

# Workshop

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## ADQL and SkyNode

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# ADQL basics (1/2)

- ADQL stands for Astronomical Data Query Language.
- ADQL is an XML query language based on SQL.
- Supports SQL basic syntax like:
  - SELECT, SELECT \*, SELECT DISTINCT, SELECT TOP
  - INTO, FROM, WHERE, ORDER BY, GROUP BY, ASC, DESC
  - Comparison operators: (NOT) LIKE, (NOT) IN, <(=), >(=), =, NOT
  - Binary operators: +, -, \*, /
  - Data types: literal, number, real, integer, string
  - Trigonometric functions: SIN, COS, TAN, COT, ASIN, ACOS, ATAN
  - Math functions: ABS, CEILING, DEGREES, EXP, FLOOR, LOG, PI, POWER, RADIANS, SQRT, LOG10, RAND, ROUND, TRUNCATE
  - Aggregate functions: AVG, MIN, MAX, SUM, COUNT
  - SQL JOIN and SQL sub-queries

# ADQL basics (2/2)

- Includes support to astronomical region search and cross matching.
- Astronomical Region shapes supported are:
  - Circle: Center coordinates (Ra, Dec) and radius.
  - Ellipse: Extends circle + minor axis and position angle.
  - Polygon: defined by a list of vertices
  - Sector: area between two circles intersecting
  - Convex and convex hull.
- Region operations supported are: intersection, union and negation.

# ADQL sample

```
<?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" xmlns="http://www.ivoa.net/xml/ADQL/v0.7.4">
  <SelectionList>
    <Item xsi:type="columnReferenceType" Table="t2" Name="obsid" />
    <Item xsi:type="columnReferenceType" Table="t2" Name="flux" />
  </SelectionList>
  <From>
    <Table xsi:type="tableType" Name="table1" Alias="t1" />
    <Table xsi:type="tableType" Name="table2" Alias="t2" />
    select t2.obsid, t2.flux from table1 t1, table2 t2 where t1.obsid = t2.obsid order by t1.obsid
  </Where>
  <OrderBy>
    <Item>
      <Expression xsi:type="columnReferenceType" Table="t1" Name="obsid" />
    </Item>
  </OrderBy>
</Select>
```

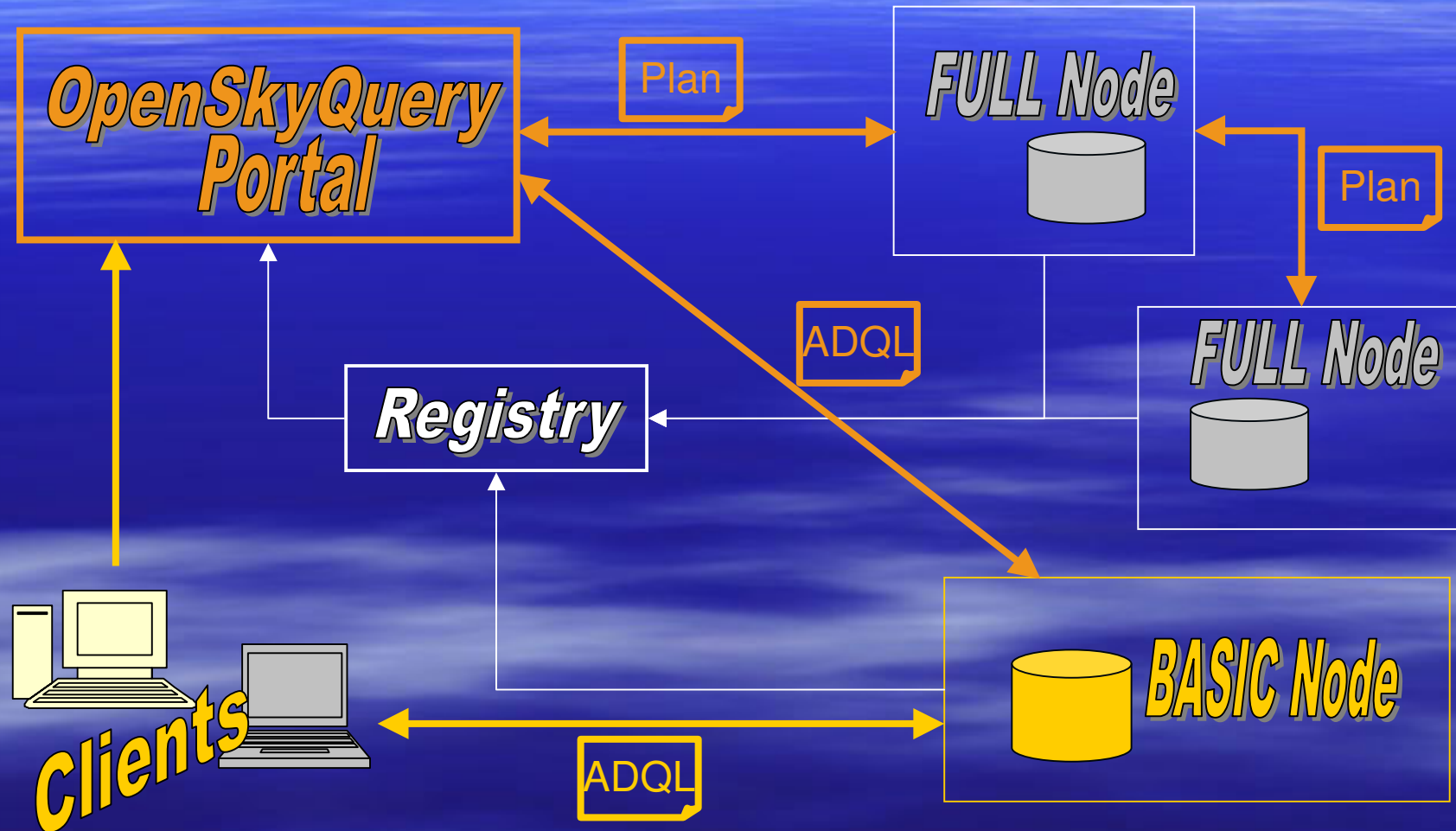
# ADQL status and future plans

- Latest version: ADQL v0.91 Working Draft.
- ADQLv0.91 = ADQL v0.7.4 + minor changes.
- Raised specification to PR ADQL v1.0.
- SQL basic syntax still missing: INSERT, UPDATE, CREATE, DELETE...
- Integration DAL/ADQL.

# SkyNode basics

- Prototyped to handle ADQL requests.
- SkyNode interface has been defined as a Web Service (SKyNode.wsdl)
- Implementers can either implement:
  - The BASIC case (single node)
  - or the FULL case (several nodes/XMatch)

# SkyNode Architecture



# SkyNode requirements (1/2)

- BASIC case
  - Must support Circular Query Search
  - Must implement the following services:
    - Tables : list of tables metadata available.
    - Columns [table] : list of columns metadata available for a given table.
    - Column [table, columnName]: column metadata.
    - Formats: Output format supported (VOTABLE by default).
    - Functions: list of functions supported.
    - PerformQuery [ADQL, format] : Processes an ADQL request and returns back the results in the output format.

# SkyNode requirements (2/2)

- FULL case
  - Must implement all BASIC services plus:
    - QueryCost [ADQL] : volume of data returned.
    - ExecutePlan [ADQL, format] : executes a query plan across the full list of nodes present in the ADQL (XMatch between catalogs)
    - Footprint [Region]: takes a region and return intersection with the survey

# SkyNode implementations

- BASIC
  - NVO provided Java package in their Summer School (2004)
  - Other implementations based on NVO Java setup:
    - ESAVO: ISO and XMM-Newton nodes (March 2005).
    - JVO
- FULL
  - NVO (.NET)
  - ESAVO (Java)
    - First fully operational Java implementation available from [www.openskyquery.net](http://www.openskyquery.net) since 6<sup>th</sup> May 2005.

# SkyNode status and future plans

- Latest version: SkyNode v0.91 Working Draft (in line with ADQL spec).
- SkyNode v0.91 = SkyNode v0.7.4 + minor changes.
- Raised specification to PR SkyNode v1.0.
- Future plans:
  - Operational implementations of SkyNode (ESAVO, NVO and JVO) supports v0.7.4 only. Upgrade?
  - XMatch issues:
    - XYZ vs. Astronomical Coordinates (Ra, Dec)?
    - Implement as a separate service?

# SkyNode/ADQL Tutorial

- Build BASIC SkyNode in Java from scratch.
  - Learn how to use:
    - Web Services (AXIS, Tomcat).
    - Java-XML technologies: XML parsers, XSLT processors.
    - Database access using JDBC and MySQL.
    - Java-ADQL parsing.
  - Learn how to implement SkyNode easily.
- Extend SkyNode implementation to support new ADQL v0.91.
  - Usage of XSLT to support several ADQL versions.
  - Explain in detail how PerformQuery really works.