Astronomy cross-matching using OGSA-DAI

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originally presented by:
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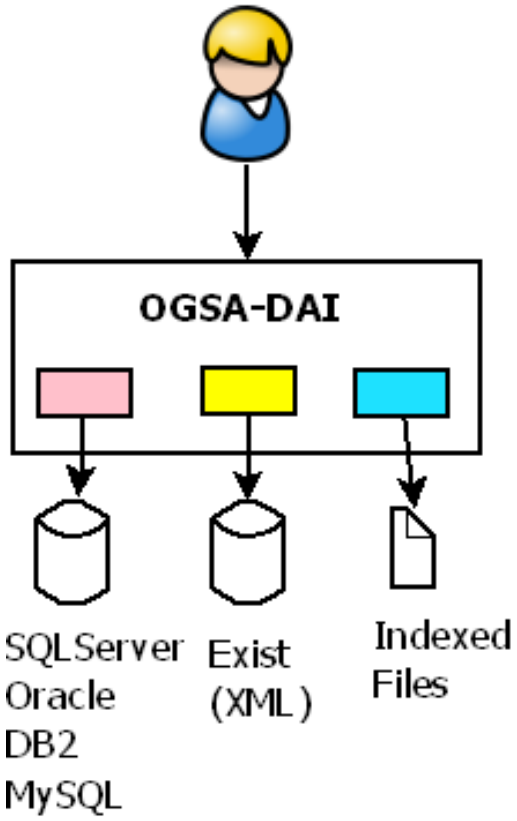
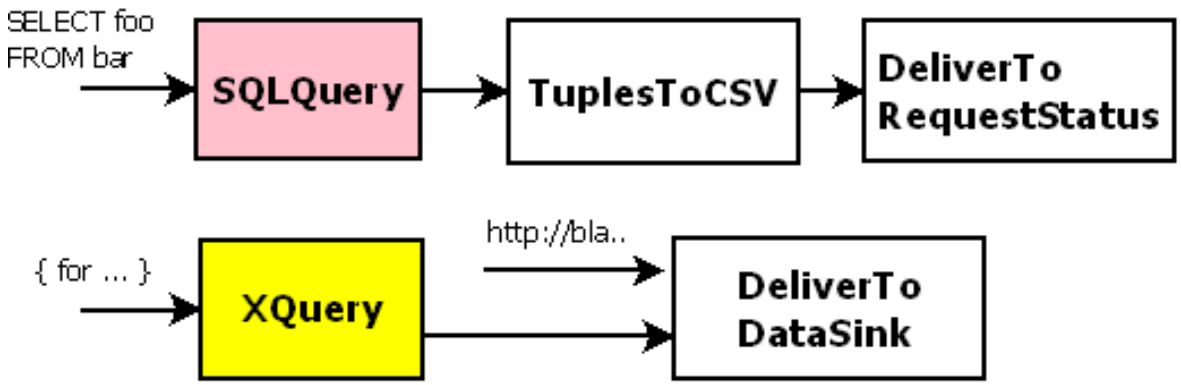
Overview





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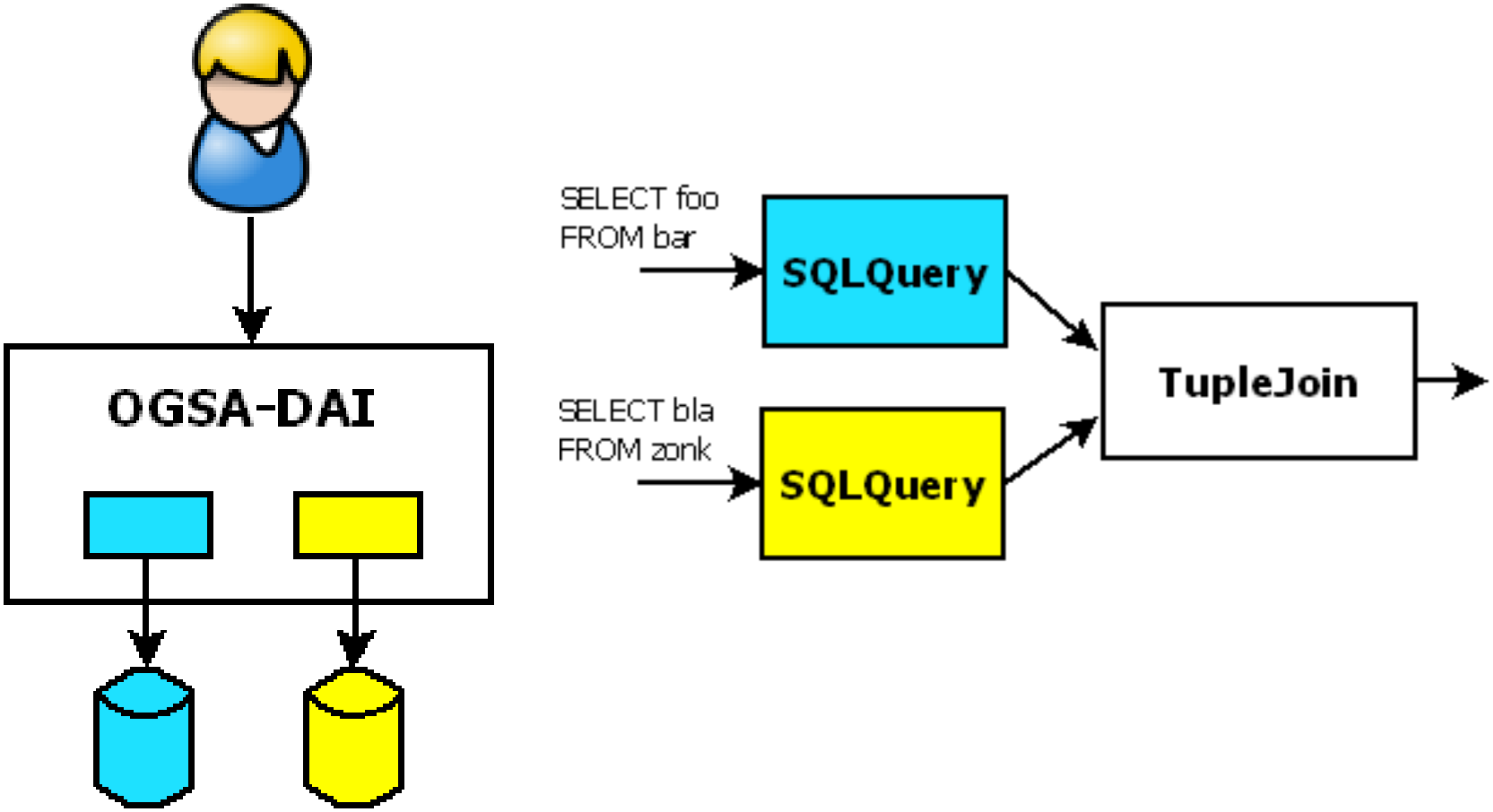
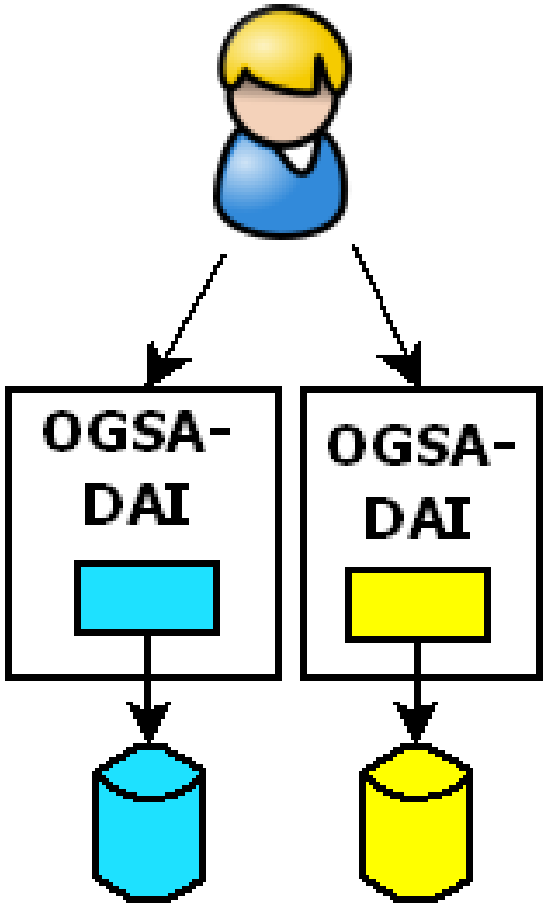
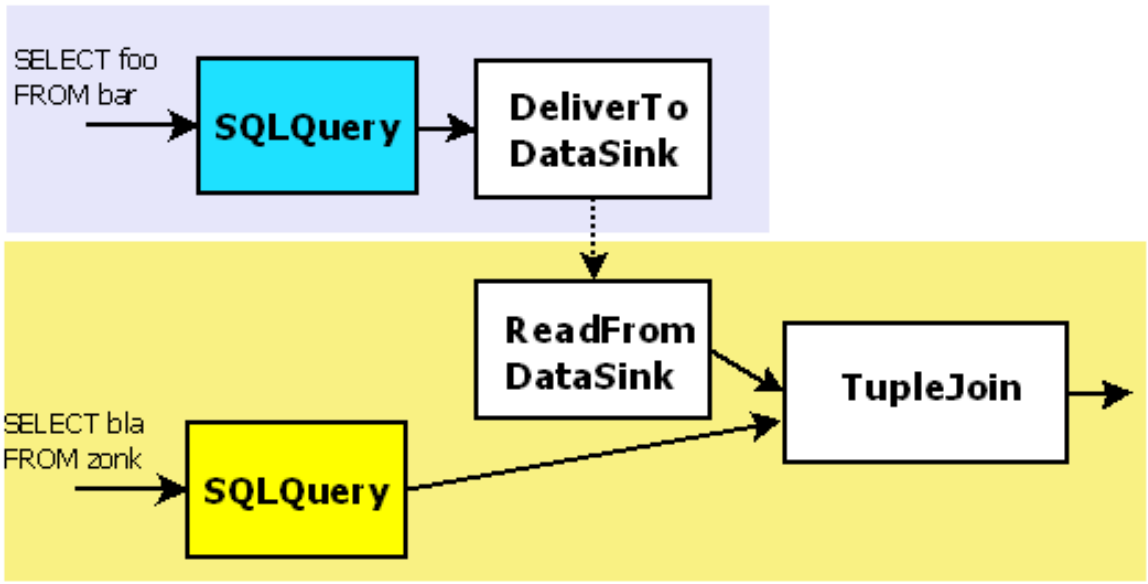
OGSA-DAI joins



OGSA-DAI distributed joins





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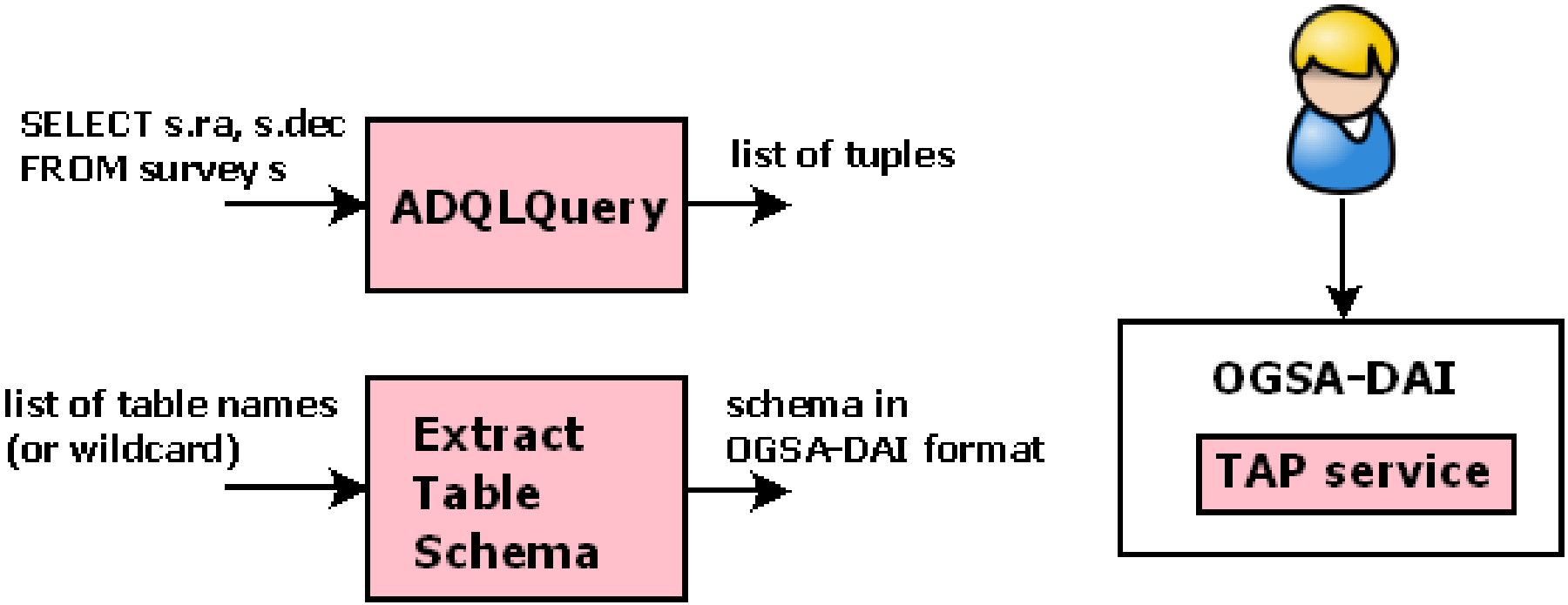
OGSA-DAI activities for astronomy



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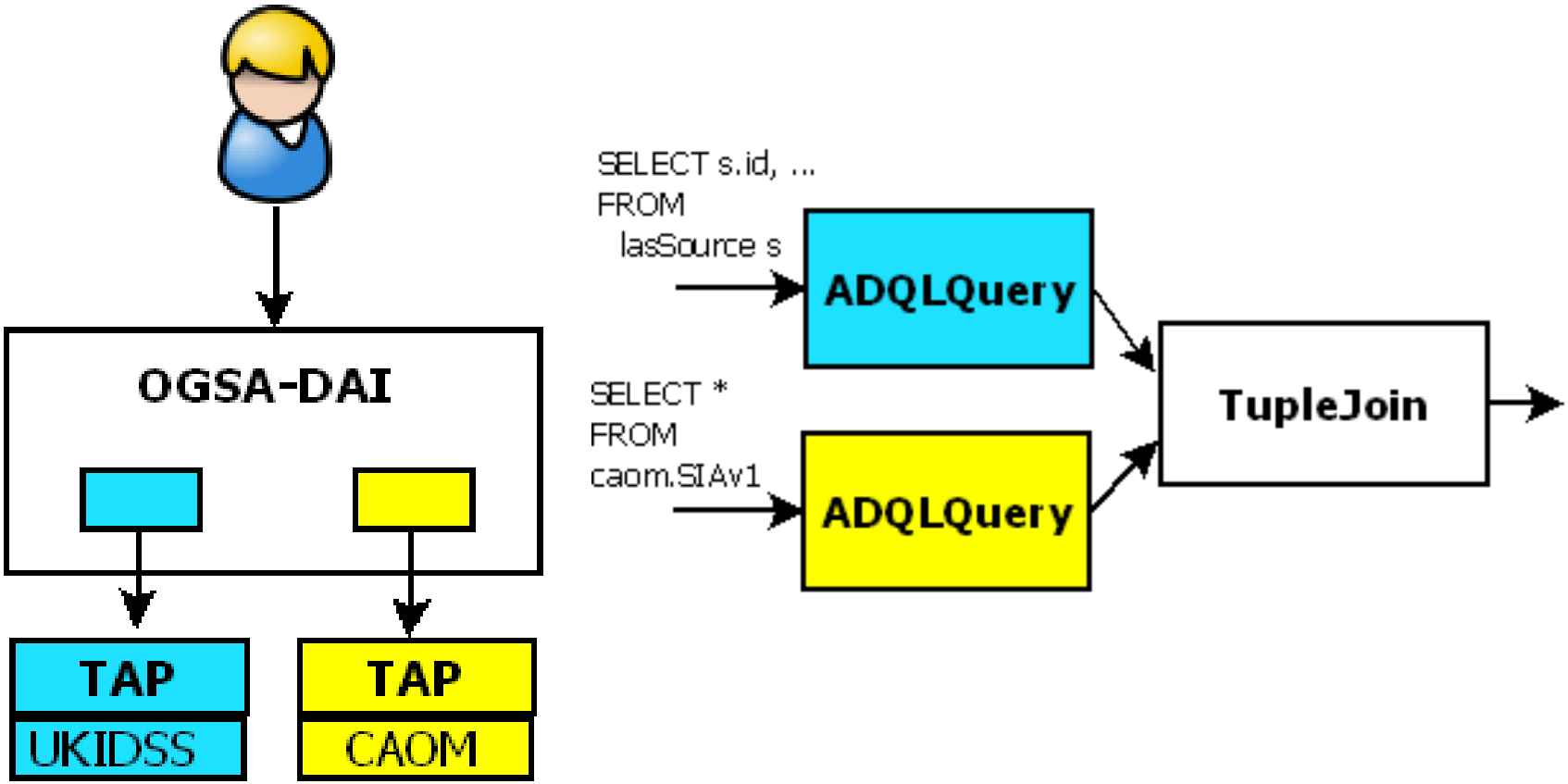
Astronomy cross-match



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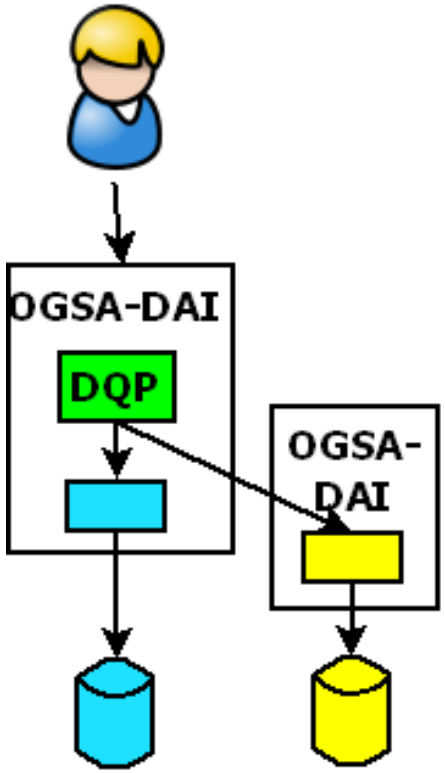
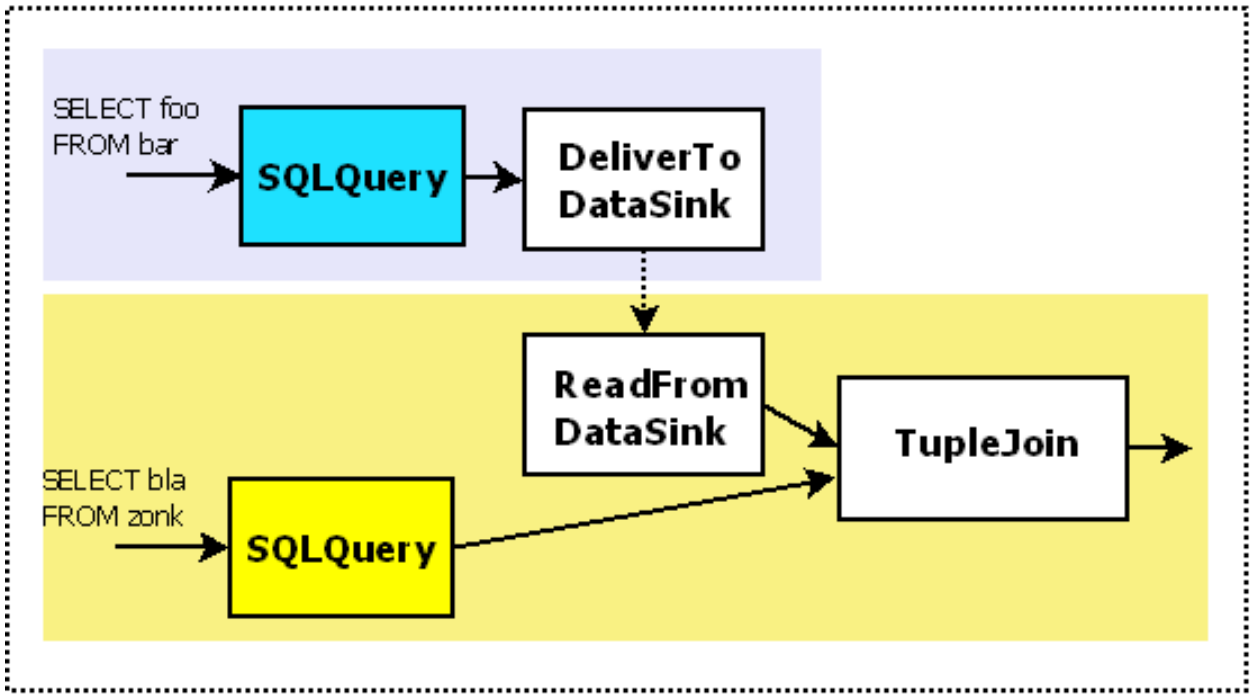
OGSA-DAI join options

- In-memory join
  - One side of join stored in memory, other side streamed
- Partial in-memory join
  - Gets first results quickly, but all data stored to disk
- Ordered merge join
  - Both inputs ordered allowing for a fully streamed join
- Parallel hash equi-join
- Batch joins using IN clauses
  - E.g. SELECT * FROM foo WHERE bar IN (x, y, z)

Distributed Query Processing (DQP)





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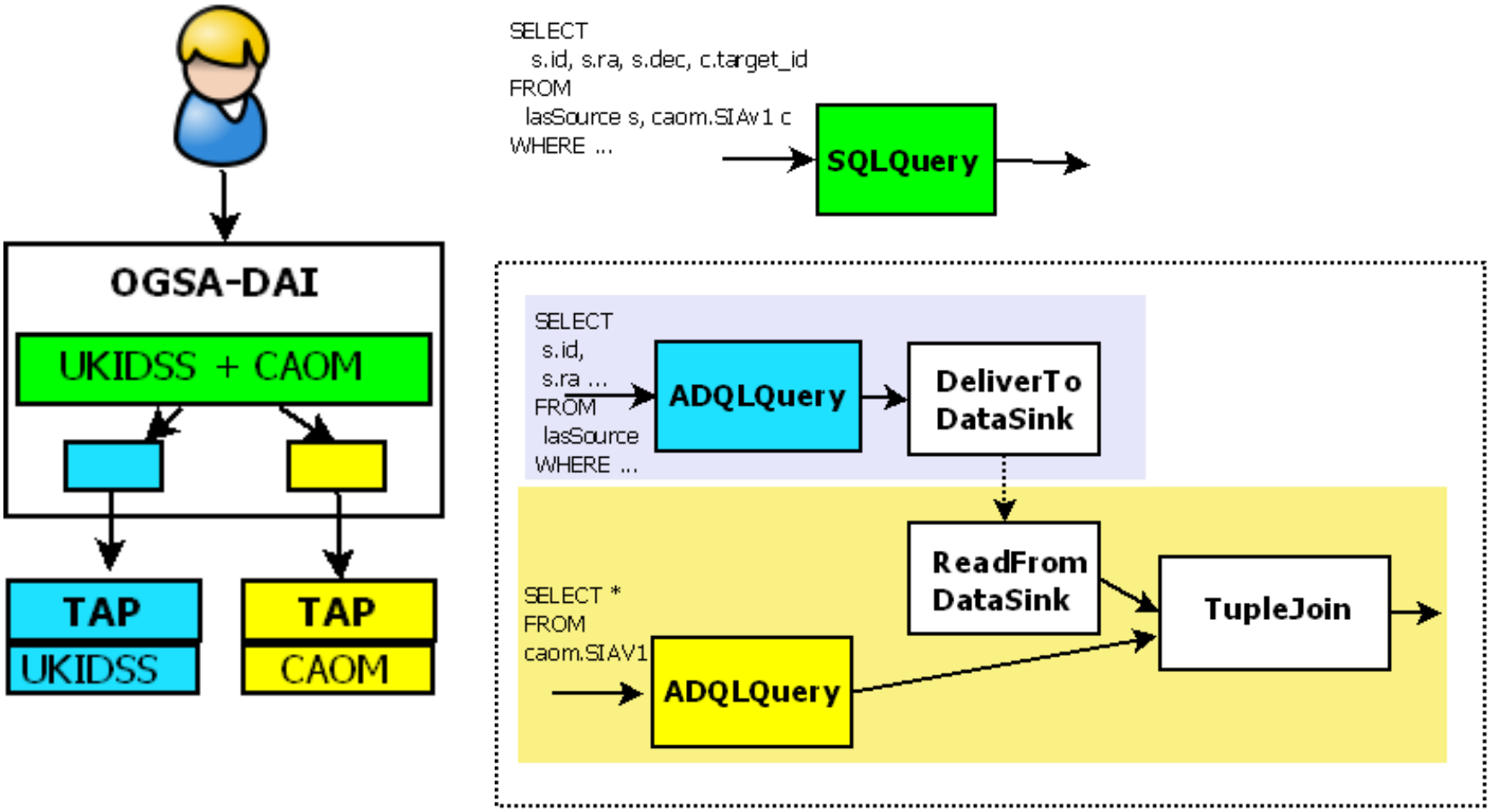
DQP over TAP



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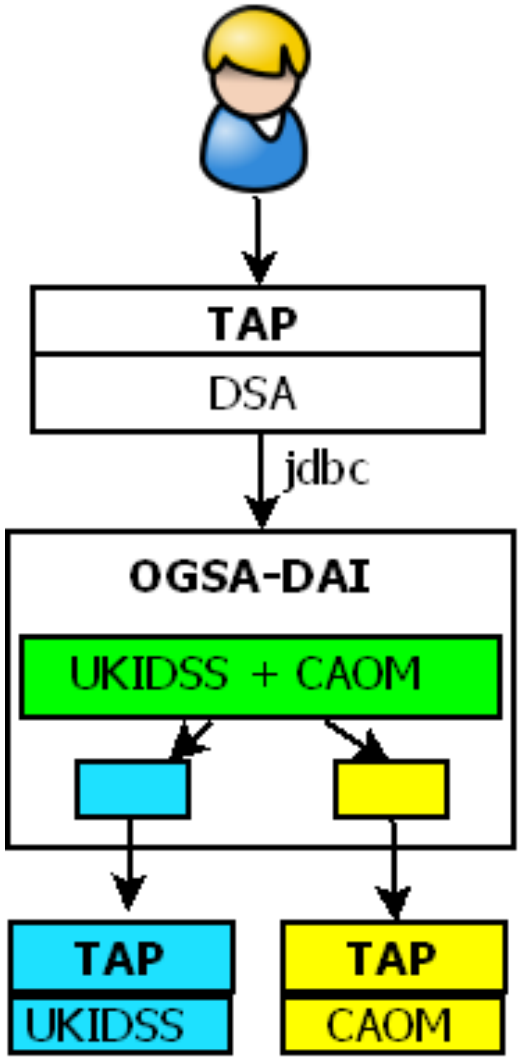
TAP over DQP over TAP



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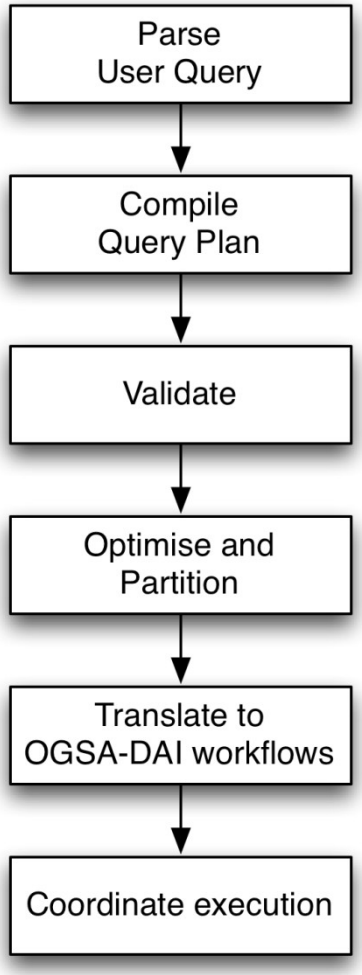
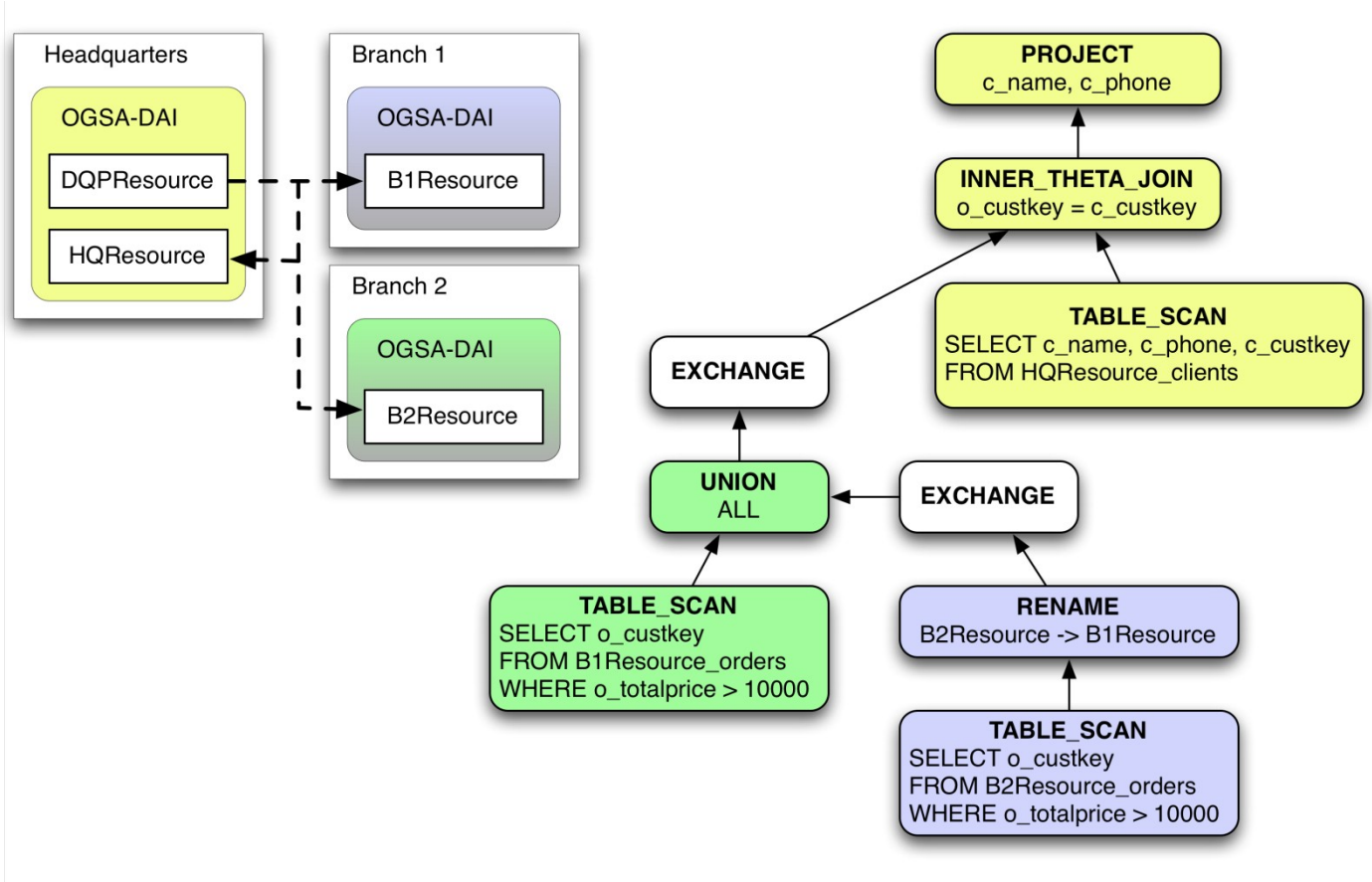
DQP under the covers





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Current status

- Working on two demo queries
- UKIDSS and CAOM
  - In-memory join
  - Works TAP->DQP->TAP for 1 TAP at a time
  - Combined not yet working
- UKIDSS and SDSS
  - Ordered merge join
  - Works direct to DBs with ugly query
  - DQP join ordering needs improved
  - DSA TAP server struggling with the query DQP produces
    - LEFT OUTER JOIN

On-line demos: http://www.ogsadai.org.uk/demos/aida/

UKIDSS/CAOM query

```
select collection, collectionID, target_name, UKIDSS_lasSource.ra,
    UKIDSS_lasSource.dec,UKIDSS_lasSource.yapermag3,

     UKIDSS_lasSource.j_1apermag3,UKIDSS_lasSource.hapermag3,UKIDSS_lasSource.kaper
     mag3
FROM UKIDSS_lasSource, CAOM_caom_SIAv1
WHERE
   (UKIDSS_lasSource.priOrSec <= 0 OR
    UKIDSS_lasSource.priOrSec = UKIDSS_lasSource.frameSetID)  AND
   UKIDSS_lasSource.yClass >= -2 AND UKIDSS_lasSource.yClass <= -1 AND
   UKIDSS_lasSource.yppErrBits < 256 AND    UKIDSS_lasSource.j_1Class >= -2 AND
   UKIDSS_lasSource.j_1Class <=  -1 AND UKIDSS_lasSource.j_1ppErrBits < 256  AND
   UKIDSS_lasSource.hClass >= -2 AND UKIDSS_lasSource.hClass <= -1 AND
   UKIDSS_lasSource.hppErrBits < 256 AND    UKIDSS_lasSource.kClass >= -2 AND
   UKIDSS_lasSource.kClass <= -1 AND UKIDSS_lasSource.kppErrBits < 256 AND
  (UKIDSS_lasSource.j_1apermag3 - UKIDSS_lasSource.kapermag3) > 1.1 AND
   UKIDSS_lasSource.j_1apermag3 < 18.0 AND
   UKIDSS_lasSource.ra - position_center_ra > -0.1 AND
   UKIDSS_lasSource.ra - position_center_dec < 0.1 AND
   UKIDSS_lasSource.dec - position_center_dec > -0.1 AND
   UKIDSS_lasSource.dec - position_center_dec < 0.1
```

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Future

- More join algorithms
  - Batch join into DQP
- Better join choices
  - Need to improve cardinality estimates
    - Need attribute histograms
- Support for ADQL spatial functionality
  - Possibly also special support for spatial joins using bounding boxes
- OGSA-DAI extensions
  - Correlated sub-queries
  - Better scalability for astronomy sided databases where as much as possible must be streamed
  - Missing functionality e.g. TOP

Thanks to...

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