SED Data Model – Oct2012 WD

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SED Data Model

- Data Model Architecture
  - SpectralDM (generic; includes Observation, Char, etc.)
    - Spectrum
    - PhotometryPoint
    - **SED**
    - TimeSeries (proposed/planned)
    - Image?

- SED
  - Top level Dataset class in DAL/DM architecture
  - Can search for SEDs with ObsTAP, find SED services in registry
    - ObsTAP: dataproduct_type="SED"

SED Data Model

- ## SED Dataset or Object
  - Generic Dataset metadata inherited from SpectralDM
    - and thus from Observation, Char, Photometry, etc.
  - SED-specific Dataset metadata
  - Data element metadata (uniform SED)

- ## Data Elements
  - Data for Uniform SED
  - Data for Aggregate SED
  - Either or both may be present

SED-Defined Dataset Metadata
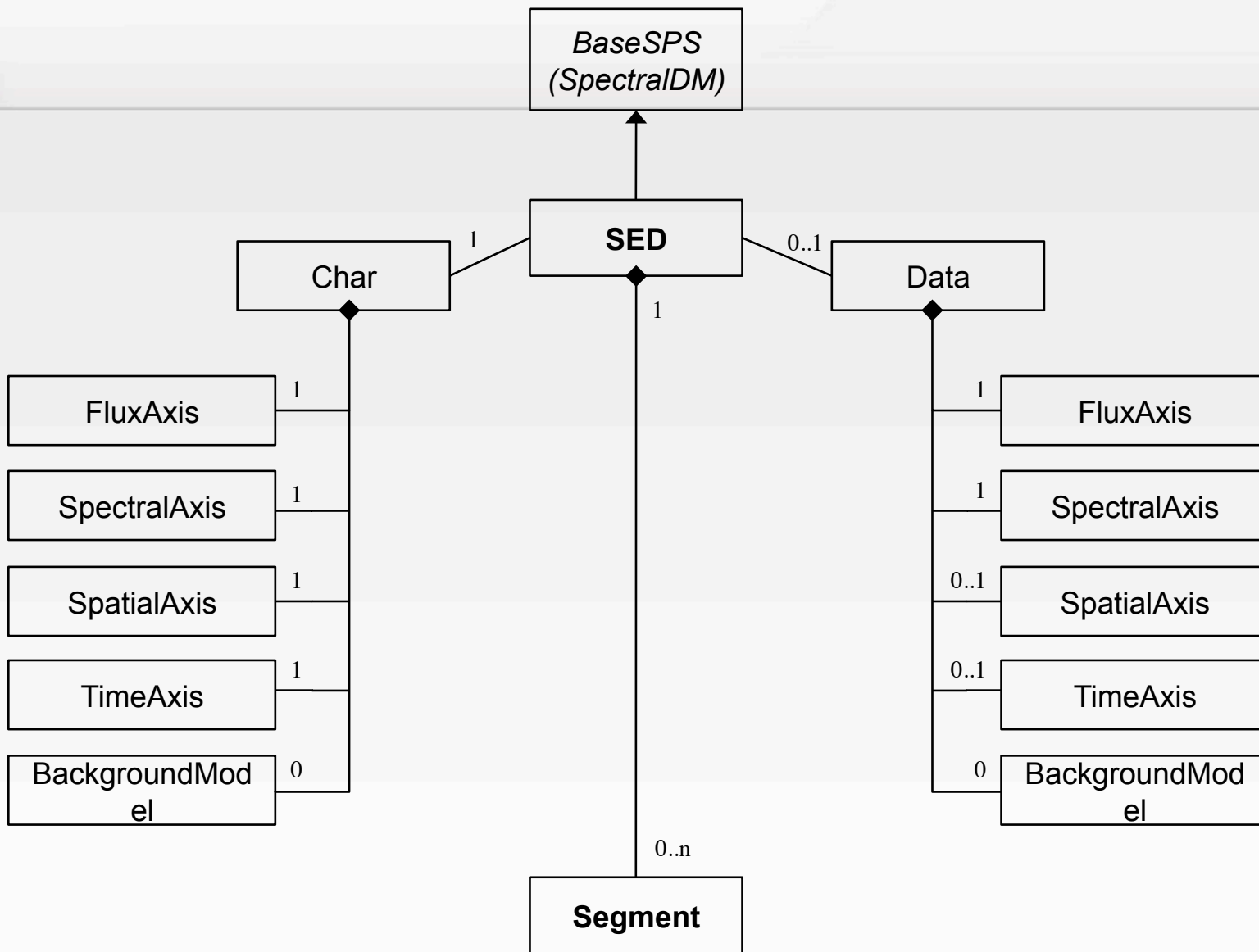
3.5.1 Dataset Metadata

The SED object or dataset should include the following global UTypes in addition to those defined Spectral DM (mandatory SED dataset fields are shown in bold text).

Dataset.dataModel	"SED-1.0"
Dataset.type	"SED"
Dataset.length	Number of data points in the uniform SED

SED.uniformSed	Data for the uniform SED is included ("true" or "false")
SED.aggregateSed	Data for the aggregate SED is included ("true" or "false")
SED.nSegments	Number of segments in the aggregate SED
SED.aggregateSedURI	URI to aggregate SED if applicable (FITS keyword: SEDORIG)

SED Data Model

- ● Uniform SED
  - − Segment data transformed to uniform spectral/flux units
  - − Stored in Data element of SED object
  - − May or may not be rebinned/merged
  - − Position, time are possible as columns
  - − Can be viewed as a type of spectrum (client s/w permitting)

- ● Uniform SED Metadata
  - − Provided in additional columns of Data table
  - − SED-defined standard metadata
  - − Metadata carried over from segments
  - − Extension metadata, e.g. from SED builder algorithm
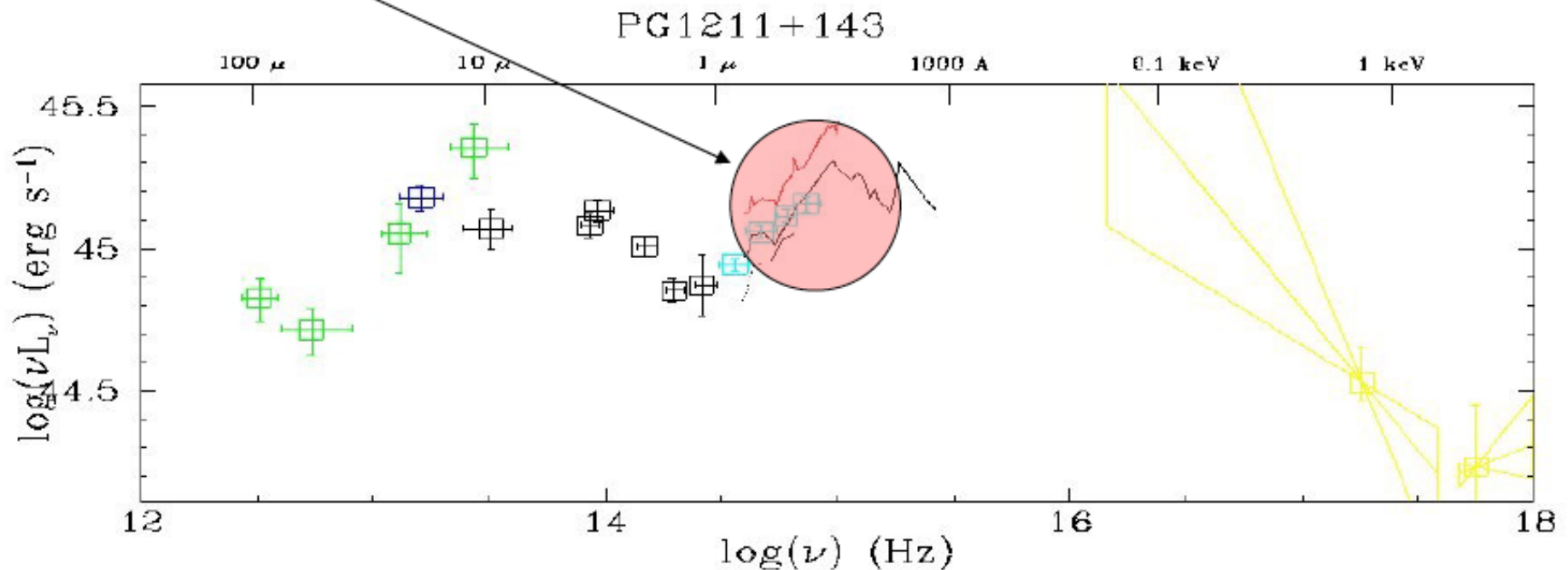   - ○ tells something about how a data point was derived

The hard part: combining overlapping data (JCM, Nara 2010)

Overlapping spectra and photometry is a common situation

What is the SED flux value here?

Implication: uniform SED data points don't have a 1-1 mapping back to aggregate SED segments.

PG1211+143

Name:Q1211+143		
QSO Name:PG1211+143		
Position:12 11 44.8 14 19 53.0		
Redshift: 0.0850 V mag: 14.63		
NH value: 283.0		
Sample:UV/WE/HL/EXO		

———— ——— Averaged		—
———	1980 Jun Bechtold et al. (1986)	Hale
———	1980 Jun Bechtold et al. (1986)	IPC
———	1983 ——— Elvis et al. (1990)	IRAS
———	1985 May Elvis et al. (1990)	MtHopk(24in)
———	1986 Feb Elvis et al. (1990)	IRTF
———	1987 Feb RDAF	LWP10115
·········	1988 Sep Elvis et al. (1990)	MMT/FOGS

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Uniform SED Metadata

SED Data Model

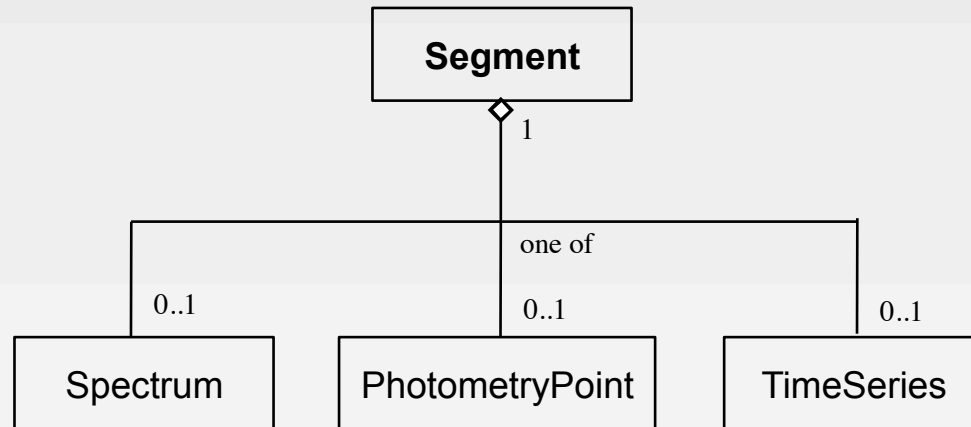|	
Data.segmentType	One of "PhotometryPoint", "TimeSeries", "Spectrum", or "Composite".
Data.segments	The segment number, a comma-delimited list of segment numbers, or NULL if a more complex combination of segments are used to compute the given photometric value. The first segment of the aggregate SED is number one.
Data.comments	Additional information about the computed data value or segment.

SED Data Model

- Aggregate SED
  - Contains observations used to construct the SED
  - Each "segment" contains one such observation
  - Data for aggregate SED may be appended to SED dataset
    - pointing to an external object via URI also permitted
  - Segments
    - may or may not be VO compliant, or derived from SpectralDM

Segment of Aggregate SED

```
                    ┌──────────────┐
                    │   Segment    │
                    └──────────────┘
                           ◇
                           1
          ┌────────────────┼────────────────┐
                        one of
      0..1              0..1              0..1
  ┌──────────┐    ┌──────────────────┐  ┌──────────────┐
  │ Spectrum │    │ PhotometryPoint  │  │  TimeSeries  │
  └──────────┘    └──────────────────┘  └──────────────┘
```

Other segment
types are possible
in the future

SED Serializations

- VOTable
  - Uniform SED very similar to Spectrum
  - Data for aggregate SEDs stored in additional table or resource elements

- FITS
  - Binary table used to serialize uniform SED
  - FITS extension mechanism may be used for segment data

Issues

- ## Uniform SED
  - support for uniform vs binned; data overlaps

- ## Aggregate SED
  - support native data or only VO/SPM?
  - container mechanism not yet fully defined

- ## Metadata Extension
  - e.g. algorithm/process used to compute SED