International

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Theory SkyNode

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Abstract

A proposal to modify specifications for the SkyNode is presented. The Theory SkyNode would be allowed to point to theory data and permit transfer of columnar data across nodes.

Status of This Document

This is a Note. The first release of this document was 2006 September 12.
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/.

Acknowledgements

This note has been developed based upon ideas developed and discussed prior to and during the NVO Summer School (2006).

Contents

1 Introduction

The standard mode of operation of a SkyNode involves the usage of footprint services and input of positional (RA, DEC) information. Positional information is not required for queries of Theory data. We would like to propose opening the usage of SkyNodes to allow retrieval of Theory data and passing of columns of data across nodes without requiring any positional parameters. Thus, we are proposing a new Type be included in the SkyNodeInterface specification for Theory data.

2 Proposed Modified Specifications

The specifications provided in version 0.9 of the IVOA SkyNode Interface would be amended in only four areas (QI-3, QI-13, QI-14 and QI-16). Modifications of the version 0.9 specifications are noted in italics.

QI-3 Basic Sky Node: A Sub-Type parameter SHALL be added specifying three categories. These would include OBS, OBJECT and THEORY

SkyNodes SHALL register with the registry with type=”OpenSkyNode”
We need to add a new SubClass of Capbability and VOResource for this – there will be

other metadata we need which is specific to OpenSkyNode, i.e.,

- Compliance :is it a Basic, Partial, or Full SkyNode
- *Sub-Type: OBS, OBJECT, THEORY*
- MaxRecords : if there is a limit to the number of records returned
- Latitude and Longitude : GPS coordinates of the Node ;
- PrimaryTable : the main table in the archive
- PrimaryKey : the key column of the primary table.
- AcceptsUCDs : True or False

QI-13 Full SkyNodes SHOULD accept complex Shapes in their queries as defined in the ADQL syntax (using the Region specification) *for OBS and OBJECT types only. Shapes are not required in queries for THEORY data.*

QI-14 Full SkyNodes SHALL be able to perform cross matching (Xmatch) between their survey and table of data provided in VOTable format. *This will occur in a plan statement for OBS and OBJECT types only. Xmatch features are not required for THEORY data.*

QI-16 *Full SkyNodes SHOULD implement the footprint service for OBS and OBJECT types only. A footprint service is not required for THEORY data as no positional information will be submitted in user queries. The footprint service* would take a region specified in the region XML and return a new region which is the intersection of the survey and the given region. The Region specification has also the ability to deal with Spectral and Temporal footprints, this implies a node should be able to deal with these entities. Currently we know how to deal with regions (just about) but have not really dealt with temporal nor spectral overlaps.

Appendix A: Examples

THEORY data resides in a database of the following form. Tables and fields, table descriptions and an example of a data search query are shown below. This particular database represents a series of galaxy clusters simulated using different physics models.

```
mysql> show tables;
+----------------+
| Tables_in_sca  |
```

```
+----------------+
| catalog        |
| cluster_stats  |
+----------------+
2 rows in set (0.00 sec)

mysql> select * from catalog;
+----+-------------------+-----------------------------------+
| id | name              | description                       |
+----+-------------------+-----------------------------------+
|  0 | adiabatic         | Adiabatic gas dynamics            |
|  1 | radiative_cooling | Radiative Cooling                 |
|  2 | zero_feedback     | Star formation with out feedback  |
|  3 | low_feedback      | Star formation with low feedback  |
+----+-------------------+-----------------------------------+
4 rows in set (0.00 sec)


mysql> describe cluster_stats;
+-----------------------+------------------+-------+-----+---------+--------+
| Field                 | Type             | Null  | Key | Default | Extra  |
+-----------------------+------------------+-------+-----+---------+--------+
| catalog               | int(10) unsigned | NO    | PRI |         |        |
| cluster               | int(10) unsigned | NO    | PRI |         |        |
| halo                  | int(10) unsigned | NO    | PRI |         |        |
| z                     | double           | NO    | PRI |         |        |
| image_scale_mpc       | double           | YES   |     | NULL    |        |
| t_look_back_gyr       | double           | YES   |     | NULL    |        |
| m200_tot_msolar       | double           | YES   |     | NULL    |        |
| m200_dm_msolar        | double           | YES   |     | NULL    |        |
| m200_gas_msolar       | double           | YES   |     | NULL    |        |
| m200_star_msolar      | double           | YES   |     | NULL    |        |
| r200_mpc              | double           | YES   |     | NULL    |        |
| t_virial_kev          | double           | YES   |     | NULL    |        |
| x_com_code            | double           | YES   |     | NULL    |        |
| y_com_code            | double           | YES   |     | NULL    |        |
| z_com_code            | double           | YES   |     | NULL    |        |
| vx_com_tot_kms        | double           | YES   |     | NULL    |        |
| vy_com_tot_kms        | double           | YES   |     | NULL    |        |
| vz_com_tot_kms        | double           | YES   |     | NULL    |        |
| vx_com_dm_kms         | double           | YES   |     | NULL    |        |
| vy_com_dm_kms         | double           | YES   |     | NULL    |        |
| vz_com_dm_kms         | double           | YES   |     | NULL    |        |
| vx_com_gas_kms        | double           | YES   |     | NULL    |        |
| vy_com_gas_kms        | double           | YES   |     | NULL    |        |
| vz_com_gas_kms        | double           | YES   |     | NULL    |        |
| lx_dm_mpc_kms         | double           | YES   |     | NULL    |        |
| ly_dm_mpc_kms         | double           | YES   |     | NULL    |        |
| lz_dm_mpc_kms         | double           | YES   |     | NULL    |        |
| lx_gas_mpc_kms        | double           | YES   |     | NULL    |        |
| ly_gas_mpc_kms        | double           | YES   |     | NULL    |        |
| lz_gas_mpc_kms        | double           | YES   |     | NULL    |        |
| spin_dm               | double           | YES   |     | NULL    |        |
| spin_gas              | double           | YES   |     | NULL    |        |
| v_dispersion_dm_kms   | double           | YES   |     | NULL    |        |
| v_dispersion_gas_kms  | double           | YES   |     | NULL    |        |
| delta_v200_sigma_dm   | double           | YES   |     | NULL    |        |
+-----------------------+------------------+-------+-----+---------+--------+
35 rows in set (0.20 sec)
```

The following query compares the virial temperatures for different catalog models including adiabatic, radiative cooling and star formation (zero and low feedback).

```
mysql> select catalog, cluster, halo, avg(t_virial_kev) from cluster_stats
where z = 0 group by catalog;
+---------+---------+------+---------------------+
| catalog | cluster | halo | avg(t_virial_kev) |
+---------+---------+------+---------------------+
|       0 |       0 |    0 |   5.1180363155963 |
|       1 |       0 |    0 |       3.336355952 |
|       2 |       0 |    0 |         3.4492808 |
|       3 |       0 |    0 |        3.44889274 |
+---------+---------+------+---------------------+
4 rows in set (0.24 sec)
```

References

[1] W. O'Mullane, M. Ohishi, *IVOA SkyNode Interface Version 1.01,* http://ivoa.net/Documents/WD/SNI/SkyNodeInterface-20050624.pdf