WFAU Operations
Royal Observatory, Edinburgh

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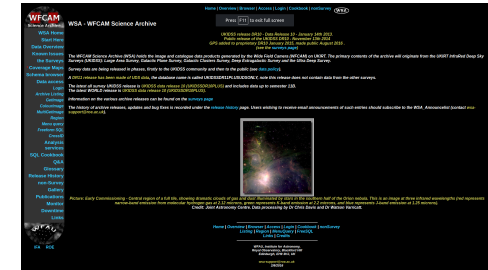
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WFAU (Wide-field Astronomy Unit) Archives

- **WSA**: WFCAM Science Archive: Holds the image and catalogue data products generated by the Wide Field Camera (WFCAM) on UKIRT

  The main surveys are the UKIDSS surveys, 5 large surveys under a single consortium.
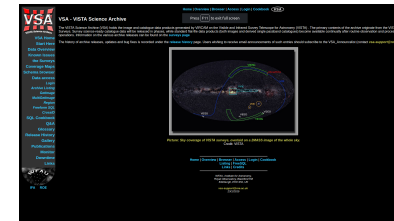 - Many small programmes ranging from a few frames to a few thousand frames.
  - i.e. UKIRT Hemisphere Survey - the rest of the Northern Hemisphere that wasn't observed by UKIDSS

- **VSA**: VISTA Science Archive. Near-infrared imaging on VISTA-VIRCAM. 5 main ESO Public Surveys, similar to the UKIDSS surveys, some smaller PI programmes. New round of ESO Public Surveys just starting.
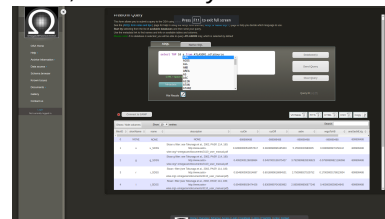

- **OSA**: Optical imaging surveys on VST-OmegaCam. We are archiving ATLAS and VPHAS+.

- **GES**: Optical spectroscopic survey using VLT-FLAMES.

- VISTA Variables in Via Lactea (**VVV**). This observes ~1 billion stars, over 70 epochs
  - Largest single survey, last release ~= 50TB SQL database.
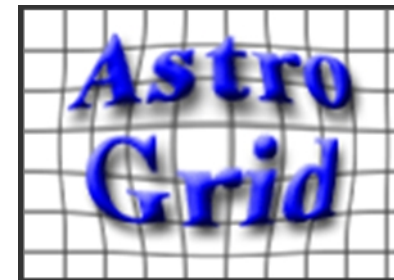
- **VIKING**, another VISTA survey is part of a group of surveys KiDS (on VST, archived by AstroWISE in the Netherlands) and GAMA - a spectroscopic survey on the AAT using AAOmega.

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Existing WFAU VO Services

- **SSAP** Services
  - 6dF

- **Cone Search** and **TAP** Services (mirrors of external datasets)(deployed using Astrogrid DSA)
  - Denis, First, Galexgr6, Glimpse, IRAS, MGC, ROSAT, Twomass, TwoMPZ, WISE, XMM, SDSS DR3, DR5, DR7, DR8, DR9

- **Cone Search** and **TAP** Services (WFAU Curated)(deployed using Astrogrid DSA)
  - 6df, 6df DR3,Atlas DR1
    SuperCOSMOS Science Archive
    UKIDSS DR1, DR2, DR3, DR4, DR5, DR6, DR7, DR8, DR9, DR10
    VHS DR1, DR2, DR3
    VIDEO DR2, DR3, DR4
    VIKING DR2, DR3, DR4
    VMC DR1, DR2, DR3
    VVV DR1, DR2

- **SIAP** Services (deployed using ESA DAL toolkit)
    Atlas DR1
    UKIDSS DR1, DR2, DR3, DR4, DR5, DR6, DR7, DR8, DR9, DR10
    VHS Pawprint (for ESA crowd-science space debris idenification website)
    VISTA Surveys (All latest releases of VHS, VMC, VIDEO, VIKING, VVV)

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VO Use in our Archives

- ADQL, VOTable, SAMP, TAP & TAP_SCHEMA

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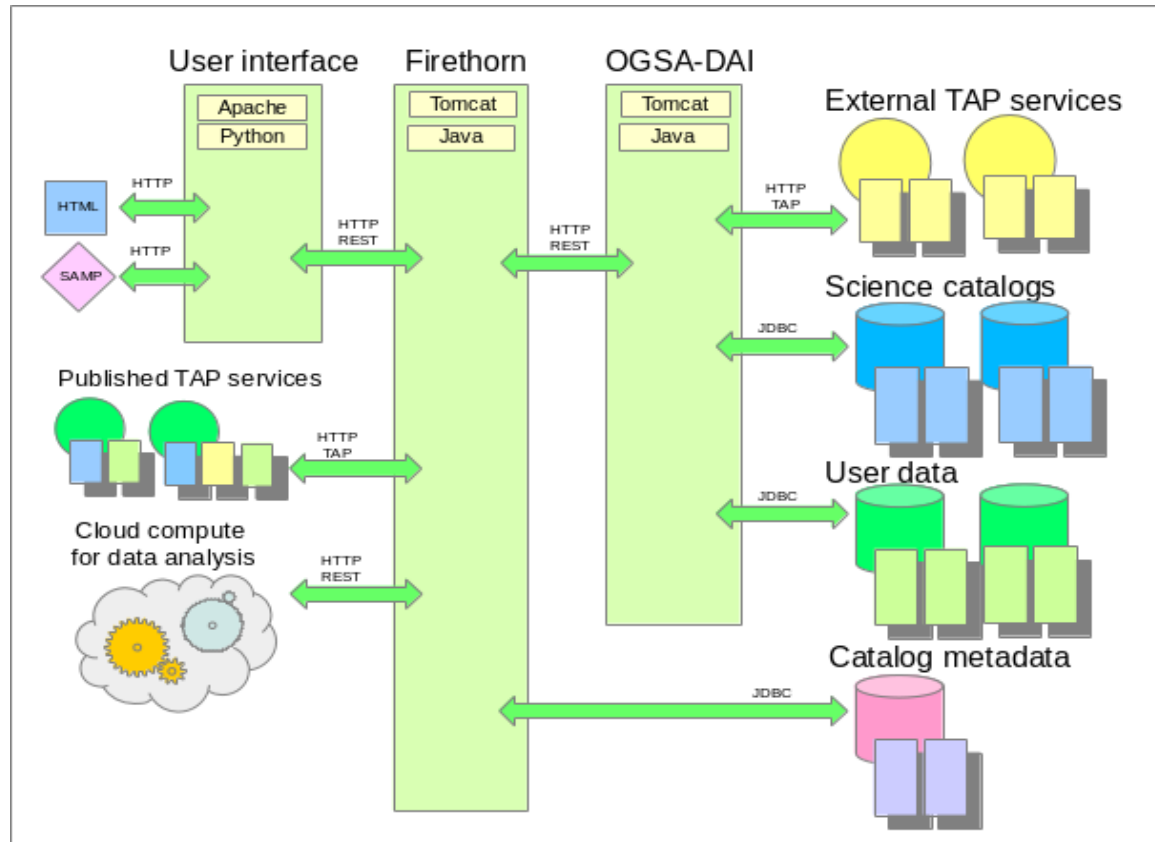Edinburgh University
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New TAP Services

- Built as part of the Firethorn Project (Infrastructure for new VO services, DQP for combining data from external TAP services, MyDB User storage..)

- Implemented using

    - ADQL Parser from CDS

    - SQL Server cluster at ROE

    - OGSA-DAI DQP service from EPCC

- Replace old AstroGrid DSA Services

- Docker for Development, Testing & Production
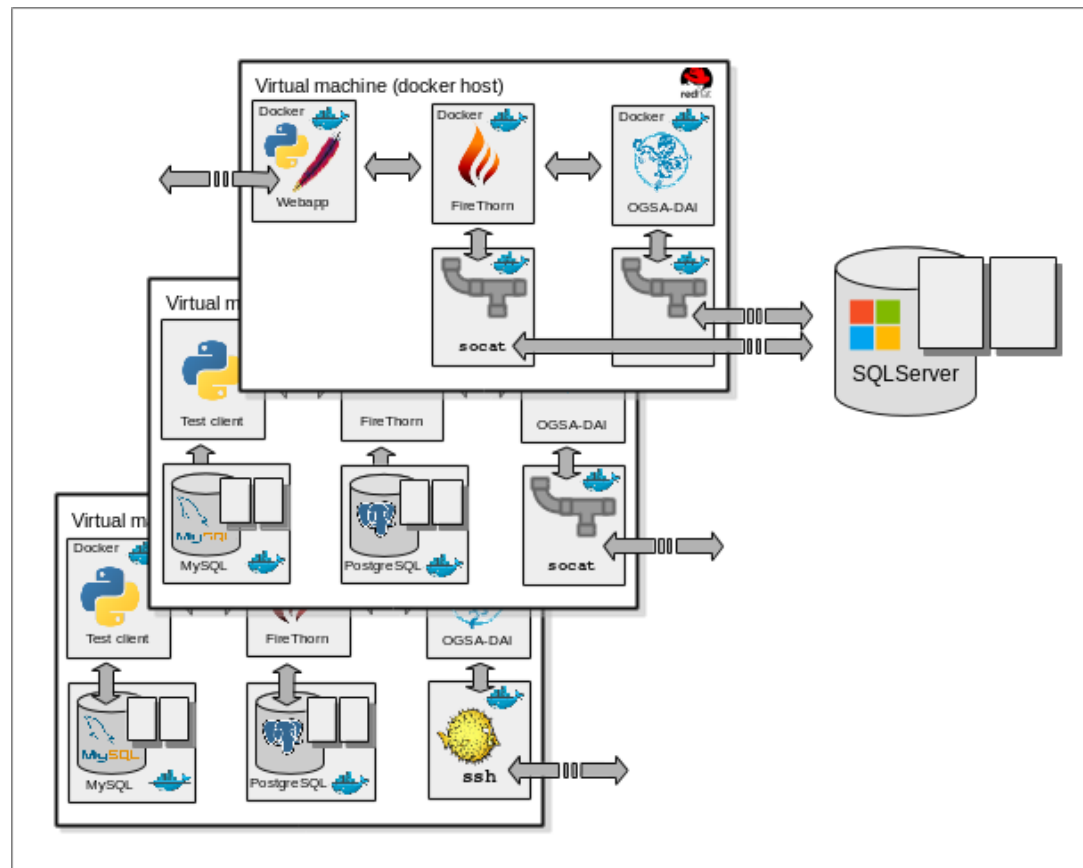
- Geometry Support & TAP Upload coming soon..

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System Design

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System Design

- Combination of Virtual Machines & Docker

- Science Data in SQL Server databases

- One Docker chain in a VM for each TAP service (osa,wsa.vsa..)

- Apache Proxy with reverse proxy, Virtual Host setup to distribute requests to the right VM

- Designed to have easily replaceable components, allowing quick upgrades and load balancing

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New TAP Services

- Single TAP Endpoint or One per archive?

  - Moving from this:
    http://wfaudata.roe.ac.uk/atlasDR1-dsa
    http://wfaudata.roe.ac.uk/atlasDR2-dsa
    http://wfaudata.roe.ac.uk/atlasDR3-dsa

//wfau.roe.ac.uk/6df-dsa	6dF Galaxy Surv
//wfau.roe.ac.uk/6dfdr3-dsa	6dF Galaxy Surv
//wfau.roe.ac.uk/astrodabis-dsa	AstroDAbis Nota
//wfau.roe.ac.uk/atlasDR1-dsa	ATLAS DR1 - VST
//wfau.roe.ac.uk/denis-dsa	Deep Near Infra
//wfau.roe.ac.uk/first-dsa	FIRST Survey Ca
//wfau.roe.ac.uk/galexgr6-dsa	GALEX Release
//wfau.roe.ac.uk/glimpse-dsa	GLIMPSE (Galac
//wfau.roe.ac.uk/iras-dsa	Infrared Astron
//wfau.roe.ac.uk/mgc-dsa	Millennium Gala
//wfau.roe.ac.uk/pssa-dsa	Personal Super
//wfau.roe.ac.uk/rosat-dsa	Rontgen Satellit

  - To this:
    http://tap.roe.ac.uk/osa , with all OSA datasets. Including related datasets for which we have neighbour tables
    One per archive: (http://tap.roe.ac.uk/wsa, http://tap.roe.ac.uk/vsa) rather than one per dataset

  - Also considering single endpoint:
    http://wfaudata.roe.ac.uk/tap

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New TAP Services
Testing/Validation

- Pyrothorn Testing suite
  - A python suite that we used to run through a list of previous user queries (~3000 queries) through our TAP service and compared results with a direct SQL Server query (https://github.com/stvoutsin/pyrothorn)

- Taplint validation (thanks M.Taylor!)
  Pass except for 1 warning:
    "Not ISO-8601 content "0" from ../destruction"

- Stress testing
    (Multithreaded Pyrothorn test querying the TAP service using sync & async

- Plan to check validity with other resources (EuroVO registry, Heasarc..)

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Future Plans & Interests

- TAP Services
    - Replace existing services with new TAP
    - TAP Upload
    - ADQL Geometry support
    - Load Balancing, Proxies (HAProxy, Nginx, Træfik..)

- Replace Astrogrid ConeSearch services and Registry

- Euclid, GAIA, LSST (VOEvent Broker, Copies of Data releases for UK)

- MOC in queries, Code to data with IPython/Jupyter Notebooks

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Difficulties/Feedback

- Teaching users VO and its benefits
  - "*Why does my MS SQL query not work?*"

- Funding needed to support maintain and build new VO Services.

- Just an idea.. an alternative discussion forum to the mailing lists?
  - An "unofficial" place for new developers/users to bring up questions but also discuss standards progression etc.
  - Easier to follow discussions

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