TimeSeries in VO
Use Case Assessment

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IVOA science use cases for TS

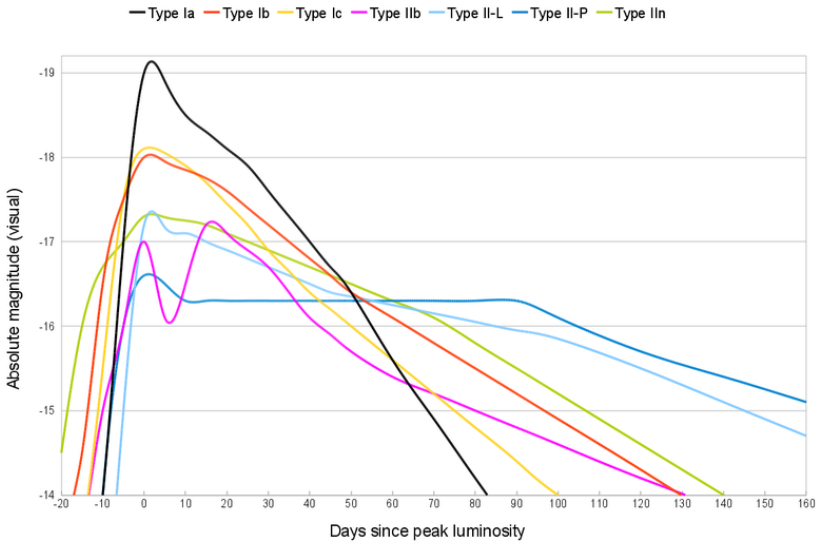
Committee on Science Priorities

TWiki > IVOA Web > IvoaSciencePriorities > CSPTimeSeries (2012-09-26, MarkAllen) Edit Attach

Science use Cases for Time Series

Group A:

- **Common requirement: Combine photometry and light curves of a given object/list of objects in the same photometric band**
- Use Case #1: Supernova classification using the light curve
  - Description: The visual light curves of the different supernova types vary in shape and amplitude, based on the underlying mechanisms of the explosion, the way that visible radiation is produced, and the transparency of the ejected material.



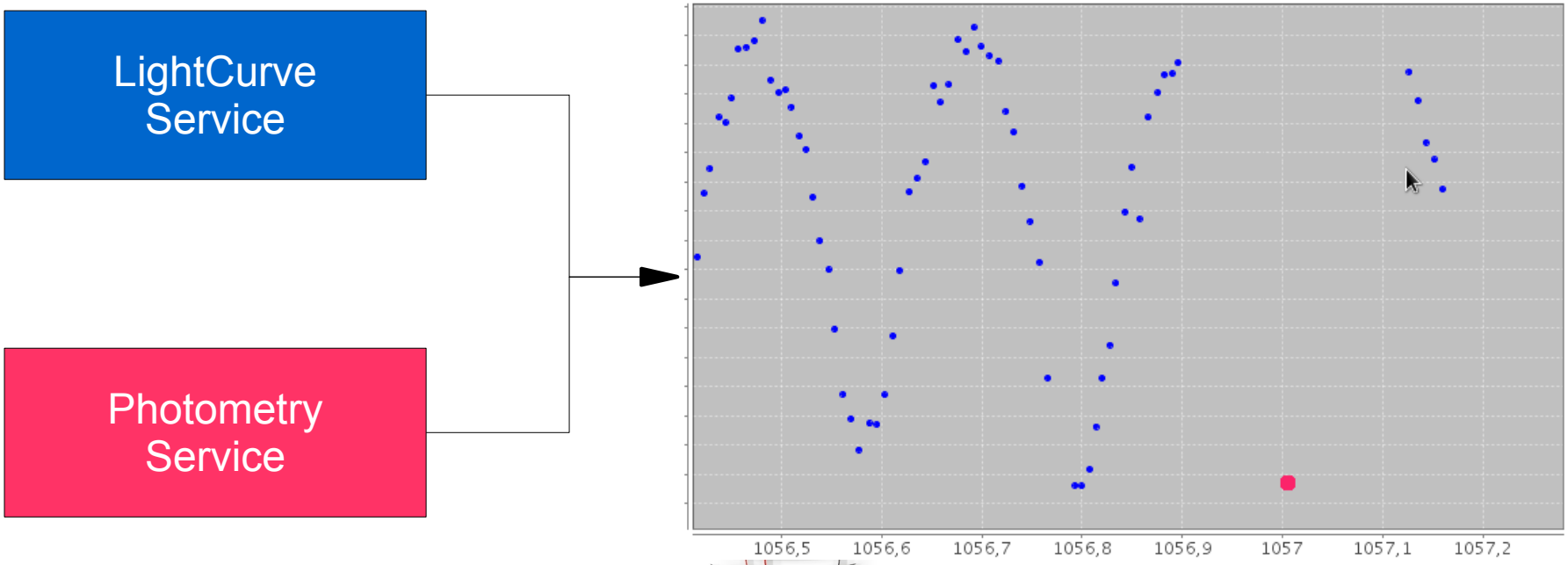
- Requirements
  - Combine photometry and light curves of a given object in the same photometric band
  - Show me a list of data that satisfies
    - Target= SN 2011FE
    - Datatype= Photometry or TimeSeries/lightcurves
    - Axes include time
    - Axes include brightness
    - Information on photometric band (zero point, transmission curve of the filter)

3 groups of scientific use cases identified by IVOA:

- Group A: Combine phot. and LCs in the same band.
  - Cases: #1,#2,#3,#4
- Group B: Combine phot. and LCs in different bands.
  - Cases: #5
- Group C: Time series other than light curves.
  - Cases: #6,#7,#8

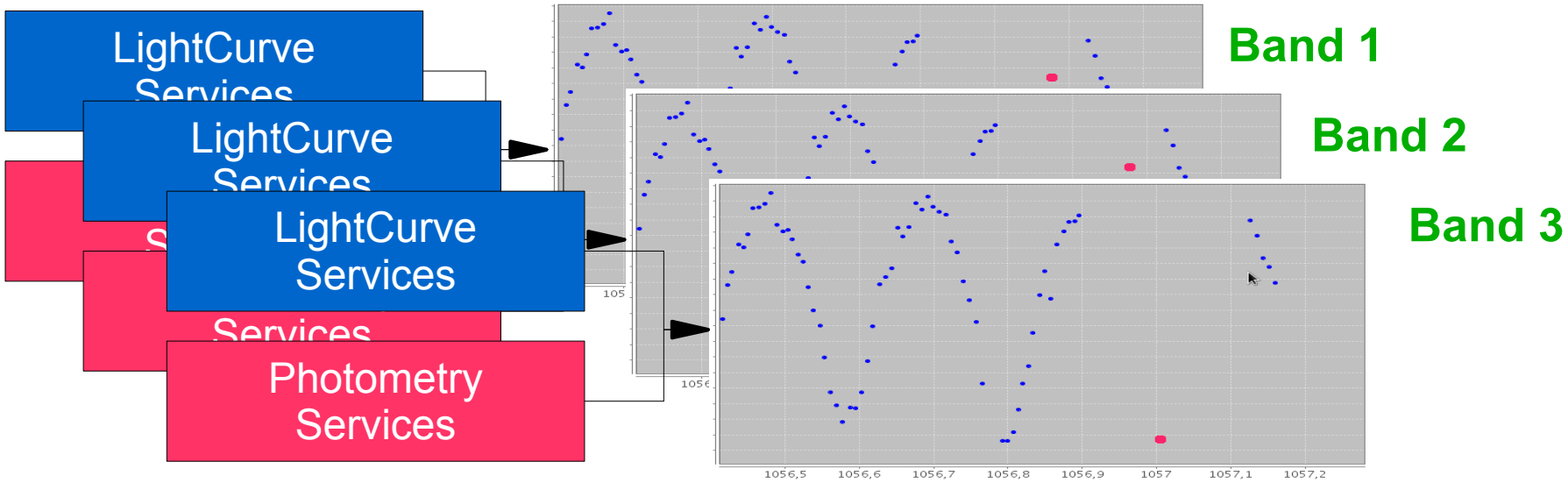
Group A

- Group A: Combine phot. and LCs in the same band.
  - Supernova classification
  - Long-term analysis of eclipsing binaries
  - Discovering brown dwarfs



Group B: Requirements

- Same as group A, but: Searching for each of the bands (light curves at different wavelengths).
  - Follow-up characterization of supernovae.



Group C

- Group C: Time series other than light curves.
  - Exoplanet studies
  - Asteroseismic studies of pulsating variables
  - Spectral and temporal variability study of X-ray sources.

Analysis

Data discovery	•Registry
Data access	•SSAP •IVOA note on 'Time Series Data' (Dec 2010) •ConeSearch •TAP
Data model	•SDM 1.1 •SDM 2.0 •IVOA note on 'Time Series Data' (Dec 2010) •DotAstro SimpleTimeseries

Data discovery requirements

- Data discovery requirements:
  - Show me services providing:
    - TimeSeries/Type
    - Photometry
- Required by: all use cases.

•Photometry:	#1, #2, #3, #4, #5
•TimeSeries/LightCurves:	#1, #2, #3, #4, #5
•TimeSeries/RvelocityCurves:	#6
•TimeSeries/PowerSpectra:	#7
•TimeSeries/HardnessRatio:	#8

Data discovery requirements

- Data discovery requirements:
  - Show me services providing:
    - TimeSeries/Type
    - Photometry
- Required by: all use cases.

Not accomplished

Search by data type needed at registry level to find services by data type:

- Photometry: #1, #2, #3, #4, #5
- TimeSeries/LightCurves: #1, #2, #3, #4, #5
- TimeSeries/RvelocityCurves: #6
- TimeSeries/PowerSpectra: #7
- TimeSeries/HardnessRatio: #8

Data access requirements

Search by target or coordinates/radius

- Required by: all use cases.

Data access requirements

Search by target or coordinates/radius

- Required by: all use cases.

Accomplished

- **SSAP**
- **'Time Series Data' Note**
- **ConeSearch**
- **TAP**

Data model requirements

X Axis:	Time #1 #2 #3 #5 #6 #8	Frequencies #7	Phase axis or Period info present #4
SDM 1.1	YES	?	No
SDM 2.0	YES	?	No
SimpleTimeseries	YES	No	YES
Note	YES	As SDM	YES

Data model requirements

Y Axis:	Flux/Mag #1 #2 #3 #4 #5	Rad. Vel. #6	Power #7	Hardness ratio #8
SDM 1.1	YES	YES	No	“NORMALIZED”
SDM 2.0	YES	YES	No	“NORMALIZED”
SimpleTimeseries	YES	DVAL (Generic)	DVAL (Generic)	DVAL (Generic)
Note	As SDM	As SDM	As SDM	As SDM

Data model requirements

If Mag is given, photometric band information needed: zero point and/or transmission curve.

Needed by: #1 #2 #3 #5

SDM 1.1	**No**
SDM 2.0	**YES**
SimpleTimeseries	**No**
Note	**Yes**

Summary

- Data discovery:
  - Action needed in Registry: search by data type
- Data model:
  - Typical cases (Time/Flux-Mag) mostly covered.
  - Period needed in SDM
  - Some cases not covered?: Power Spectra

Thanks