The **XCATDB**
A Complex Database
Based on Saada

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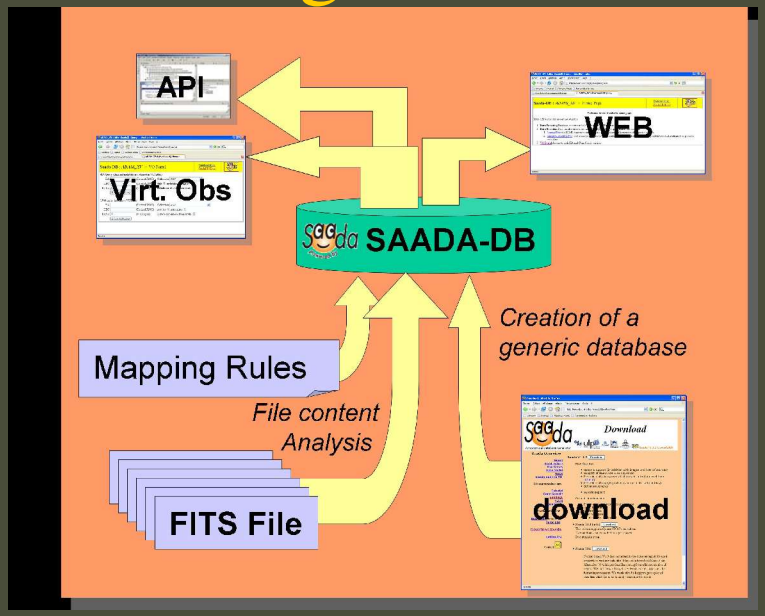
Saada: http://astro.u-strasbg.fr/websaada
XCATDB: http://amwdb.u-starsbg.fr/jacds

Saada in a few Words (see demo)

- Saada: An Astronomical Database generator
  - Making automatic the process of building a database
  - Hosting heterogeneous datasets
  - Highlighting scientific content
  - Publishing personal data into the VO



- Databases are installed on local machines
  - Any Linux/Windows/Mac box
  - Tomcat 5.xx
  - PostrgreSQL 8.xx

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The XMM-Newton Pipeline

XMM-Newton
SURVEY SCIENCE CENTRE

Observatoire astronomique de Strasbourg

CDS
Centre de Données astronomiques de Strasbourg

Catalogue extractions are included in XMM datasets

X-ray Sources are cross-matched with 200 Vizier catalogues (+ Ned & Simbad)

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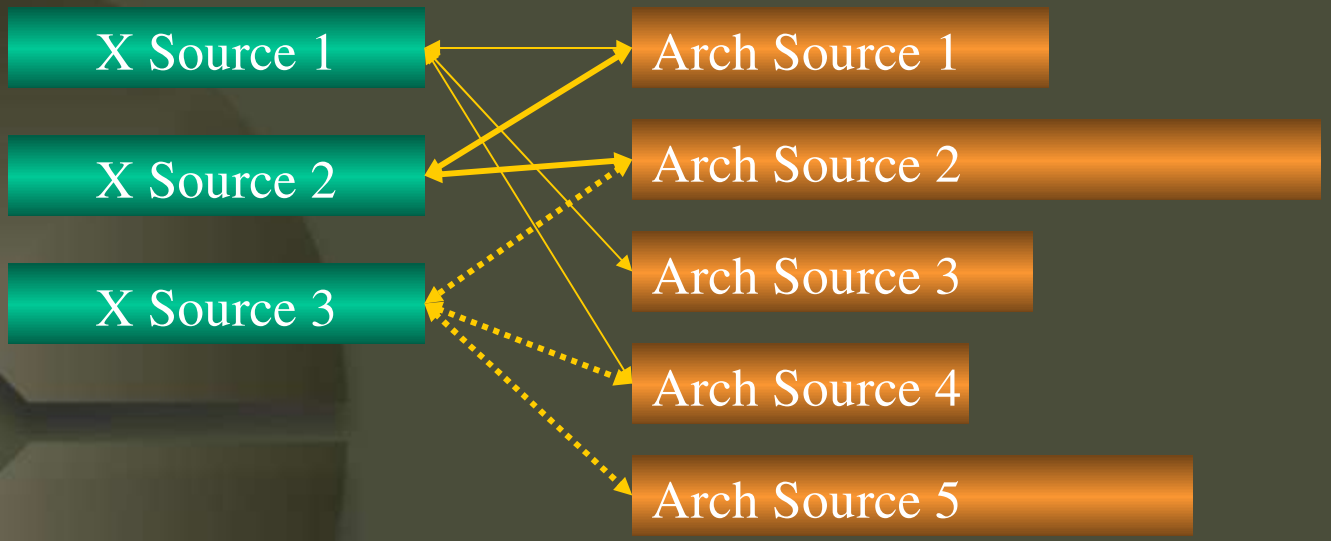
The XCATDB



- N to M persistent relationship
  - Difficult to implement in an efficient way for complex queries
  - Possibility of doing more than with dynamic cross-matches
    - Data-mining feature

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2nd Release of the XMM Catalogue

Native Saada Data-loader

150,000 X-ray sources
In 2800 observations

Implemented with Saada relationships

Specific Module

1,000,000 links

Native Saada Data-loader

1,400,000 archival sources

Demo

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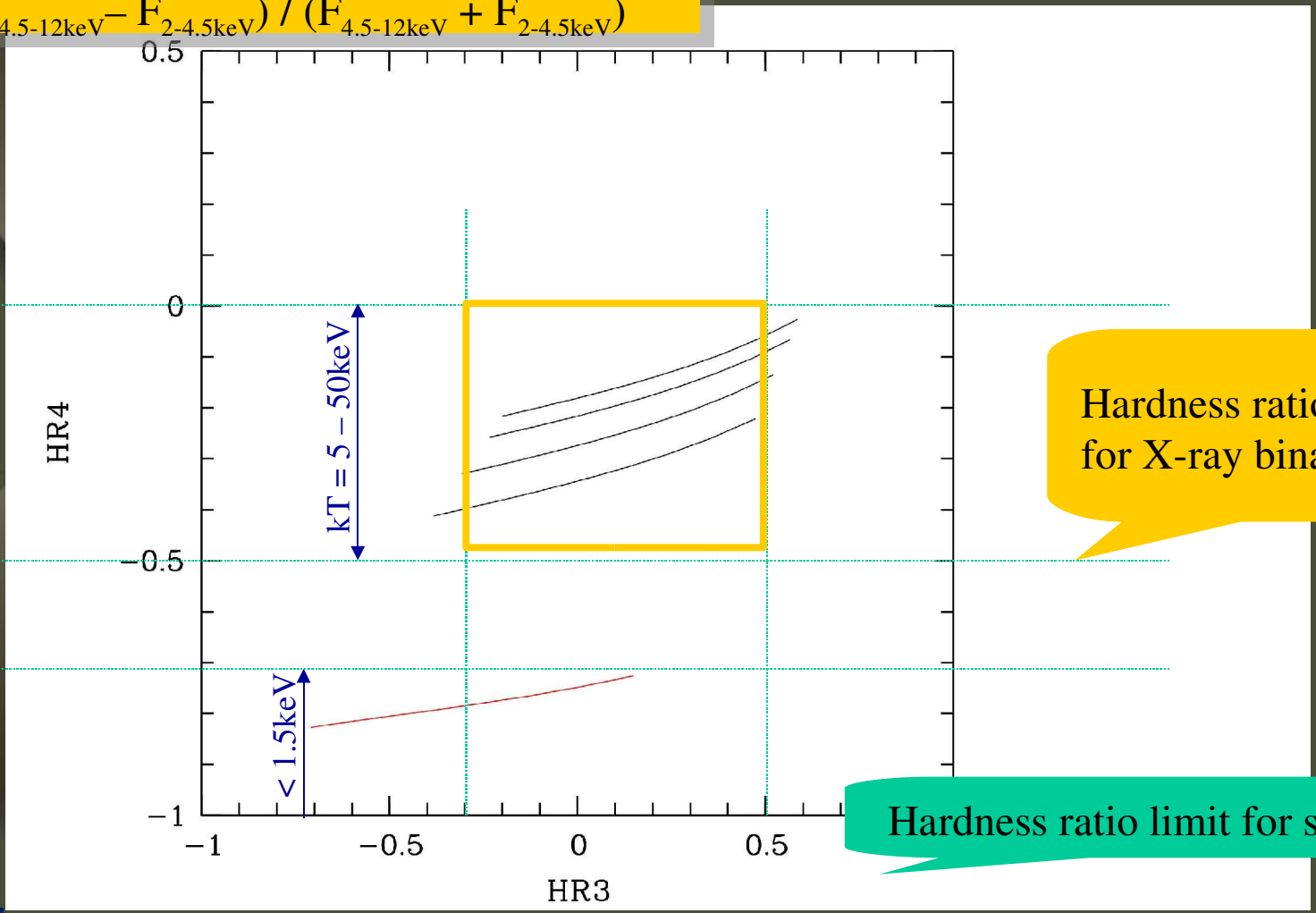
A simplified example: Looking for High Mass X-ray Binaries

$HR3 = (F_{2\text{-}4.5keV} - F_{1\text{-}2keV}) / (F_{2\text{-}4.5keV} + F_{1\text{-}2keV})$

$HR4 = (F_{4.5\text{-}12keV} - F_{2\text{-}4.5keV}) / (F_{4.5\text{-}12keV} + F_{2\text{-}4.5keV})$



Hardness ratio range for X-ray binaries

Hardness ratio limit for stars

Demo

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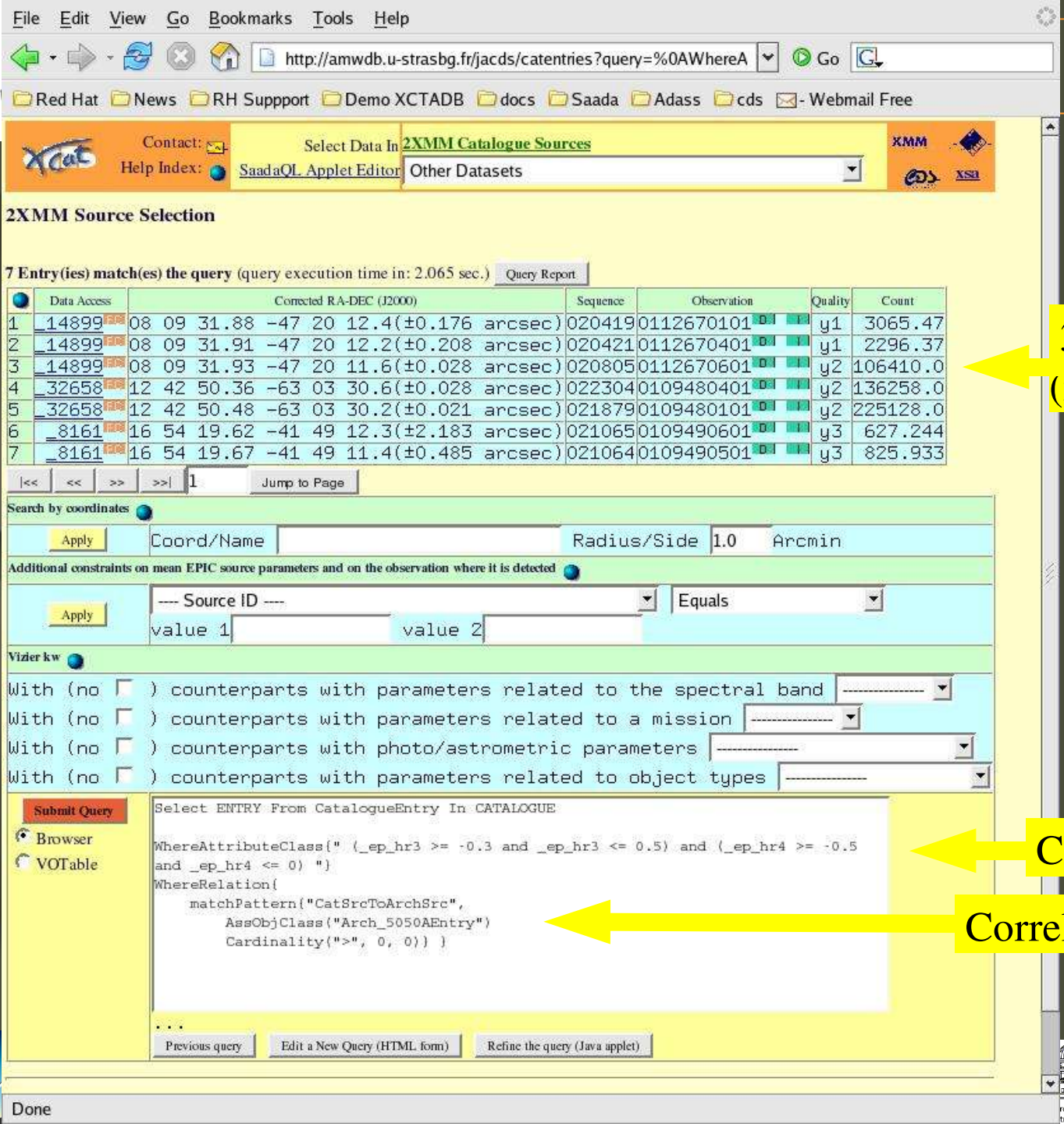
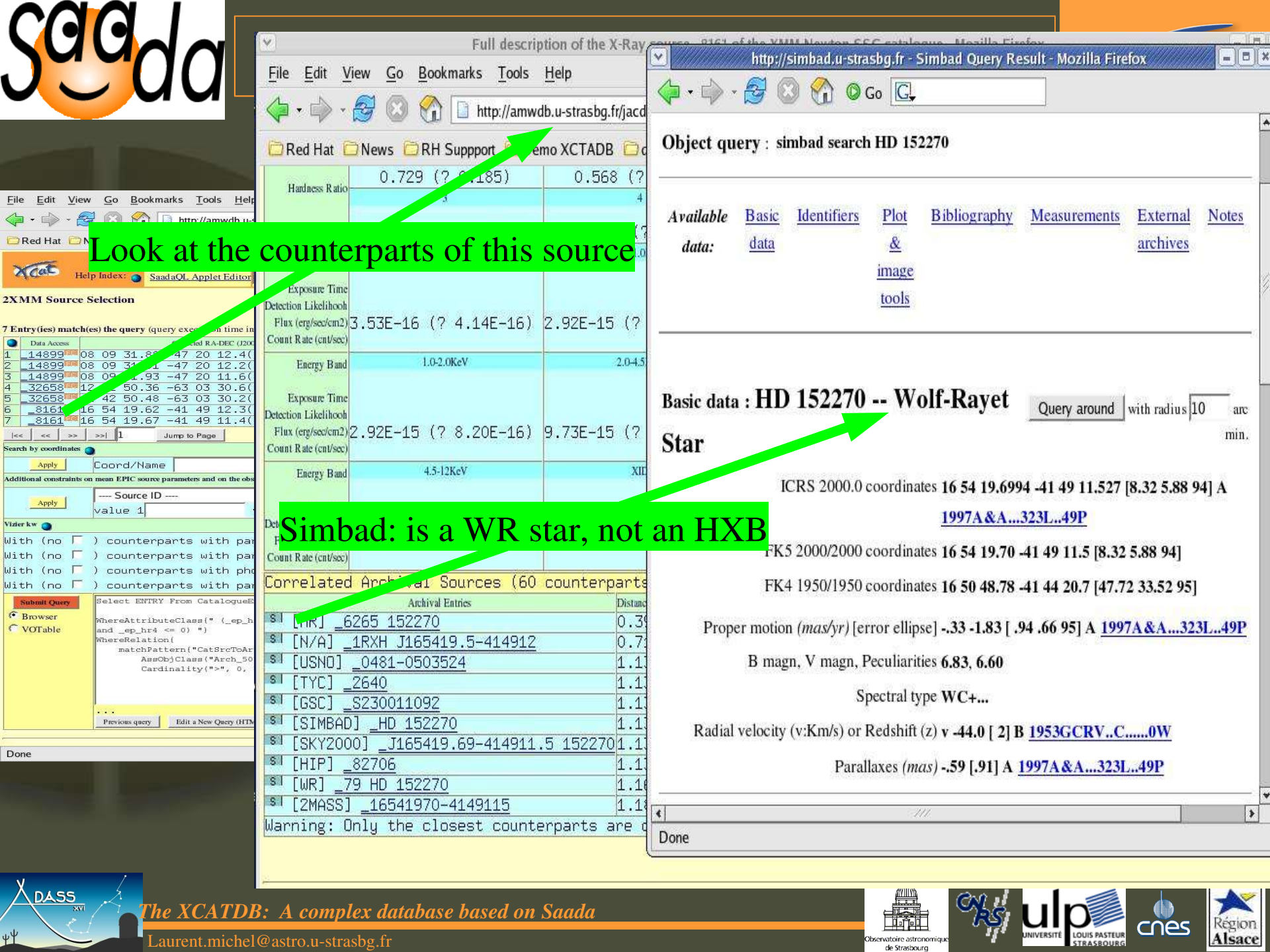


3 X-ray sources selected (mult. detections)

Constraint on HRs

Correlated with bright stars


Look at the counterparts of this source
Simbad: is a WR star, not an HXB
Full description of the X-Ray
http://simbad.u-strasbg.fr - Simbad Query Result - Mozilla Firefox
Object query : simbad search HD 152270
Basic data : HD 152270 -- Wolf-Rayet Star
Query around
with radius
Correlated Archival Sources (60 counterparts
Done

File Edit View Go Bookmarks Tools Help

http://amwdb.u-strasbg.fr/jacds/catentries?query=Select%20El Go

Red Hat News RH Suppport Demo XCTADB docs Saada Adass cds - Webmail Free

Contact: Help Index: Select Data In 2XMM Catalogue Sources SaadaQL Applet Editor Other Datasets XMM XSA

2XMM Source Selection

2 Entry(ies) match(es) the query (query execution time in: 2.134 sec.) Query Report

	Data Access	Corrected RA-DEC (J2000)	Sequence	Observation	Quality	Count
1	_32658	12 42 50.36 -63 03 30.6(±0.028 arcsec)	022304	0109480401	y2	136258.0
2	_32658	12 42 50.48 -63 03 30.2(±0.021 arcsec)	021879	0109480101	y2	225128.0

|<< << >> >>| 1 Jump to Page

1 X-ray source selected (mult. detections)

Search by coordinates

Apply Coord/Name Radius/Side 1.0 Arcmin

Additional constraints on mean EPIC source parameters and on the observation where it is detected

Apply --- Source ID --- Equals value 1 value 2

Vizier kw

With (no) counterparts with parameters related to the spectral band ----------

With (no) counterparts with parameters related to a mission ----------

With (no) counterparts with photo/astrometric parameters ----------

With (no) counterparts with parameters related to object types ----------

Submit Query

Browser

VOTable

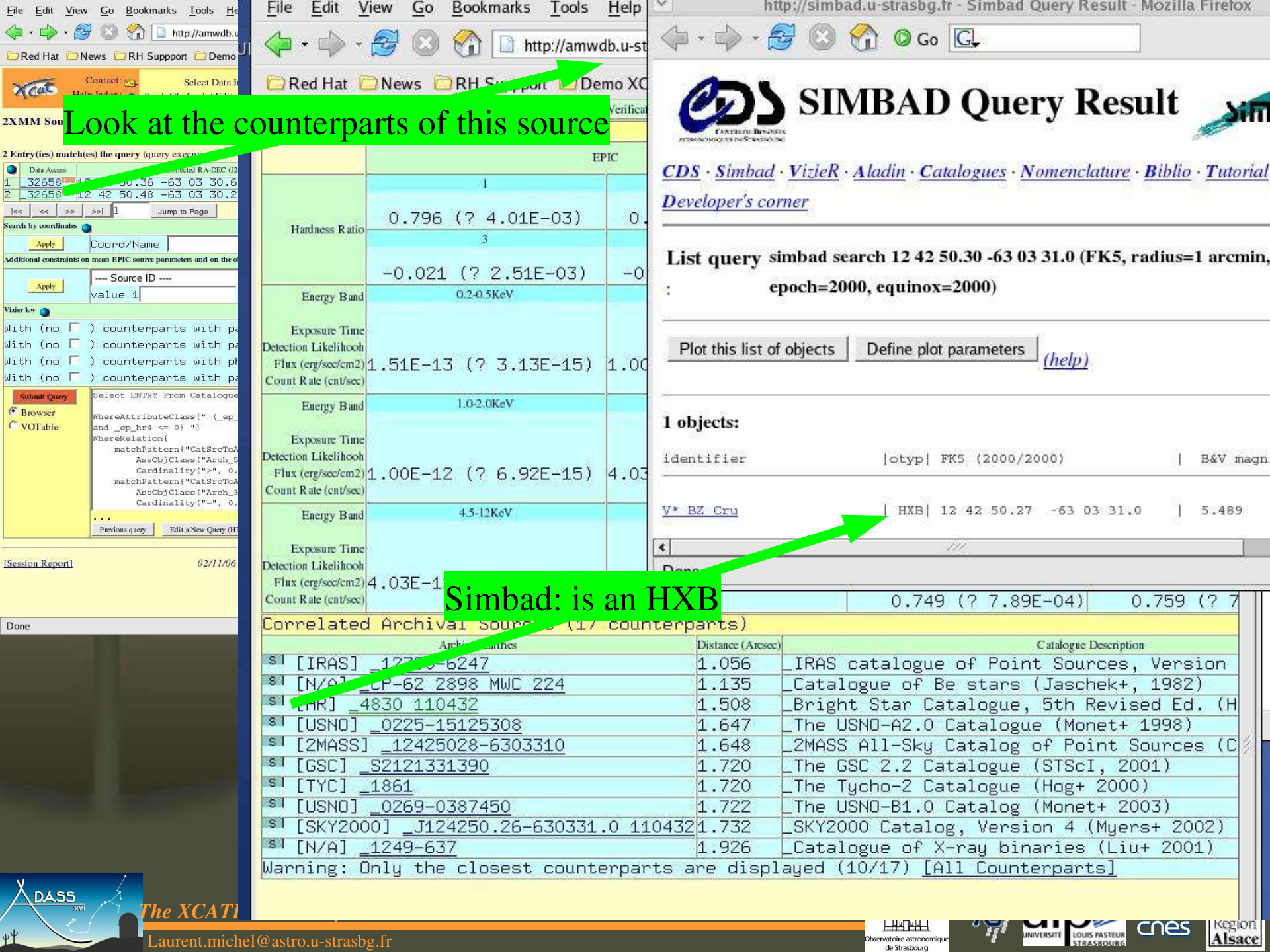
```
Select ENTRY From CatalogueEntry In CATALOGUE

WhereAttributeClass(" (_ep_hr3 >= -0.3 and _ep_hr3 <= 0.5) and (_ep_hr4 >= -0.5
and _ep_hr4 <= 0) ")
WhereRelation(
    matchPattern("CatSrcToArchSrc",
        AssObjClass("Arch_5050AEntry")
        Cardinality(">", 0, 0))
    matchPattern("CatSrcToArchSrc",
        AssObjClass("Arch_3215AEntry")
        Cardinality("=", 0, 0)) )
...
```

Not correlated with WR star

Previous query | Edit a New Query (HTML form) | Refine the query (Java applet)

[Session Report] *02/11/06 18:55:46 CET Anonymous logged on*

Done


Look at the counterparts of this source
Simbad: is an HXB
SIMBAD Query Result
CDS · Simbad · VizieR · Aladin · Catalogues · Nomenclature · Biblio · Tutorial
Developer's corner
List query simbad search 12 42 50.30 -63 03 31.0 (FK5, radius=1 arcmin,
epoch=2000, equinox=2000)
Plot this list of objects
Define plot parameters
(help)
1 objects:
identifier |otyp| FK5 (2000/2000) | B&V magn
V* BZ Cru | HXB| 12 42 50.27 -63 03 31.0 | 5.489
Correlated Archival Sources (17 counterparts)
Distance (Arcsec)
Catalogue Description
[IRAS] _6247
1.056
_IRAS catalogue of Point Sources, Version
[N/A] _CP-62 2898 MWC 224
1.135
_Catalogue of Be stars (Jaschek+, 1982)
[HR] _4830 110432
1.508
_Bright Star Catalogue, 5th Revised Ed. (H
[USNO] _0225-15125308
1.647
_The USNO-A2.0 Catalogue (Monet+ 1998)
[2MASS] _12425028-6303310
1.648
_2MASS All-Sky Catalog of Point Sources (C
[GSC] _S2121331390
1.720
_The GSC 2.2 Catalogue (STScI, 2001)
[TYC] _1861
1.720
_The Tycho-2 Catalogue (Hog+ 2000)
[USNO] _0269-0387450
1.722
_The USNO-B1.0 Catalog (Monet+ 2003)
[SKY2000] _J124250.26-630331.0 110432
1.732
_SKY2000 Catalog, Version 4 (Myers+ 2002)
[N/A] _1249-637
1.926
_Catalogue of X-ray binaries (Liu+ 2001)
Warning: Only the closest counterparts are displayed (10/17) [All Counterparts]
0.749 (? 7.89E-04)
0.759 (? 7
1.51E-13 (? 3.13E-15)
1.00E-12 (? 6.92E-15)
4.03E-1
0.796 (? 4.01E-03)
-0.021 (? 2.51E-03)
0.2-0.5KeV
1.0-2.0KeV
4.5-12KeV
EPIC
Hardness Ratio
Energy Band
Exposure Time
Detection Likelihood
Flux (erg/sec/cm2)
Count Rate (cnt/sec)
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Using UCDs in queries

- Selecting X-Rays sources by correlation patterns on 200 classes of X-Ray sources requires to handle a lot of meta-data

```
select oidsaada from Arch_9037AEntry where ( _Flux > 1e-13 )
select oidsaada from Arch_7181AEntry where ( _Flux2 > 1e-16 )
select oidsaada from Arch_9032AEntry where ( _FX > 1e-16 )
select oidsaada from Arch_9015AEntry where ( _fX > 1e-16 )
select oidsaada from Arch_9031AEntry where ( _Fx > 1e-13 )
…….
```

- **Solution**: Expressing queries using **UCDs** and **Units**

```
[phot.flux;em.X-ray] > 1e-16 [W/m2]
```

Archival Sources Selection - Mozilla Firefox

File Edit View Go Bookmarks Tools Help

Select radio sources with a given density of flux among 200 archival catalogues

	J00013-2500	19.0	...	...
13	[QSO] _NGC 253	00 47 33.20 -25 17 17.0	...	...
14	[QSO] _3C 273.0	12 29 06.70 +02 03 08.0	...	...
15	[QSO] _IRAS 13349+2438	13 37 18.80 +24 23 04.0	...	...
16	[QSO] _NGC 4486	12 30 49.50 +12 23 28.0	...	...
17	[QSO] _PKS 1346+26	13 48 52.50 +26 35 35.0	...	...
18	[QSO] _SDSS J14014+0256	14 01 27.70 +02 56 06.0	...	...
19	[QSO] _NGC 4593	12 39 39.40 -05 20 39.0	...	...
20	[QSO] _MZZ 5571	03 13 46.70 -55 11 49.0	...	...

|<< << >> >>| 1 Jump to Page

Search by coordinates

Apply Coord/Name Radius/Side 1.0

Correlations With EPIC Sources

at distance (arcec) Equals value 1 value 2

with observation (obs_id) Equals value 1 value 2

counterpart properties ---- Source ID ---- Equals

Apply Match number must be Equals value 1

Submit Query

Browser

VOTable

```
Select ENTRY From * In ARCH_CAT
WhereUCD { [phot.flux.density;em.radio.750-1500MHz] > 1 [mJy] }
```

Order by:

desc asc

No sort

...

Previous query | Reset query | New Query (HTML form) | Refine Query (Java applet)

Done

http://amwdb.u-strasbg.fr - Mozilla Firefox

Query Editor for the SaadaDB XCATDB:

Click on the right button to get possible choices.

Learn more about SaadaQL on Saada web pages.

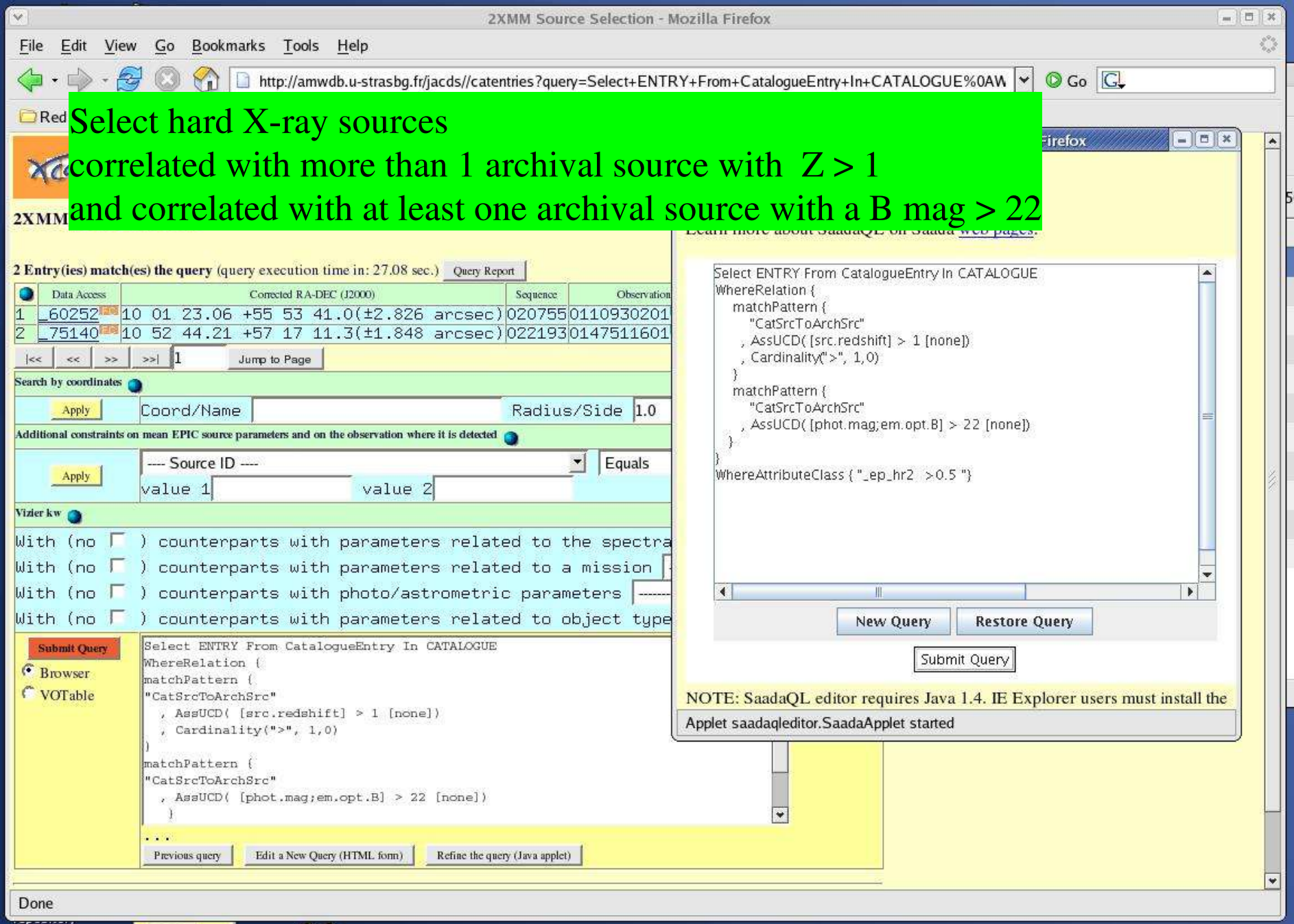
```
Select ENTRY From * In ARCH_CAT
WhereUCD { [phot.flux.density;em.radio.750-1500MHz] > 1 [mJy] }
```

New Query | Restore Query

Submit Query

NOTE: SaadaQL editor requires Java 1.4. IE Explorer users must install the

Applet saadaqleditor.SaadaApplet started


2XMM Source Selection - Mozilla Firefox
File Edit View Go Bookmarks Tools Help
http://amwdb.u-strasbg.fr/jacds//catentries?query=Select+ENTRY+From+CatalogueEntry+In+CATALOGUE%0AW
Go
Select hard X-ray sources
correlated with more than 1 archival source with Z > 1
and correlated with at least one archival source with a B mag > 22
2XMM
2 Entry(ies) match(es) the query (query execution time in: 27.08 sec.)
Query Report
Data Access
Corrected RA-DEC (J2000)
Sequence
Observation
1 _60252 10 01 23.06 +55 53 41.0(±2.826 arcsec) 020755 0110930201
2 _75140 10 52 44.21 +57 17 11.3(±1.848 arcsec) 022193 0147511601
Jump to Page
Search by coordinates
Apply
Coord/Name
Radius/Side
1.0
Additional constraints on mean EPIC source parameters and on the observation where it is detected
--- Source ID ----
Equals
value 1
value 2
Vizier kw
With (no) counterparts with parameters related to the spectra
With (no) counterparts with parameters related to a mission
With (no) counterparts with photo/astrometric parameters
With (no) counterparts with parameters related to object type
Submit Query
Browser
VOTable
Select ENTRY From CatalogueEntry In CATALOGUE
WhereRelation {
matchPattern {
"CatSrcToArchSrc"
, AssUCD([src.redshift] > 1 [none])
, Cardinality(">", 1,0)
}
matchPattern {
"CatSrcToArchSrc"
, AssUCD([phot.mag;em.opt.B] > 22 [none])
}
...
Previous query
Edit a New Query (HTML form)
Refine the query (Java applet)
Firefox
Select ENTRY From CatalogueEntry In CATALOGUE
WhereRelation {
matchPattern {
"CatSrcToArchSrc"
, AssUCD([src.redshift] > 1 [none])
, Cardinality(">", 1,0)
}
matchPattern {
"CatSrcToArchSrc"
, AssUCD([phot.mag;em.opt.B] > 22 [none])
}
}
WhereAttributeClass { "_ep_hr2 >0.5 "}
New Query
Restore Query
Submit Query
NOTE: SaadaQL editor requires Java 1.4. IE Explorer users must install the
Applet saadaqleditor.SaadaApplet started
Done

UCD Issue

```
[UCD]>x1 and [UCD]<x2
```

↓

```
(att1>x1 or att2>x1) and (att1<x2 or att2<x2)
```

↓

```
(att1>x1 and att1<x2) or (att2>x1 and att2<x2)
or
(att1>x1 and att2<x2) or (att2>x1 and att1<x2)
```

Usually makes no sense

Solution: Using unambiguous operators: `[UCD]In(x1,x2)`

UCD Issue (continued)

- **Query language issue**: using a simple syntax
  - One operator for one UCD
- **Query execution**
  - Editable execution plan
- **UCD attribution:** a sensible issue
  - Using multi-words UCDs as often as possible
  - Limit the columns accessible per UCDs
  - Take care with units
    - Existence
    - Name: known by the converter
- **Result presentation**: another sensible issue
  - The client must understand how resources have been selected and accessed

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Thank You for your Attention

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