



IVOA Astronomical Data Query Language Version 0.7.1

IVOA Working Draft 2004-01-23

This version:

0.7.1 <http://www.ivoa.net/internal/IVOA/IvoaVOQL/ADQL-0.7.1.pdf>

Previous versions:

0.7 <http://skyservice.pha.jhu.edu/develop/vo/adql/ADQL-0.7.pdf>

0.6 <http://skyservice.pha.jhu.edu/develop/vo/adql/ADQL-0.6.pdf>

0.5 <http://skyservice.pha.jhu.edu/develop/vo/adql/SkyNodeInterface-0.5.pdf>

0.4 <http://skyservice.pha.jhu.edu/develop/vo/adql/SkyNodeInterface--0.4.pdf>

0.3 <http://skyservice.pha.jhu.edu/develop/vo/adql/QueryInterface-2003Aug.pdf>

0.2 <http://skyservice.pha.jhu.edu/develop/vo/adql/QueryInterface-2003July.pdf>

Editors:

Masatoshi Ohishi, Alex Szalay

Authors:

IVOA VOQL Working group

Please send comments to: <mailto:voql@ivoa.net>

Abstract

This document describes the Astronomical Data Query Language(ADQL) and SkyQL its string representation,

Status of this document

This is a Working Draft. There are no prior released versions of this document.

This is an IVOA Working Draft for review by IVOA members and other interested parties. It is a draft document and may be updated, replaced, or obsoleted by other documents at any time. It is inappropriate to use IVOA Working Drafts as reference materials or to cite them as other than "work in progress." A list of [current IVOA Recommendations and other technical documents](http://www.ivoa.net/docs/) can be found at <http://www.ivoa.net/docs/>.

Acknowledgments

This work is based on discussions at various IVOA meetings and continuing emails on the mailing list.

Contents

Abstract.....	1
Status of this document.....	1
Acknowledgments.....	2
Contents.....	2
1 Introduction	2
2 Astronomical Data Query Language(ADQL).....	2
3 ADQL String Representation.....	3
4 ADQL example.....	4
5 Changes from previous versions.....	4
6 References.....	5

1 Introduction

ADQL is an XML language for constructing queries. This is based on Structured Query Language (SQL). We have many tabular data sets in the VO and many are in relational databases, making SQL an interesting first step. This document is a formal agreement of what is contained in ADQL.

The mechanics of passing a query to a node is described in the SkyNode Interface document [SKYNODE]

2 Astronomical Data Query Language(ADQL)

ADQL is passed as an XML document to the Query Interface. ADQL is based on a subset of SQL plus Circle(Cone Search). The only SQL command allowed in ADQL is a "select". The full XSD for ADQL and services for translation of SQL to ADQL and back may be found at

<http://skyservice.pha.jhu.edu/develop/vo/adql/>

Since ADQL is similar in semantics to SQL the requirements below list differences or special considerations only.

ADQL-1 ADQL shall be in the form of an XML document.

ADQL-2 All table names in ADQL shall be followed by an alias.

This means queries must take the form

```
Select * from table t
```

This makes substitution of table names much easier as it must be done in only one place to change the alias.

- ADQL-3** ADQL shall support Column aliasing using the AS keyword.
- ADQL-4** ADQL shall support the region specification as defined by the region.xsd [REGION] of the IVOA/NVO. For this and RegionXML specified below we shall create some default coordinate systems and units to simplify the regions initially.
- ADQL-5** JDBC [JDBC] Mathematical functions shall be allowed in ADQL as follows:

Trigonometric functions: acos, asin, atan, atan2, cos, cot, sin, tan

Math functions: abs, ceiling, degrees, exp, floor, log, log10, mod, pi, power, radians, sqrt, rand, round, truncate

- ADQL-6** ADQL documents shall contain a version identifier for the version of ADQL. This will start as 1.0. The version number is a dot separated string of numbers. The version number is included in the document solely so the receiving node may decide if it wishes to deal with the document or thrown an exception. This is assumed to only come into use at some later stage when there may be a major version change causing some possible incompatibility between versions. We should strive for backward compatibility i.e. only adding new features not deprecating the old.

Sample applications and tutorials for development and deployment of ADQL services is available at <http://skyservice.pha.jhu.edu/develop/vo/adql/>

3 ADQL String Representation

A string like representation of ADQL will be beneficial for human readability. This has been referred to as SkyQL. . Semantically SkyQL and ADQL are identical. Syntactically ADQL is XML and SkyQL is more human readable. This is like the current SkyQL in SkyQuery.NET .

- ADQL-7** SkyQL shall have SQL like Syntax.
- ADQL-8** SkyQL shall support the Region keyword. This will be followed by a single quoted string specifying a region in a simple manner similar to the current SDSS cover specification in [HTMDLL]. This would look something like:

```
Region ('CIRCLE J2000 19.5 -36.7 0.02')
```

This is a one way operation. If a SkyQuery string is converted to ADQL this Region string will be converted to XML. If the resulting XML is converted back to a String the region should remain as inlined XML using the RegionXML keyword.

There may be a comment section added to the region xsd. In this comment section the original string should be kept. The comment section will be used for display purposes in certain areas and should contain a summary description (in English) of the region.

Other constructs mention in [HTMDLL] are RECT, POLY, and CHULL.

- ADQL-9** It should be possible to inline a region specification as in SkyQL using the RegionXML keyword e.g. (not a valid region spec)

```
RegionXML ('<circle><coordsys>ICRS</coordsys><ra>19.5</ra><dec>-36.7</dec><radius>0.02</radius></circle>')
```

ADQL-10 It should be possible to refer to a region specification as a url in SkyQL using the RegionURL keyword e.g.

```
RegionURL ( 'http://aserver.edu/aregion.xml' )
```

4 ADQL example

An SQL like string for ADQL might be as follows :

```
Select a.* from Tab a where Region('Circle Cartesian 1.2 2.4 3.6
0.2')
```

This would be represented in xml as follows

```
<?xml version="1.0" encoding="utf-16"?>
<Select xmlns:xsd="http://www.w3.org/2001/XMLSchema"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <Selection>
    <Items>
      <SelectedItem xsi:type="ExprSelectedItem">
        <Expr xsi:type="ColumnExpr">
          <Column xsi:type="AllColumnReference">
            <TableName>a</TableName>
          </Column>
        </Expr>
      </SelectedItem>
    </Items>
  </Selection>
  <TableClause>
    <FromClause>
      <TableReference>
        <Table>
          <Name>Tab</Name>
          <AliasName>a</AliasName>
        </Table>
      </TableReference>
    </FromClause>
    <WhereClause>
      <Condition xsi:type="RegionSearch">
        <Region xmlns:ql="urn:nvo-region" xsi:type="ql:circleType">
          <ql:Center>
            <Pos3Vector xmlns="urn:nvo-coords">
              <CoordValue>
                <Value>
                  <double>1.2</double>
                  <double>2.4</double>
                  <double>2.4</double>
                </Value>
              </CoordValue>
            </Pos3Vector>
          </ql:Center>
          <ql:Radius>0.2</ql:Radius>
        </Region>
      </Condition>
    </WhereClause>
  </TableClause>
</Select>
```

5 Changes from previous versions

- Removed schema diagrams –put in example section instead
- Added text on version number
- Put in HTMDLL spec ref which seems to have dropped out – clarified circle
- Put in example section with String and ADQL.

6 References

- [SQL92] <http://www.contrib.andrew.cmu.edu/%7Eshadow/sql/sql1992.txt>
- [SKYNODE] IVOA VOQL Working group; IVOA SkyNode Interface – get latest from www.ivoa.net/voql
- [REGION] Space Time Coordinates for VO; Arnold Rots, May 2003; <http://www.ivoa.net/internal/IVOA/InterOpMay2003DataModel/STCdoc.pdf> and http://hea-www.harvard.edu/~arots/nvometa/STC_UML.pdf
- [JDBC] Java Database Connectivity Specification 3.0 ; download from <http://java.sun.com/products/jdbc/index.jsp>
- [HTMDLL] SQLServer2000 HTM Interface specification; Alex Szalay, George Fekete, Jim Gray; July 2003 ; http://skyservice.pha.jhu.edu/develop/vo/adql/htmdll_2_0.doc