STC-2 Design and Development: Status

Arnold Rots
SAO/CXC

Designing STC-2 in VO-DML

- Refer to Omar's talk this morning
  - VO-DML offers a rigorous design framework that improves completeness and consistency
  - Separated in packages with explicit dependencies
  - It provides tools for integration in applications
  - Implicitly, it also serves as a version management system
  - With thanks to:
    - Gerard Lemson
    - Omar Laurino
    - Mark Cresitello-Dittmar
    - Markus Demleitner

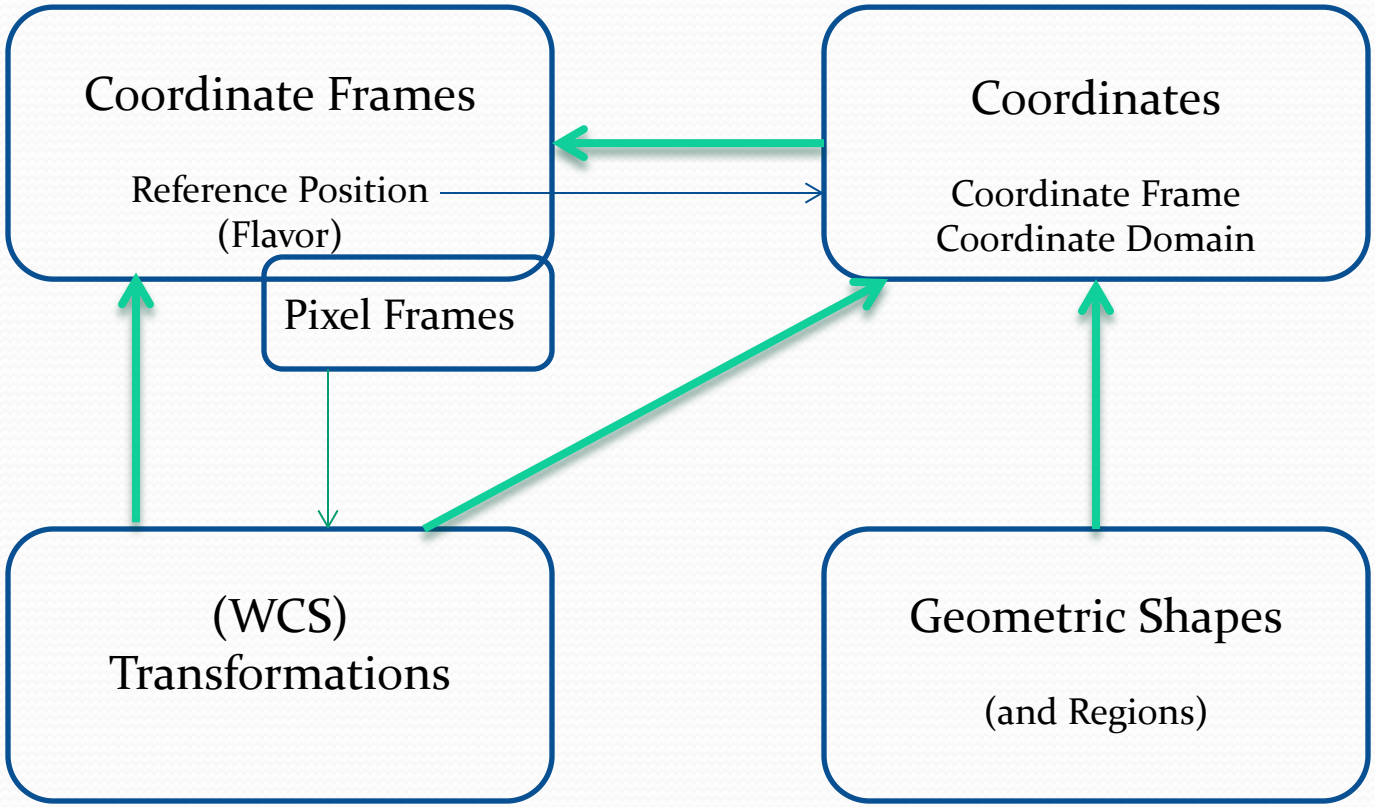
Scope

- Metadata to describe the location of a physical or data object in Observation Space:
  - Time
  - Space
  - EM Spectrum
  - Redshift/Doppler velocity
  - Polarization
- These are the independent variables in an observation
- They are (or can be) interrelated
  - It must therefore be possible to provide them in a single self-consistent metadata object

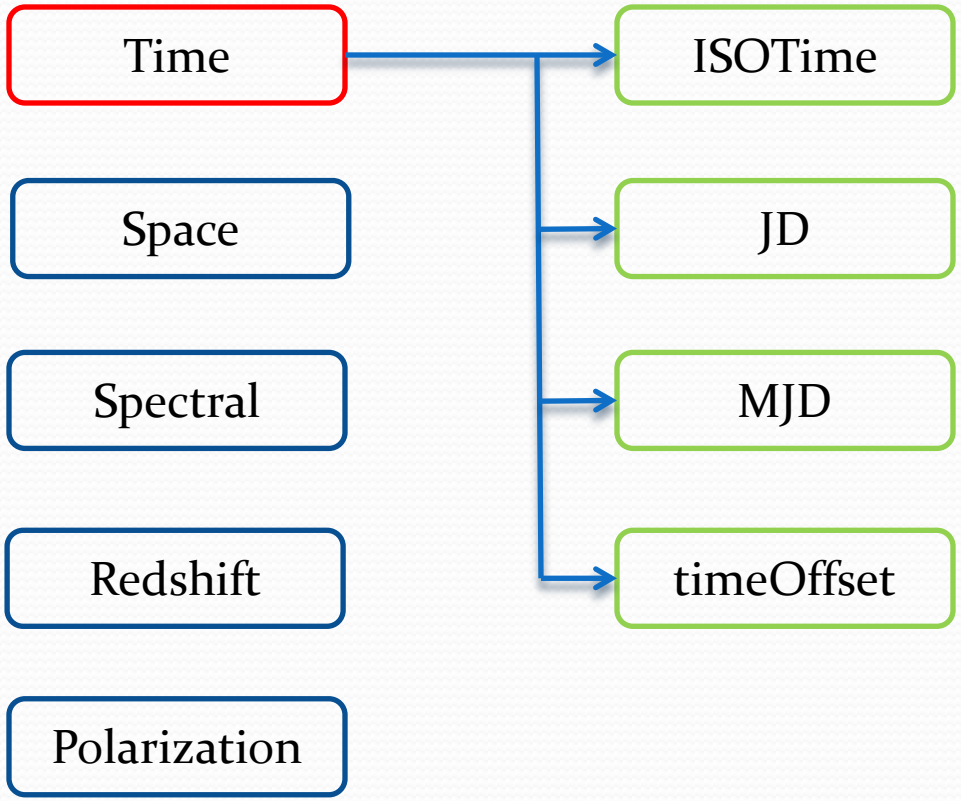
Frames and Coordinates

- Coordinate Frames
  - Frame definition: standard only
  - Reference position: standard
    - Custom optional; creates a dependency on Coordinates pkg
  - Flavor (for spatial frames only)
- Coordinates
  - Contents generally based on RealQuantity (value + unit)
  - Reference to a Coordinate Frame
  - SKOS concept: coordinate domain
    - Constrains allowable units

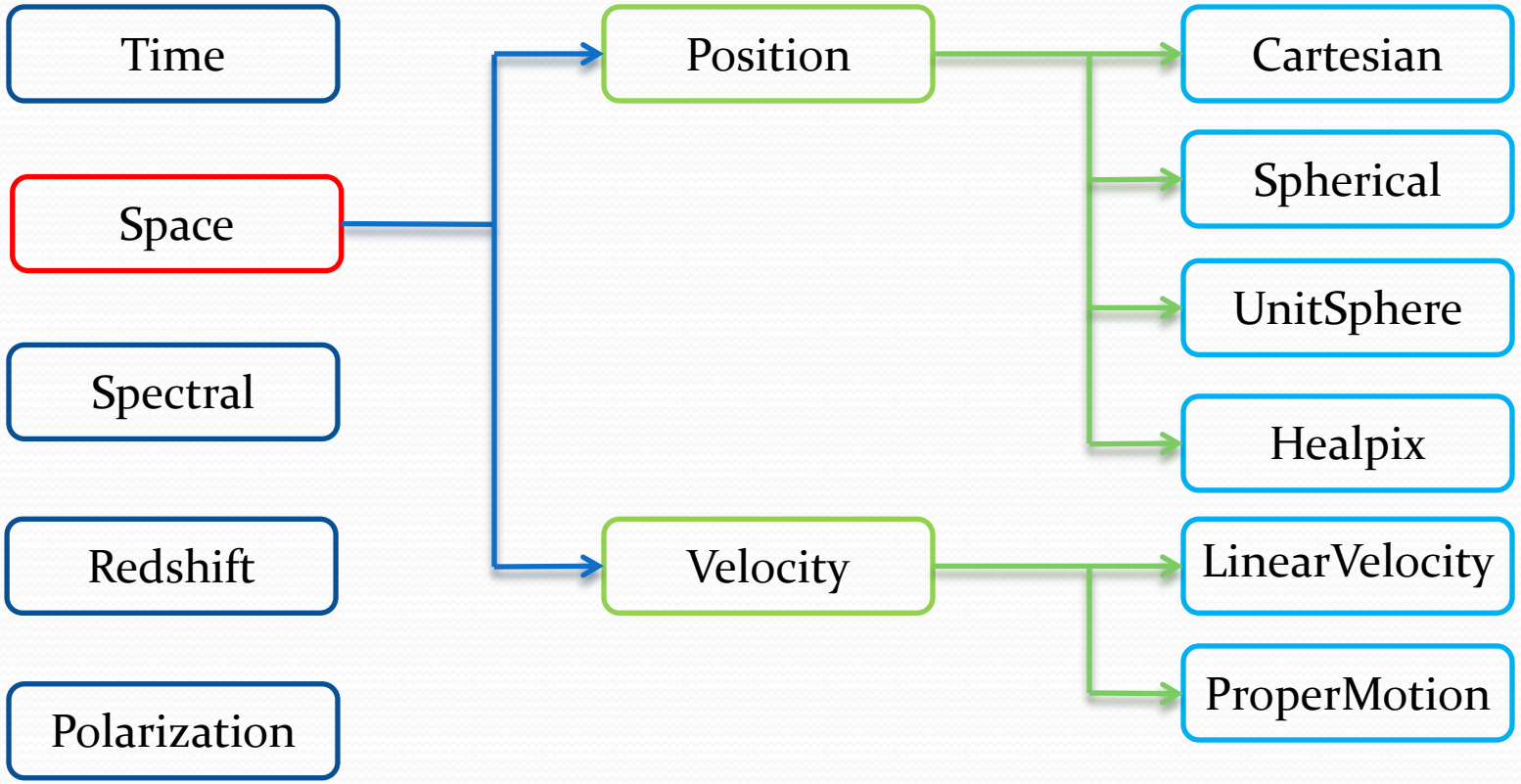
Packages


Coordinate Frames
Reference Position
(Flavor)
Pixel Frames
Coordinates
Coordinate Frame
Coordinate Domain
(WCS)
Transformations
Geometric Shapes
(and Regions)

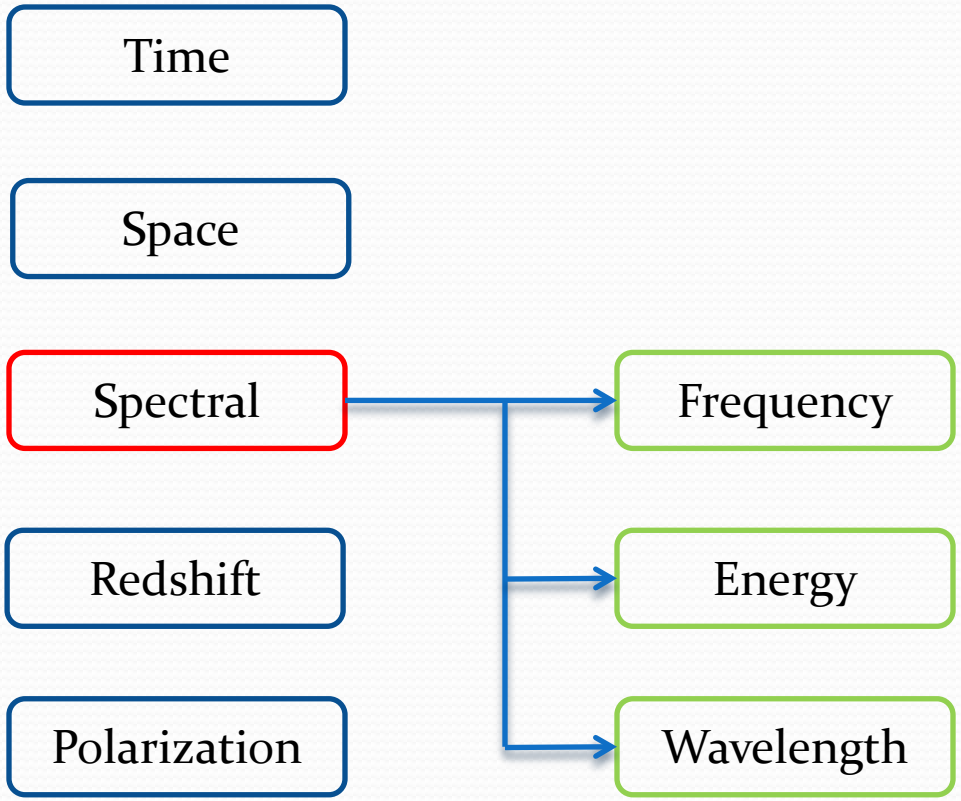
Coordinate Domain Taxonomy



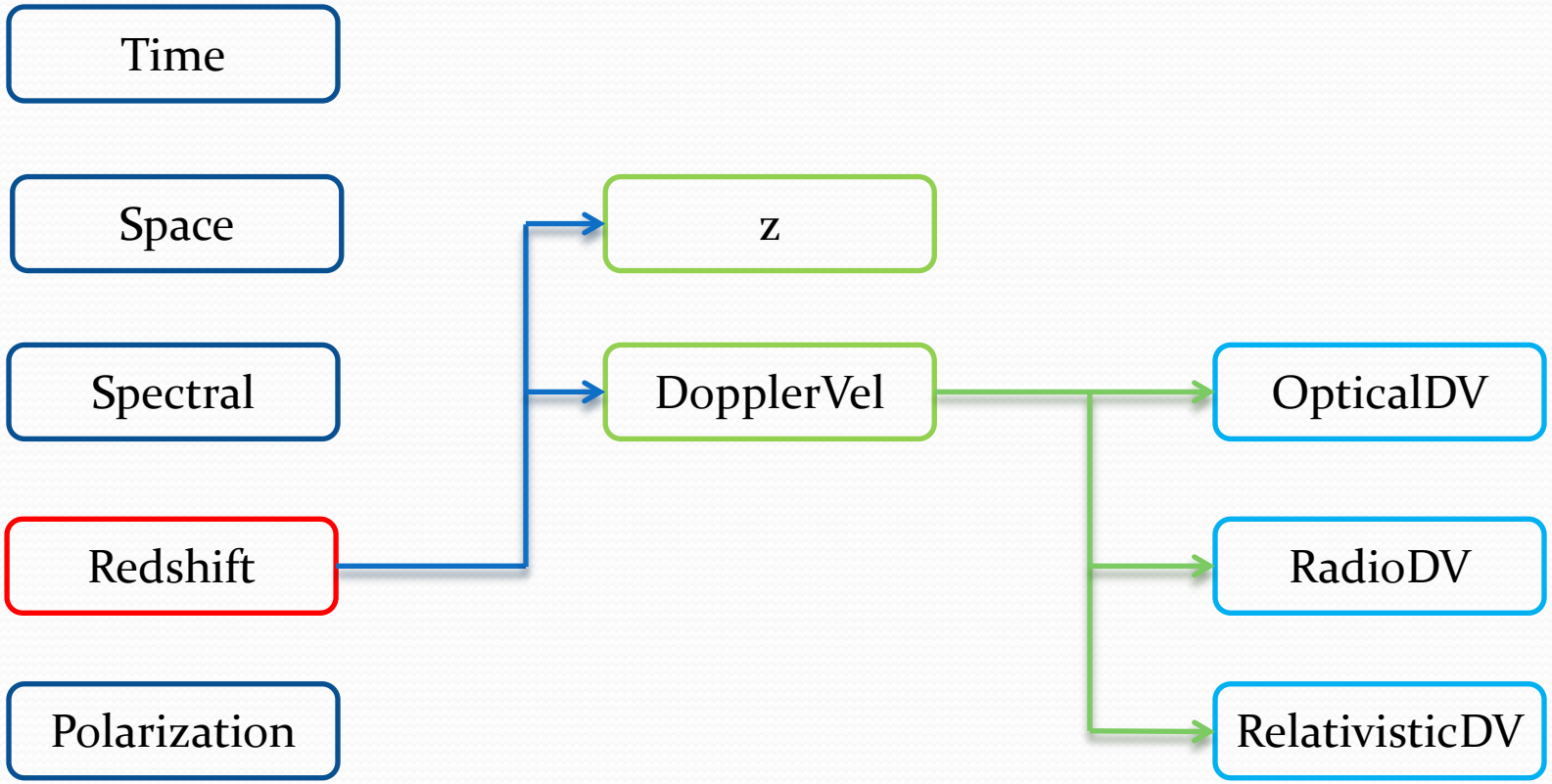
Coordinate Domain Taxonomy



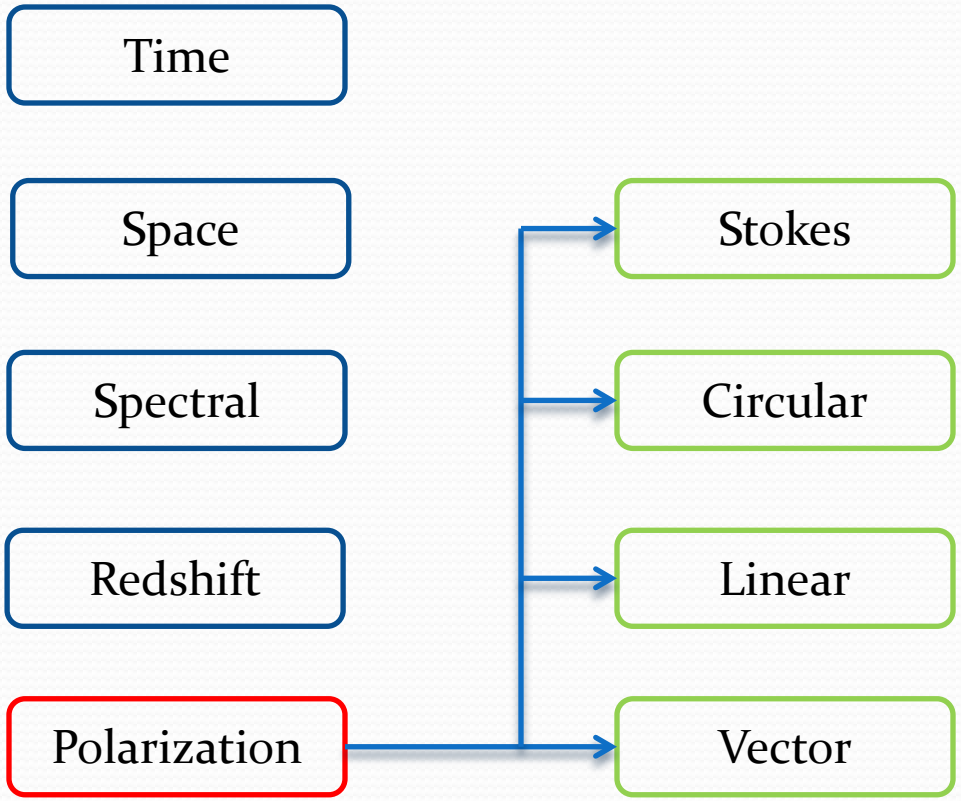
Coordinate Domain Taxonomy



Coordinate Domain Taxonomy



Coordinate Domain Taxonomy



Coordinates Contents

- Implemented as Data Types
  - Allows easy use with minimal overhead
- Coordinate Frame reference
- Coordinate Domain
- Data (all optional):
  - Name
  - Value
  - Error
  - Resolution

Polarization

- By necessity an enumerated coordinate axis
- Stokes
  - I, Q, U, V
- Circular
  - LL, RR, LR, RL
- Linear
  - XX, YY, XY, YX
- Vector
  - I, PolFlux, PolPercent, PolAngle

Pixel Frames and Coordinates

- Pixel coordinates are simple n-dimensional values
- The Pixel Space consists of one or more Pixel Frames
- A Pixel Frame maps to a WCS Coordinate Frame
- Multiple mappings are allowed
- Note that Pixel Frames are the only Coordinate Frames that have a dependence on Transformations

Generic Coordinates

- Generic Coordinate Frames and Coordinates
- Allow using the same tools for use with, say, dependent variables like flux

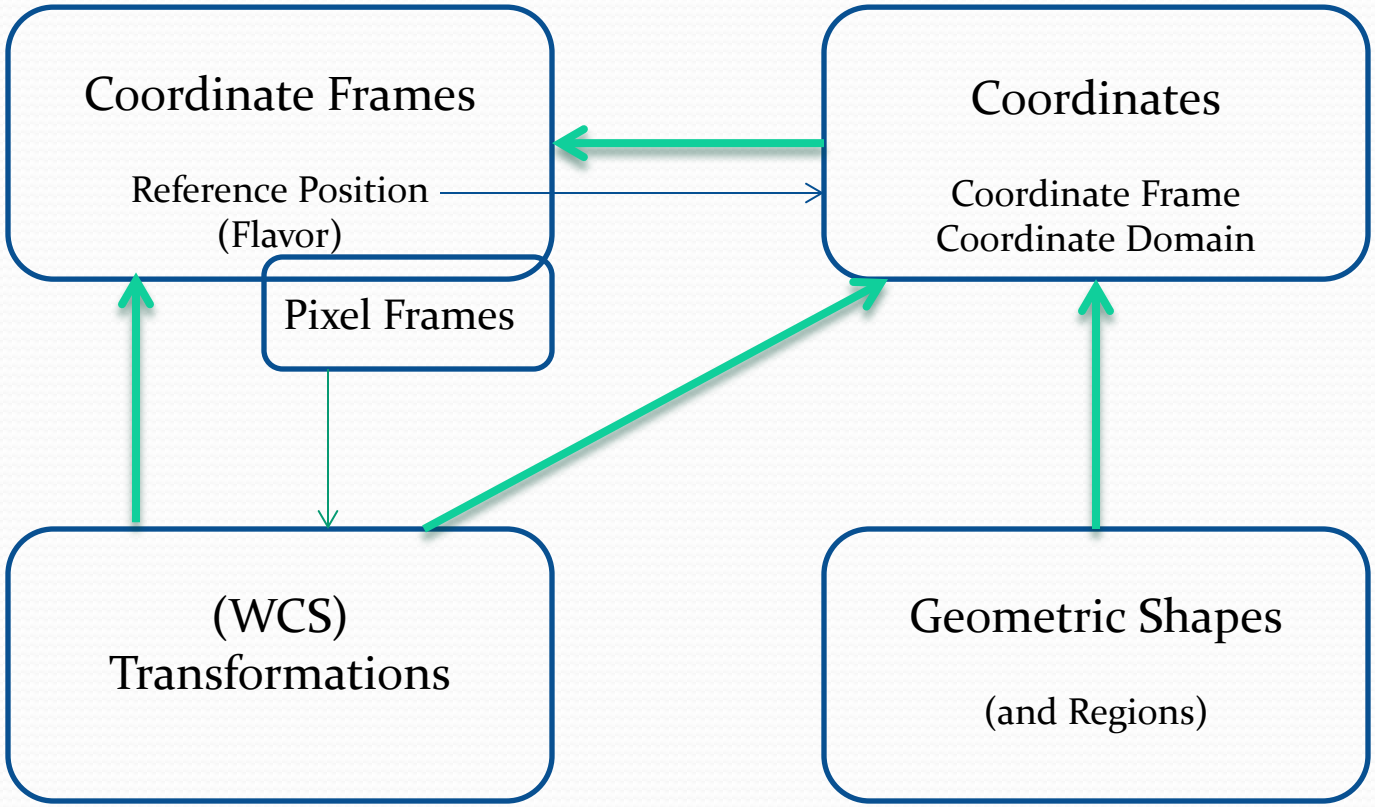
Transformations

- Define (not implement) a mapping from one Coordinate Frame to another
- Mirrors FITS WCS conventions and standards
- General extension to all Frames, including Generic
- Allow enumerated coordinates

Geometries

- Specify ranges, areas, volumes in Observing Space
- Specialized set: Regions in 2-D
- Dependent on Coordinates
- No other packages depend on Geometries

Summary


Coordinate Frames
Reference Position
(Flavor)
Pixel Frames
Coordinates
Coordinate Frame
Coordinate Domain
(WCS)
Transformations
Geometric Shapes
(and Regions)