position may be a Standard or a Custom one:

1.1.2.1.1 Standard Reference Position
TOPOCENTER, GEOCENTER, BARYCENTER, etc., as in Table 1, noting the exceptions.
All Solar System positions, except GEOCENTER, should include a Planetary Ephemeris.

1.1.2.1.1.1 Planetary Ephemeris (PlanetaryEphem; conditional)
JPL-DE200 or JPL-DE405; needed when such an ephemeris is used to transform times.

1.1.2.1.2 Custom Reference Position (CoordRefPos)
A Coordinate Reference Position consists of a Coordinate.

1.1.2.2 Time Scale
TT (TDT), ET, TAI (IAT), UTC, GPS, TDB (TEB), TCG, TCB, LST, LOCAL (Table 2).

1.1.2.3 Time Reference Direction (TimeRefDirection; conditional)
If Time Reference Position is not TOPOCENTER, this direction (a Coordinate element) needs to be provided.
1.1.3 Space Frame (SpaceFrame)
A SpaceFrame includes a Reference Position, Spatial Reference Frame, and Coordinate Flavor, and may include an Offset Center.

1.1.3.1 Reference Position (ReferencePosition)
A Reference Position may be a Standard or a Custom one:

1.1.3.1.1 Standard Reference Position
TOPOCENTER, GEOCENTER, BARYCENTER, etc., as in Table 1, noting the exceptions (but including RELOCATABLE).
All Solar System positions, except GEOCENTER, should include a Planetary Ephemeris.

1.1.3.1.1.1 Planetary Ephemeris (PlanetaryEphem; conditional)
JPL-DE200 or JPL-DE405; needed when such an ephemeris is used to transform times.

1.1.3.1.2 Custom Reference Position (CoordRefPos)
A Coordinate Reference Position consists of a Coordinate.

1.1.3.2 Space Reference Frame
A Space Reference Frame may be a Standard or a Custom one:

1.1.3.2.1 Standard Reference Frame
FK4, FK5, ICRS, ECLIPTIC, GALACTIC, etc., as in Table 3, including UNKNOWNFrame.

1.1.3.2.1.1 Equinox (conditional)
Bnmmm or Jnmmm, for FK\text{I} only

1.1.3.2.2 (Custom) Coordinate Reference Frame (CoordRefFrame)
There are four types of Coordinate Reference Frame:
(All Transformation elements contain a projection attribute, using values from Table 4)

1.1.3.2.2.1 ScalarRefFrame
Contains:
1. Scale
1.1.3.2.2 \textbf{Cart2DRefFrame} \\
Contains one of:  
\begin{enumerate}  
\item Transform2  
\item Transform2Matrix  
\end{enumerate}

1.1.3.2.3 \textbf{Cart3DRefFrame} \\
Contains one of:  
\begin{enumerate}  
\item Transform3  
\item Transform3Matrix  
\end{enumerate}

1.1.3.2.4 \textbf{SphericalRefFrame} \\
Contains:  
\begin{enumerate}  
\item Frame  
\item Pole\_Zaxis  
\item Xaxis  
\end{enumerate}

1.1.3.3 Coordinate Flavor (\texttt{CoordFlavor}) \\
\texttt{CARTESIAN}, \texttt{SPHERICAL}, \texttt{UNITSPHERE}, \texttt{POLAR}, \texttt{CYLINDRICAL}, or \texttt{HEALPIX}; contains: dimensionality.

1.1.3.4 Offset Center (\texttt{OffsetCenter}; optional) \\
For offset coordinates; consists of a \texttt{Coordinate}.
1.1.4 Spectral Frame (SpectralFrame)
A SpectralFrame only contains a Reference Position

1.1.4.1 Reference Position
Note that the Spectral Reference Position requires position as well as a velocity vector. A Reference Position may be a Standard or a Custom one:

1.1.4.1.1 Standard Reference Position
TOPOCENTER, GEOCENTER, BARYCENTER, etc., as in Table 1, noting the exceptions (but including LSRx).
All Solar System positions, except GEOCENTER, should include a Planetary Ephemeris.

1.1.4.1.1.1 Planetary Ephemeris (PlanetaryEphem; conditional)
JPL-DE200 or JPL-DE405; needed when such an ephemeris is used to transform times.

1.1.4.1.2 Custom Reference Position (CoordRefPos)
A Coordinate Reference Position consists of a Coordinate.
1.1.5 Redshift Frame (RedshiftFrame)
A RedshiftFrame contains a Reference Position and a Doppler Definition. It also contains an attribute that indicates whether the coordinate values represent redshifts or Doppler velocities.

1.1.5.1 Reference Position
Note that the Redshift Reference Position also requires position as well as a velocity vector. A Reference Position may be a Standard or a Custom one:

1.1.5.1.1 Standard Reference Position
TOPOCENTER, GEOCENTER, BARYCENTER, etc., as in Table 1, noting the exceptions (but including LSRx).
All Solar System positions, except GEOCENTER, should include a Planetary Ephemeris.

1.1.5.1.1.1 Planetary Ephemeris (PlanetaryEphem; conditional)
JPL-DE200 or JPL-DE405; needed when such an ephemeris is used to transform times.

1.1.5.1.2 Custom Reference Position (CoordRefPos)
A Coordinate Reference Position consists of a Coordinate.

1.1.5.2 Doppler Definition (DopplerDefinition)
Allowed values: OPTICAL, RADIO, RELATIVISTIC.
1.1.6 Pixel Frame (PixelFrame)
A PixelFrame contains a Coordinate Flavor and may contain a Coordinate Reference Frame, a Coordinate Reference Position, and/or a Reference Pixel. It contains one or more axis_order attributes.

1.1.6.1 Reference Position (CoordRefPos)
A CoordRefPos consists of a Coordinate.

1.1.6.2 Coordinate Reference Frame (CoordRefFrame)
There are four types of Coordinate Reference Frame:
(All Transformation elements contain a projection attribute, using values from Table 4)

1.1.6.2.1 ScalarRefFrame
Contains:
   1. Scale

1.1.6.2.2 Cart2DRefFrame
Contains one of:
   1. Transform2
   2. Transform2Matrix

1.1.6.2.3 Cart3DRefFrame
Contains one of:
   1. Transform3
   2. Transform3Matrix

1.1.6.2.4 SphericalRefFrame
Contains:
   1. Frame
   2. Pole_Zaxis
   3. Xaxis

1.1.6.3 Coordinate Flavor (CoordFlavor)
CARTESIAN, SPHERICAL, UNITSPHERE, POLAR, CYLINDRICAL, HEALPIX, or STRING; contains: dimensionality.

1.1.6.4 Reference Pixel (ReferencePixel)
ReferencePixel contains a 1, 2, or 3-dimensional Pixel.
1.2 Coordinates (Coords, AstroCoords, PixelCoords)

A Coordinates element consists of up to six Coordinate elements and contains a reference to a Coordinate System. Each Coordinate has five components. Each component may occur once (a definite or typical value) or twice (indicating a range of values):

1. Value
2. Error
3. Resolution
4. Size
5. Pixel size

All components are optional; in addition, there may be a name. One or more Coordinate elements may be provided through a binary FITS table.

A variety of error types may be defined; statements below on the data types of errors are to be considered preliminary, contingent on additional definitions.

There are nine types of Coordinate elements, each of which is a composite of the above-mentioned components, except where noted.

Each Coordinates object needs to refer to a Coordinate System through a coord_system_id attribute.

There are three types of Coordinates elements:

1. (Generic) Coords; contains one or more Generic Coordinates and refers to a CoordSys; individual Coordinates need to refer to a specific Coordinate Frame through a frame_id
2. AstroCoords; refers to an AstroCoordSystem and may contain:
   a. One or more Generic Coordinates; individual Coordinates need to refer to a specific Coordinate Frame through a frame_id
   b. One Time Coordinate
   c. One Spatial Position Coordinate
   d. One Spatial Velocity Coordinate
   e. One Orbit Coordinate
   f. One Spectral Coordinate
   g. One Redshift Coordinate
   h. One Coordinate File
3. PixelCoords; refers to an PixelCoordSystem and may contain one or more:
   a. Generic Coordinate
   b. Pixel Coordinate

Individual Coordinates need to refer to a specific Coordinate Frame through a frame_id.
1.2.1 Generic Coordinate (GenCoordinate)
The `Coordinate` needs to refer to a specific Coordinate Frame through a `frame_id`. There are four types of GenCoordinate:

1.2.1.1 ScalarCoordinate
Optional units; all components are scalar doubles.

1.2.1.2 Vector2DCoordinate
Optional units; `Error`, `Resolution`, `Size`, `PixSize` may consist of:
   1. Two doubles
   2. 2x2 matrix
   3. Radius

1.2.1.3 Vector3DCoordinate
Optional units; `Error`, `Resolution`, `Size`, `PixSize` may consist of:
   1. Three doubles
   2. 3x3 matrix
   3. Radius

1.2.1.4 StringCoordinate
Only contains a (string) `Value`, no other components.
1.2.2 Time (Time)
The value (TimeInstant) is an instant of the AstronTime class; all other components (Error, Resolution, Size, PixSize) are doubles and need a unit (s, d, a or yr, cy). AstronTime contains an Absolute Time element and an optional relative time element. It also may have a TimeScale attribute. AstronTime contains the following:

1.2.2.1 Absolute Time (AbsoluteTime)
Absolute Time may be of type ISOTime (ISO-8601 format), JDTime, or MJDTime. This should be a decimal for JD and MJD since a double is not guaranteed to have sufficient accuracy. In addition, for use with simulations, it may be of the type TimeOrigin which currently may only have the value RELOCATABLE.

1.2.2.2 Time Offset (TimeOffset; optional)
Decimal; offset with respect to Absolute Time; unit required.
1.2.3 Spatial Position (Position)
Units are required for all components, angular or linear. There are three types of Position:

1.2.3.1 Position1D
All components are scalar doubles.

1.2.3.2 Position2D
CError2, CResolution2, CSize2, CPixSize2 may consist of:
1. Two doubles
2. 2x2 matrix
3. Radius

1.2.3.3 Position3D
CError3, CResolution3, CSize3, CPixSize3 may consist of:
1. Three doubles
2. 3x3 matrix
3. Radius

1.2.4 Spatial Velocity (Velocity)
Same model as Spatial Position; needs a spatial as well as a time unit. Note that this item is for true space velocities, not for derived Doppler velocities. There are three types of Velocity:

1.2.4.1 Velocity1D
All components are scalar doubles.

1.2.4.2 Velocity2D;
CError2, CResolution2, CSize2, CPixSize2 may consist of:
1. Two doubles
2. 2x2 matrix
3. Radius

1.2.4.3 Velocity3D;
CError3, CResolution3, CSize3, CPixSize3 may consist of:
1. Three doubles
2. 3x3 matrix
3. Radius
1.2.5 Orbital Elements (Orbit; alternative)
Spatial Position and Velocity (values only, of course) may also be provided through orbital elements:

1.2.5.1 Semi-major axis ($a$; conditional)
Semi-major axis to be used for elliptical orbits ($0 \leq e < 1$); for parabolic and hyperbolic orbits use periapsis distance $q$.

1.2.5.2 Periapsis Distance ($q$; conditional)
Required for open orbits ($1 \leq e$); may be used instead of $a$ for closed orbits.

1.2.5.3 Eccentricity ($e$)

1.2.5.4 Inclination ($i$)

1.2.5.5 Longitude of Ascending Node (Node)

1.2.5.6 Argument of Periapsis (Aop)

1.2.5.7 Mean Anomaly ($M$; optional)
Mean anomaly at time $T$; if absent, $T$ will refer to pericenter.

1.2.5.8 Orbital Period ($P$; optional)
Redundant, but optional for closed orbits.

1.2.5.9 Epoch ($T$)
Epoch of mean anomaly, if $M$ is present, or of periapsis if $M$ is absent.
1.2.6 Spectral Coordinate (Spectral)
All components are scalar doubles; spectral unit required.

1.2.7 Redshift Coordinate (Redshift)
All components are scalar doubles; position and time unit required for Doppler velocities.
1.2.8 Coordinate File (CoordFile)
Astronomical coordinate components may be specified in FITS files; this element provides an unambiguous description and reference. It contains the following elements:

1.2.8.1 FITSFile
Provides a URI and, optionally, one or two attributes: hdu_num and hdu_name. The HDU that is referred to should be a FITS Binary (or ASCII) Table.

1.2.8.2 FITSTime (optional)
Contains the FITS TTYPE (name) of the column containing the data for each of the Time coordinate components (value, error, resolution, size, pixel size) present.

1.2.8.3 FITSPosition (optional)
Contains the FITS TTYPE (name) of the column containing the data for each of the Time coordinate components (value, error, resolution, size, pixel size) present. For vector coordinates FITSPosition contains the TTYPEs for the appropriate number of columns, separated by commas.

1.2.8.4 FITSVelocity (optional)
Contains the FITS TTYPE (name) of the column containing the data for each of the Time coordinate components (value, error, resolution, size, pixel size) present. For vector coordinates FITSVelocity contains the TTYPEs for the appropriate number of columns, separated by commas.

1.2.8.5 FITSSpectral (optional)
Contains the FITS TTYPE (name) of the column containing the data for each of the Time coordinate components (value, error, resolution, size, pixel size) present.

1.2.8.6 FITSRedshift (optional)
Contains the FITS TTYPE (name) of the column containing the data for each of the Time coordinate components (value, error, resolution, size, pixel size) present.
1.2.9 **Pixel Coordinate (Pixel)**

The **Pixel** needs to refer to a specific Coordinate Frame through a `frame_id`. The elements only contain a **Value** component and, optionally, a **Name**.

There are three types of **Pixels**:

### 1.2.9.1 **Pixel1D**

One double.

### 1.2.9.2 **Pixel2D**

Two doubles.

### 1.2.9.3 **Pixel3D**

Three doubles.
1.3 **Coordinate Area** (CoordArea, AstroCoordArea, PixelCoordArea)

Specifies the coordinate volume occupied by the object that the metadata refer to. The Coordinate Area shall contain a reference to a Coordinate System. There is one Area object for each Coordinate Frame that shall indicate whether or not limits are included (lo_included and hi_included) and that contains an optional fill factor (fill_factor; default=1.0). The typical form is one or more intervals consisting of a lower limit, an upper limit, or both (i.e., open intervals are allowed). The selection for 2-dimensional spatial coordinates in particular is more elaborate.

Each Coordinate Area object needs to refer to a Coordinate System through a coord_system_id attribute.

There are three types of Coordinate Area elements:

1. **(Generic) CoordArea**: contains one or more Generic Coordinate Intervals and refers to a CoordSys; individual CoordIntervals need to refer to a specific Coordinate Frame through a frame_id.
2. **AstroCoordArea**: refers to an AstroCoordSystem and may contain any number of:
   a. Generic Coordinate Intervals; individual CoordIntervals need to refer to a specific Coordinate Frame through a frame_id.
   b. Time Intervals
   c. Spatial Position Intervals
   d. Spatial Velocity Intervals
   e. Spectral Intervals
   f. Redshift Intervals
3. **PixelCoordArea**: refers to a PixelCoordSystem and may contain any number of:
   a. Generic Coordinate Intervals
   b. Pixel Coordinate Intervals

Individual Coordinate Intervals need to refer to a specific Coordinate Frame through a frame_id.
1.3.1 Generic Scalar Range (CoordInterval)
The CoordInterval needs to refer to a specific Coordinate Frame through a frame_id. There are three types of CoordInterval:

1.3.1.1 CoordScalarInterval
Optional units; LoLimit and HiLimit are scalar doubles.

1.3.1.2 Coord2VecInterval
Optional units; LoLimit2Vec and HiLimit2Vec are arrays of two doubles.

1.3.1.3 Coord3VecInterval
Optional units; LoLimit3Vec and HiLimit3Vec are arrays of three doubles.

1.3.2 Time Interval (TimeInterval)
StartTime and StopTime are of class AstronTime (see Section 1.2.2).
1.3.3 Spatial Area (PositionInterval)

1.3.3.1 1-Dimensional Intervals (PositionScalarInterval)
Spatial position units required; LoLimit and HiLimit are scalar doubles.

1.3.3.2 2-Dimensional Rectangles (Coord2VecInterval)
One or more intervals defined by vector pairs (BLC/TRC).
Spatial position units required; LoLimit2Vec and HiLimit2Vec are arrays of two doubles.

1.3.3.3 2-Dimensional Region
A Region may be a shape or the result of an operation on one or more Regions. It shall optionally contain its Area and associated unit. The supported shapes are: Allsky, Circle, Ellipse, Polygon, Box, Sector, Convex, ConvexHull, and SkyIndex. The supported operations are Union, Intersection, Negation, and Difference.

1.3.3.3.1 AllSky
For convenience.

1.3.3.3.2 Circle
 Defined by a 2-D Position and a radius.

1.3.3.3.3 Ellipse
 Defined by a 2-D Position, semi-major and semi-minor axes, and position angle.

1.3.3.3.4 Polygon
Defined by two or more vertices connected by straight lines (Cartesian) or great or small circles (Spherical). Small circle sides may be specified by adding a SmallCircle element to a Vertex which specifies the pole that defines the curvature of the small circle between that vertex and its predecessor.

1.3.3.3.5 Box
For convenience; it is a special case of polygon, allowing only great circle sides.

1.3.3.3.6 Sector
The area swept by position angle between two half lines starting in a common position and defined by a position angle.

1.3.3.3.7 Convex
Convex polygon on unit sphere, defined by two or more HalfSpaces.
1.3.3.8 ConvexHull
The smallest convex polygon that contains all its points; in spherical coordinates all points have to be contained within a hemisphere

1.3.3.9 SkyIndex
Hook for future use, allowing the specification of a Region through a sky indexing scheme.

1.3.3.10 Union
Union of two or more Regions.

1.3.3.11 Intersection
Intersection of two or more Regions.

1.3.3.12 Negation
Negation of one Region.

1.3.3.13 Difference
Difference of two Regions; for convenience, since it can, in principle, be constructed through a combination of Intersection and Negation.

1.3.3.4 3-Dimensional Intervals (Coord3VecInterval)
One or more brick-shaped intervals defined by vector pairs (BLC/TRC). Spatial position units required; LoLimit3Vec and HiLimit3Vec are arrays of three doubles.

1.3.3.5 3-Dimensional Sphere (Sphere)
Defined by a 3-D Position and a radius. Spatial position units required
1.3.4 Spatial Velocity
Defined by one or more 1-D, 2-D, or 3-D intervals.

1.3.4.1 1-Dimensional Intervals (VelocityScalarInterval)
Spatial position and time units required; LoLimit and HiLimit are scalar doubles.

1.3.4.2 2-Dimensional Rectangles (Velocity2VecInterval)
One or more intervals defined by vector pairs (BLC/TRC).
Spatial position and time units required; LoLimit2Vec and HiLimit2Vec are arrays of two doubles.

1.3.4.3 3-Dimensional Intervals (Velocity3VecInterval)
One or more brick-shaped intervals defined by vector pairs (BLC/TRC).
Spatial position and time units required; LoLimit3Vec and HiLimit3Vec are arrays of three doubles.

1.3.4.4 3-Dimensional Sphere (VelocitySphere)
Defined by a 3-D Velocity and a radius.
Spatial position and time units required.
1.3.5 Spectral Interval (SpectralInterval)
Spectral units required; LoLimit and HiLimit are scalar doubles.

1.3.6 Redshift Interval (RedshiftInterval)
Spatial position and time units required if expressed in terms of Doppler velocity; LoLimit and HiLimit are scalar doubles.

1.3.7 Pixel Interval (PixelCoordInterval)
The PixelCoordInterval needs to refer to a specific Coordinate Frame through a frame_id. There are three types of PixelCoordInterval:

1.3.7.1 PixelCoordScalarInterval
Optional units; LoLimit and HiLimit are scalar doubles.

1.3.7.2 PixelCoord2VecInterval
Optional units; LoLimit2Vec and HiLimit2Vec are arrays of two doubles.

1.3.7.3 PixelCoord3VecInterval
Optional units; LoLimit3Vec and HiLimit3Vec are arrays of three doubles.
2 Units
This section lists all units strings as they are recognized in the STC schema.

2.1 Time Units
- s (second)
- h (hour = 3600 s)
- d (day = 86400 s)
- a or yr (Julian year = 365.25 d)
- cy (Julian century = 36525 d)
- " (empty, i.e., dimensionless; for ISO-8601 format)

2.2 Spectral Coordinate Units

2.2.1 Frequency
- Hz
- kHz
- MHz
- GHz

2.2.2 Wavelength
- m
- mm
- um (micrometer)
- nm
- Angstrom

2.2.3 Energy
- eV
- keV
- MeV
- GeV
- TeV

2.3 Spatial Coordinate Units

2.3.1 Angular Units
- deg (degree)
- rad (radian)
- h (hour)
- arcmin
- arcsec
2.3.2 Linear Units

m (meter)
km
mm
AU
pc (parsec)
kpc
Mpc
lyr (lightyear)
" (empty, i.e., dimensionless, for unit sphere)

2.3.3 Three-units Strings

These strings are for special 3-D vectors where the components do not share the same unit; one may prefer to give each component its own unit, instead:

'deg deg m'
'deg deg Mpc'

2.3.4 Position Angles

Then there is the position angle definition (not strictly a unit). Position angles may be counted from North (through East), (positive) X (to positive Y), or (positive) Y (to positive X) axis:

North
X
Y

Velocity units are constructed as posUnitType / velTimeType and the position and velocityTime units are specified separately in order to reduce the size of the enumeration list the latter may be second, day, hour, year (a or yr), century, but not empty.
3 Usage

3.1 Referencing
It shall be possible to reference the same object multiple times in a metadataset. It shall be possible to assign values to metadata components through references. It shall be possible to refer to components within and outside the same metadataset.

3.2 Use Context
The STC metadata description may be used in a number or contexts. Listed here are the four comprehensive cases, but these are not exclusive.

3.2.1 Resource Profile (STCResourceProfile)
Describe coverage, coordinate systems, and properties (e.g., resolution, field-of-view size, accuracy) of data in a repository.

3.2.2 Search (SearchLocation)
Describe coverage, coordinate systems, and properties (e.g., resolution, field-of-view size, accuracy, pixel size) of data requested in a query.

3.2.3 Catalog Data (CatalogEntryLocation)
STC metadata for a data table: coverage, accuracy, resolution, coordinate values – optionally pointed to through a reference.

3.2.4 Observational Data (ObsDataLocation)
In this case there shall be STC metadata for the observer’s location (ObservatoryLocation) as well as for the observational data (ObservationLocation) themselves.
4 Global Elements

The following table provides a list of all global elements and their substitution group hierarchy.

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<th>Column 1</th>
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<td>If the element is abstract, this column contains an a</td>
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