

Semantics Session 1

- Vocabularies for the VO + RFC
 - Norman Gray
- Use vocabulary words in other WGs
 - Theory (today 5pm), VOEvent, DM
- Ontologies in VOTECH
 - (SD)
- Exposing database as RDF model
 - Alasdair Gray
- SEMAST 2009

Ontologies in VOTECH

- <http://wiki.eurovotech.org/twiki/bin/view/VOTech/ResourceDiscovery>
- Ontology use cases
- Ontologies construction :
 - semi-automated generation from existing structures
 - manual construction with editor
- UML to ontologies
- Ontology of astronomical object types

Onto. Use Cases

- **Ontology for Access control**
 - database restricted queries/result
 - virtual files permission/sharing
 - quota on VOSpace storage
- **VOEvent use cases**
 - Find all CMEs within 24h of a solar flare
- **Astronomical object types**
 - Check consistency of multiple types for an object

UML to ontologies

- Take the UML description of a data model, and turn it into an ontology (E. Auden)
 - XSD schema
 - OWL file
- Automated conversion proved troublesome
- Application (manual OWL edition) to :
 - VOEvent
 - STC
 - Characterisation (imports STC1.3.owl)
 - Registry

Using knowledge bases

- **Ontologies + datasets**
 - convert XML (e.g. VOEvent packets) to RDF
 - put ontology and datasets in a knowledge base
- **Knowledge bases and Queries**
 - Quaestor: SPARQL queries
 - Sesame: SeRQL queries

SeRQL Query to Sesame for VOEvents

Sesame: rdbms-rdfs-db-votech2 - Microsoft Internet Explorer

Address: <http://msslxx.mssl.ucl.ac.uk:8080/sesame/actionFrameset.jsp?repository=rdbms-rdfs-db-votech2>

Logged in: **griduser** [log out] Read actions: [SeRQL-S](#) [SeRQL-C](#) [RDQL](#) [RQL](#) [Extract](#) [Explore](#)
Repository: **MySQL RDFS Test DB VOTECH 2** [select other] Modify actions: [Add \(file\)](#) [Add \(www\)](#) [Add \(copy-paste\)](#) [Remove](#) [Clear](#)

Evaluate a SeRQL-select query

Your query: and Dec > "-29.5"^^xsd:float"/>

Response format:

Query results:

| RA | Dec |
|---------------------|----------------------|
| "270.3940833333333" | "-29.18508333333333" |
| "270.037366" | "-29.324656" |
| "270.037355" | "-29.055211" |
| "270.169803" | "-29.110250" |
| "270.169799" | "-29.379694" |
| "270.302421" | "-29.323862" |
| "270.302401" | "-29.054417" |
| "270.434963" | "-29.110149" |
| "270.434969" | "-29.379593" |

9 results found in 2993 ms.

Return RA and Dec where
RA > 270.0 && RA < 270.5 && Dec < -29.0 && Dec > -29.5

Done Internet

start namespace - WordPad Sesame: rdbms-rdfs-... VoEventSERQLnotes ... Apache Tomcat/5.5.2... Application of RDF/S ... Microsoft PowerPoint ... 01:34

Ontology of object types

- Protégé editor, OWL file
- Two IVOA notes
 - <http://ivoa.net/Documents/cover/AstrObjectOntology-20080716.html>
 - <http://ivoa.net/Documents/cover/AstrObjectOntologyUseCases-20080703.html>
- *Defined concepts*
 - put restrictions on concepts (definitions)
 - allows use of inference engines

Ontology Editor

The screenshot displays the 'CLASS EDITOR' for the class 'EclipsingBinary'. The interface includes a 'SUBCLASS EXPLORER' on the left, a 'CLASS EDITOR' in the center, and an 'Asserted Conditions' panel on the right. The 'CLASS EDITOR' shows a table of properties and their values for the class 'EclipsingBinary'.

| Property | Value | Lang |
|------------------|--------------------|------|
| rdfs:comment | | |
| simbad:name | EB* | |
| simbad:shortCode | EB* | |
| vizier:kwd | Binaries:eclipsing | |

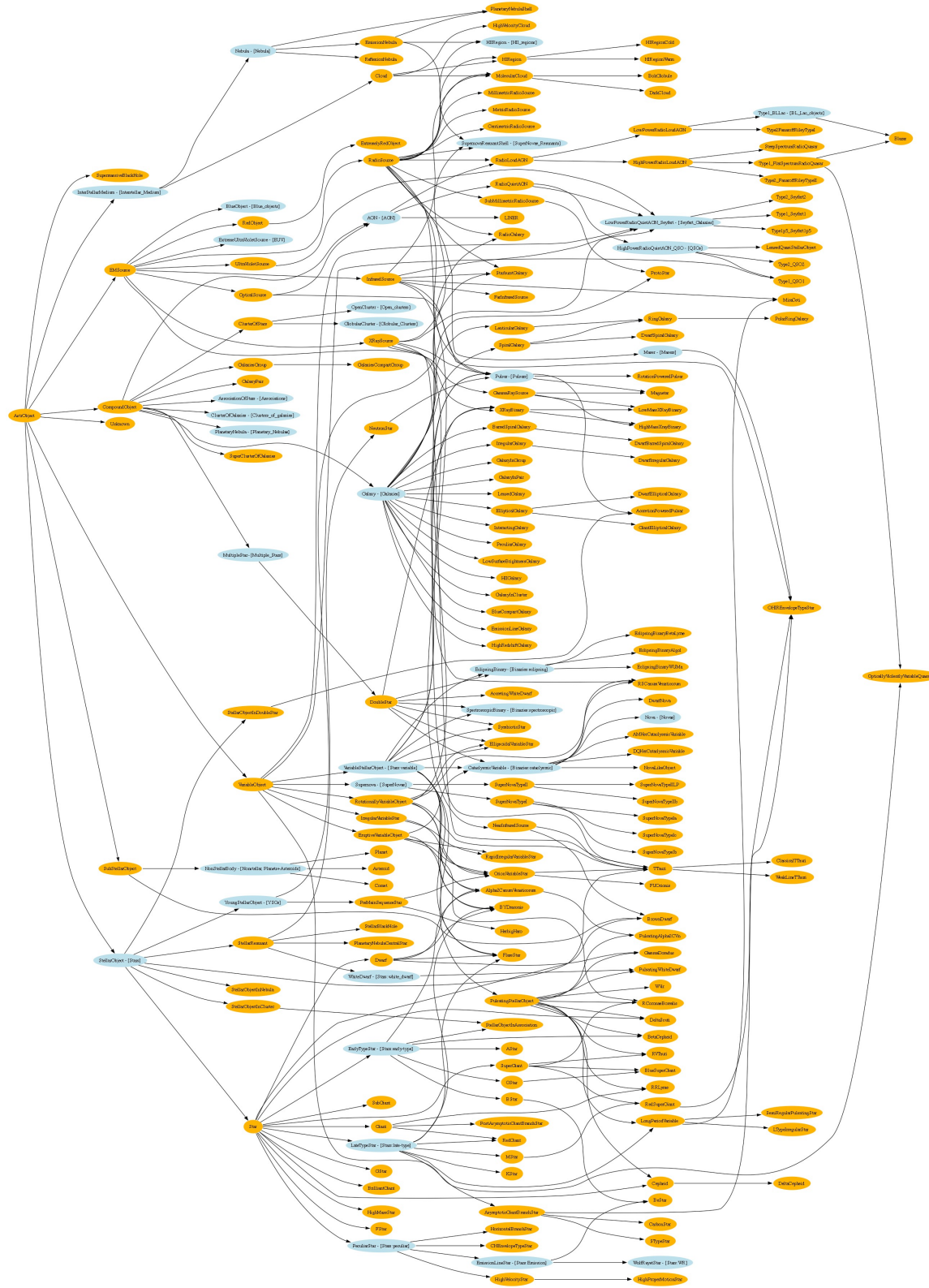
The 'Asserted Conditions' panel shows the following conditions for 'EclipsingBinary':

- DoubleStar (NECESSARY & SUFFICIENT)
- hasProcessVariabilityPeriodic some Eclipse (NECESSARY)
- VariableCompositeObject (NECESSARY)
- hasDirectComponent only AstrObject (INHERITED [from CompositeObject])
- hasDirectComponent only StellarObject (INHERITED [from MultipleStar])
- hasDirectComponent exactly 2 StellarObject (INHERITED [from DoubleStar])
- hasDirectComponent min 2 (INHERITED [from CompositeObject])
- not Unknown (INHERITED [from VariableObject])
- not Unknown (INHERITED [from VariableObject])
- not Unknown (INHERITED [from CompositeObject])

The 'SUBCLASS EXPLORER' shows the following hierarchy:

- AstrObject
 - CompositeObject
 - AssociationOfStars
 - ClusterOfGalaxies
 - ClusterOfStars
 - GalaxiesGroup
 - GalaxyPair
 - MultipleStar
 - DoubleStar
 - CataclysmicVariable
 - AMHerCataclysmicVar
 - DQHerCataclysmicVar
 - DwarfNova
 - Nova
 - NovaLikeObject
 - EclipsingBinary** (selected)
 - EclipsingBinaryAaool
 - EclipsingBinaryAlaol
 - EclipsingBinaryAlaol
 - EclipsingBinaryAlaol
 - SpectroscopicBinary
 - XRayBinary
 - HighMassXrayBinary
 - LowMassXRayBinary

- PlanetaryNebula
- SuperClusterOfGalaxies
- VariableCompositeObject
- DiffuseMatter



SIMBAD consistency check

- Each object in SIMBAD can have multiple « object types » attached, derived from
 - literature: « Crab nebula is a SNR »
 - detection in catalogues (e.g. cat. of planetary nebulae)
- Check if multiple types for a single object are consistent with constraints in the ontology (disjoints, etc...)

- M_31
- [VV98]_J141534.3+533714
- RX_J172904.4+742552a
- [VV98c]_J072041.5+561219
- PN_PM__1-325

Draw

INCONSISTENT ITEMS

nb of items: 1:

[\[VV98\]_J141534.3+533714](#)

CONSISTENT ITEMS

nb of items: 4:

[PN_PM__1-325](#)

[\[VV98c\]_J072041.5+561219](#)

[RX_J172904.4+742552a](#)

[M_31](#)

M_31 ([SIMBAD Entry](#))

OTYPES: [G, GiC, GiG, AGN, LIN, QSO, Rad, IR, X]

SUBSUMERS FROM OTYPES: [Galaxy, GalaxyInCluster, GalaxyInGroup, AGN, LINER, HighPowerRadioQuietAGN_QSO, RadioSource, InfraredSource, XRaySource]

Suggested Additional otypes: mul

--- M_31 is **CONSISTENT**

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[VV98]_J141534.3+533714 ([SIMBAD Entry](#))

OTYPES: [* , QSO, blu]

SUBSUMERS FROM OTYPES: [StellarObject, HighPowerRadioQuietAGN_QSO, BlueObject]

inconsistent otypes: StellarObject [] and HighPowerRadioQuietAGN_QSO [QSO]*

----- HighPowerRadioQuietAGN_QSO CANNOT be component of StellarObject

----- StellarObject can be component of HighPowerRadioQuietAGN_QSO

--- [VV98]_J141534.3+533714 is **INCONSISTENT**: inconsistency from otypes

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Vocabulary mappings

- Add annotations from various vocabularies to concepts in the ontology
- Allows mapping from one vocabulary to the other (equivalent, broader, narrower)

The screenshot displays an ontology editor interface. On the left, an 'Asserted Hierarchy' tree shows the following structure:

- owl:Thing
 - AstrObject
 - CompoundObject
 - AGN
 - AssociationOfStars
 - ClusterOfGalaxies
 - ClusterOfStars
 - GalaxiesGroup
 - Galaxy
 - GalaxyPair
 - MultipleStar
 - PlanetaryNebula
 - SuperClusterOfGalaxies
 - EMSource
 - InterStellarMedium
 - StellarObject
 - SubStellarObject

On the right, a table lists property mappings:

| Property | |
|---|---|
| <input type="checkbox"/> rdfs:comment | |
| <input type="checkbox"/> adc:keyword | Clusters, galaxy |
| <input type="checkbox"/> misc:genericKeywords | cluster##galaxy##galaxies##clusters##g##gal |
| <input type="checkbox"/> misc:naturalName | Cluster of Galaxies |
| <input type="checkbox"/> ned:code | GClstr |
| <input type="checkbox"/> simbad:name | CIG |
| <input type="checkbox"/> simbad:shortCode | CIG |
| <input type="checkbox"/> vizier:keyword | Clusters_of_galaxies |

SEMAST 2009

- Practical Semantics Astronomy
- 2-5 march 2009, Glasgow, Scotland