

Architecture of the Spectral Tools Platform (STOP) project

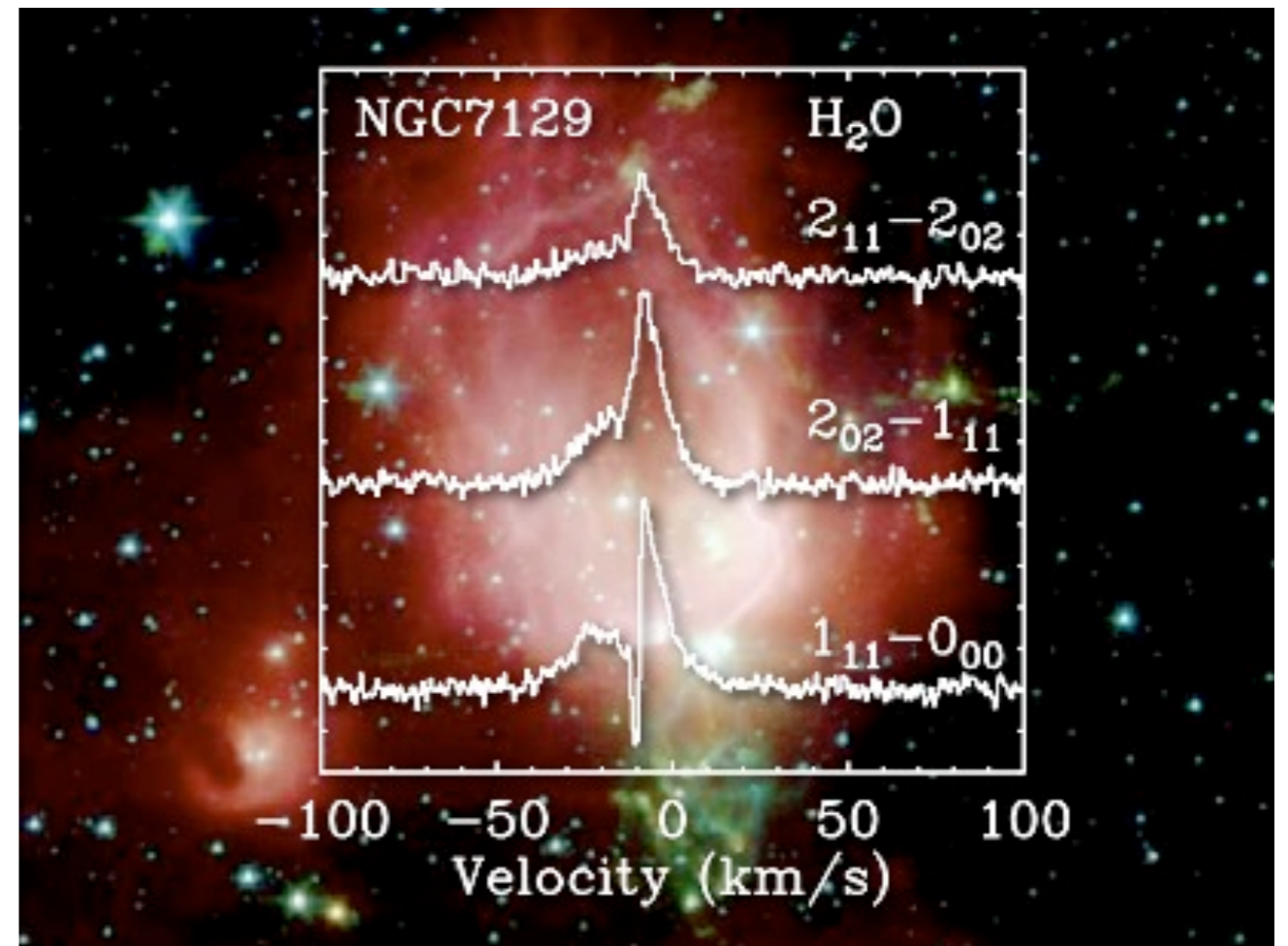
Ivan Zolotukhin
IRAP / UPS

Talk outline

- Scientific motivation
- Virtual Observatory
- Architecture & technology choice
- Project status

Scientific motivation

- Wealth of high quality radio telescopes data became available recently
- It is necessary to develop theoretical models and compare them with observations



Scientific motivation

- Modeling of 3D structures with diffuse interstellar medium, such as star-forming regions, protostar envelopes, jets, outflows, supernovae, novae
- Models in the order of increasing complexity:
 - LTE, local thermodynamic equilibrium
 - LVG, local velocity gradient
 - Full radiative transfer

Scientific motivation

- LTE simple, LVG and full RT are not
- 2 particular line modeling codes of MICMAC interest: LVG_GRE (C. Ceccarelli) and LIME (Brinch & Hogerheijde)
- Complex to install, inconvenient to access, troublesome to maintain :)
- C / Fortran written by researchers = hard to interface with anything
- Computationally intensive (impossible to use on a workstation)

Project STOP

streamline comparison of
observations with results of
*terrible, horrible, no good, very
bad* modeling codes

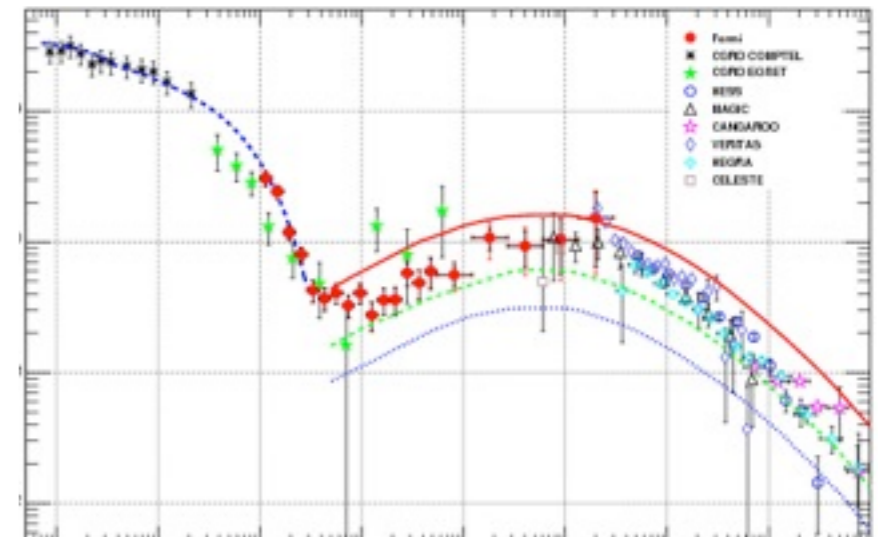
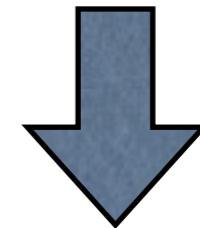
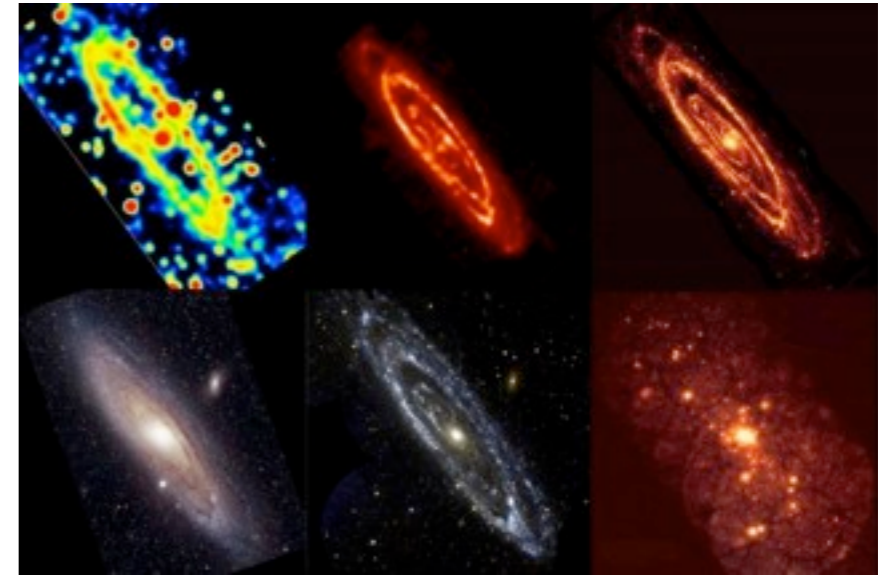


STOP

- Project STOP: **S**pectral **T**ools **P**latform
(collaboration with S. Bottinelli, J.-M. Glorian, E. Caux, D. Quénard)
- Legacy / heavy codes to model fluxes in Fortran / C: LIME and LVG_GRE

Virtual Observatory

- World-wide initiative to make **all** astronomical data homogeneous and accessible
- Being able to easily access γ -to-radio data (tables, images, spectra) for each object
- Science ready data!



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350013100100
550011100100
00212
01.000



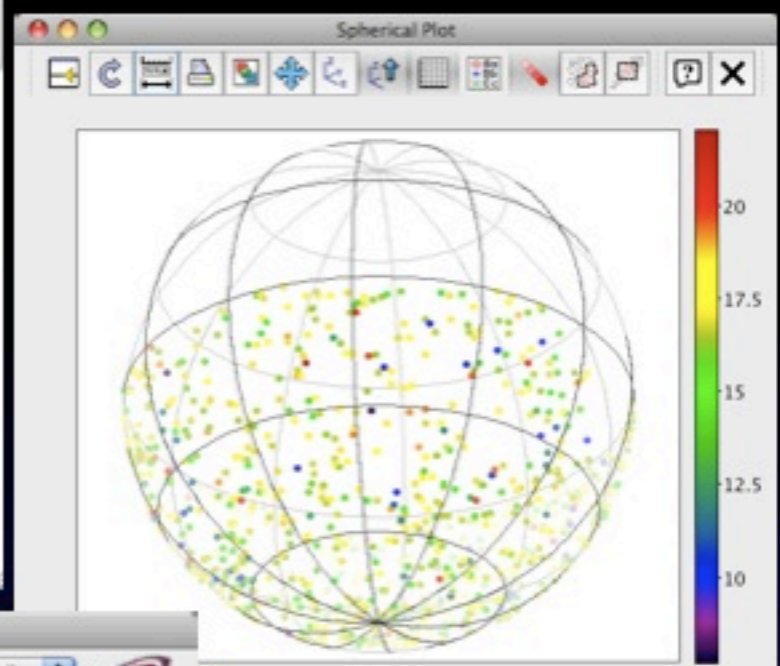
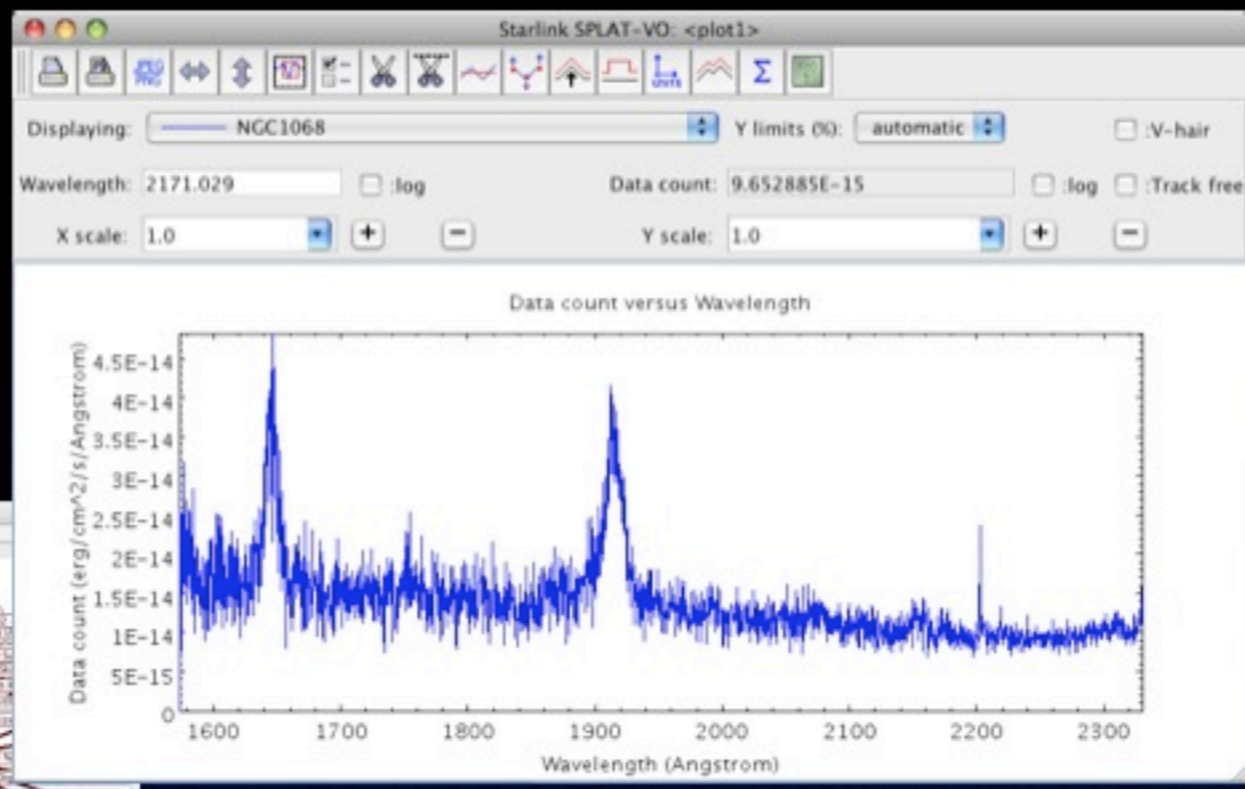
AstroScope

1. Search

Position or Object Name
40-670125, -0-013444
Search Radius (deg): 7
0.000000

2. Navigate

3. Process



Aladin v5.0

Location: KRS Pixel full

Ks.GOODS_ISAAC_mosaic_Ks_v2.0

VO Explorer - CDF-5

Contents of CDF-5 - 1302 resources

Status	Flag	Title	Capability	Date
▶		ESO Distant Cluster Survey, EDCS-II (Milvang-Jensen...)		2008-05-17
▶		ESO Imaging Survey (EIS) (Arnouts+, 2001)		2002-05-06
▶		ESO Imaging Survey (Zagaria+, 1999)		1999-06-19
▶		ESO Imaging Survey. CDF-5 point sources (Hatzimina...)		2002-03-03
▶		ESO Imaging Survey. VII. (Scodreggio+, 1999)		2000-10-12
▶		ESO Science Archive Catalog (ESO, 2002)		2002-09-10
▶		ESO Science Archive Image Service		2008-04-11
▶		ESO Science Archive Spectrum Service		2008-04-11
▶		ESO Slice Project (Vettolani+ 1998)		1998-06-16
▶		ESO Slice Project. VI. Groups of Galaxies. (Ramella+ ...)		1999-02-23
▶		ESO VLT Calibrators Program (Rkhichi+, 2005)		2005-05-05
▶		ESO-Uppsala ESO(B) Survey		2008-02-19
▶		ESO/Uppsala Survey of the ESO(B) Atlas (Lauberts 19...)		1998-07-08
▶		ESOUPPSALA: ESO-Uppsala ESO(B) Survey (LEDAS)		2008-03-26

Information Table Metadata

ESO Science Archive Spectrum Service

Short Name: ESO SAF SSA ID: ivo.archive.eso.org/ESO-SAF-SSAP
Type: CatalogService Created: 2008-02-13T16:32:45
Updated: 2008-04-11T14:17:38:05

Content Type: archive, organisation Subject: stars, galaxies, surveys

Level: research

The ESO-ST-ECF Science Archive is a joint collaboration of the European Organisation for Astronomical Research in the Southern Hemisphere (ESO) and the Space Telescope - European Coordinating Facility (ST-ECF). ESO observational data can be requested after the proprietary period by the astronomical community. [Further information...](#)

Relationships: service-for European Southern Observatory - Science Archive Facility

Waveband Coverage: infrared, optical, uv
Spatial Coverage: All-Sky

Annotations: Flag Highlight Alternative title Notes Tags Monitoring service Judged to be up at

VO Explorer - CDF-5

Resource Lists

- Examples
- quasar optical catalogues
- quasar infrared catalogues
- infrared imaging
- UKIDSS
- 30 doradus
- CDF-5
- ESO SSA

Actions

Query

About

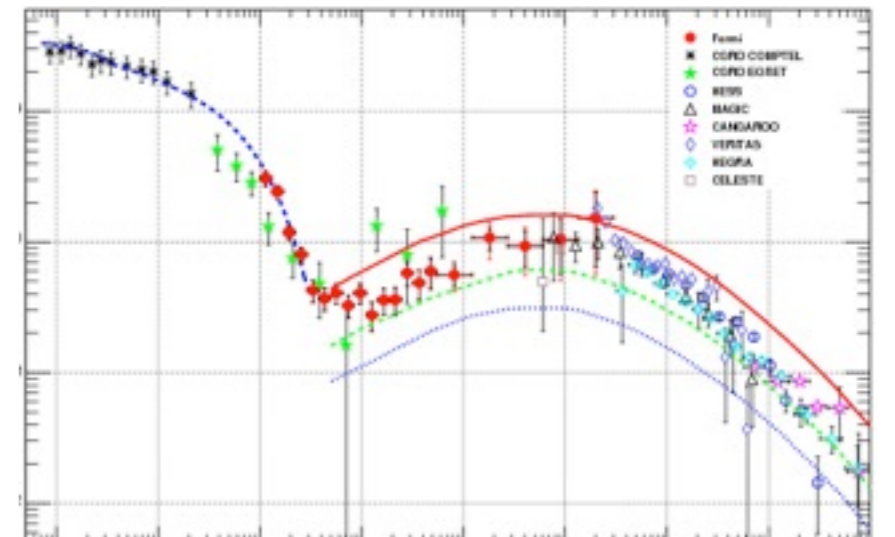
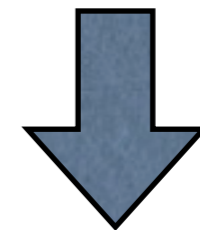
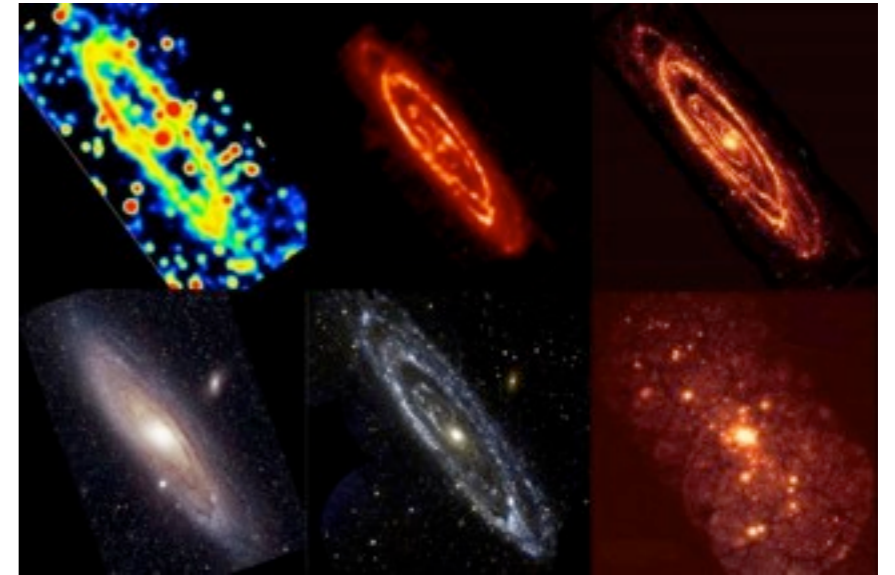
Selection: CatalogService

Further Info

Email Curator

Virtual Observatory

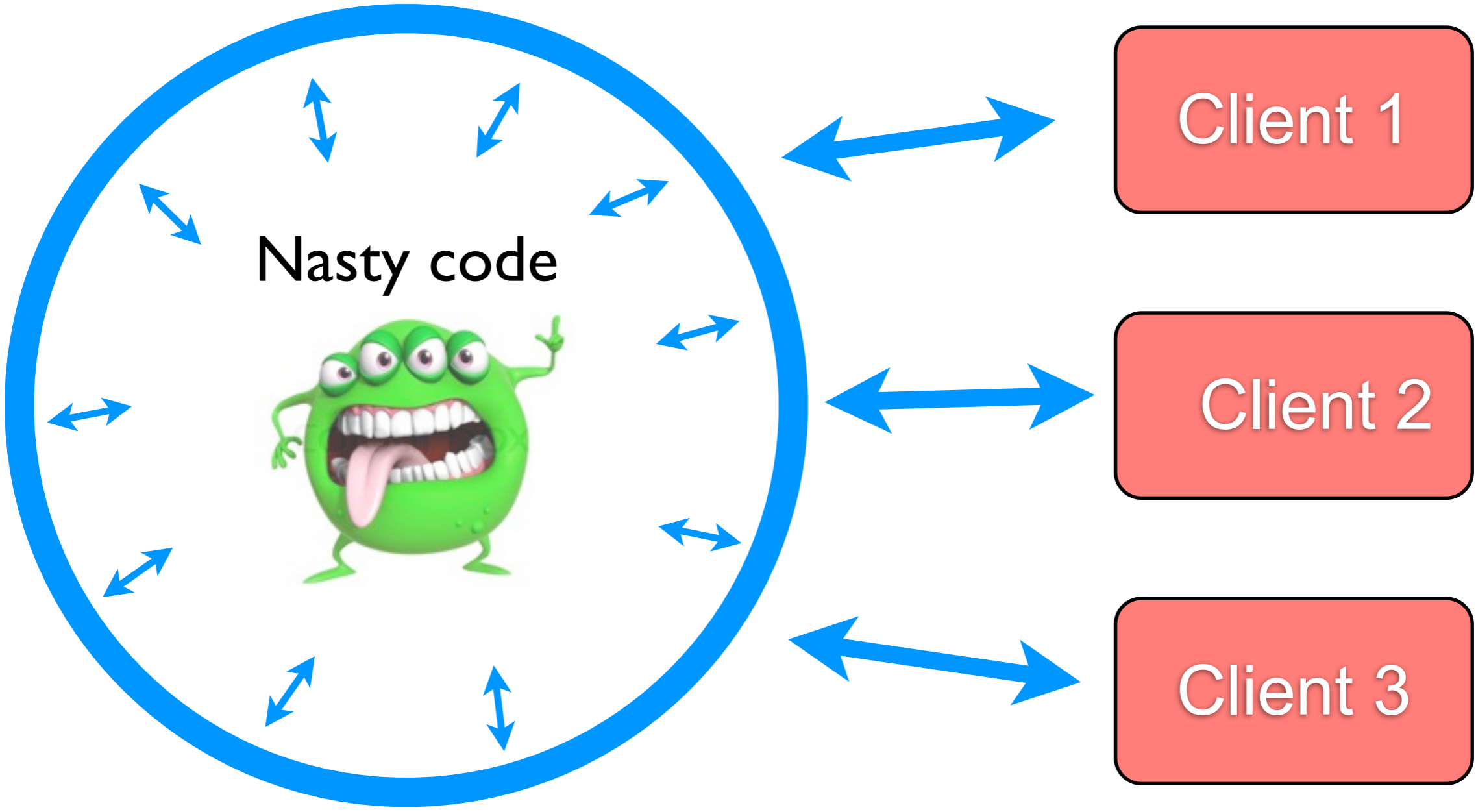
- It's crucial that everyone talks same language (protocol)
- IVOA works out protocols and conducts the orchestra
- Most famous protocols are: ConeSearch, SIAP, SSAP, SAMP, TAP, UWS



What's UWS?

- UWS – Universal Worker Service, built to access asynchronous services by submitting long-running jobs (tasks)
- You say to a web service: start job with these params, stop job, fetch results
- Wrapping code into UWS cures most of the usage / maintenance problems
- Many client applications can now access it
- Dispatch jobs on a large cluster (e.g. SLURM)

UWS server



Technologies

- Architecture: UWS server + client(s)
- Very useful rule: limit zoo of a project's technologies, try to use the single one
- Client: python / Django
- Hence UWS server: python

Why python / Django?

- 2011: exoplanet.eu world's reference exoplanet database
- 2012: vespa.obspm.fr virtual european solar and planetary access
- 2015: xmm-catalog.irap.omp.eu xmm-newton catalog and photon database

UWS with DaCHS

- DaCHS: data center suite by M. Demleitner (GAVO)
- Very powerful solution (arbitrary binary wrap, arbitrary job input environment, arbitrary arguments through UWS, etc)
- Power of python embedded into `q.rd` – the only service configuration file
- VIP access to Markus

Need for special UWS client

- Complex input parameters
 - File uploads
 - Array / dictionary arguments
 - Complex relationships between input arguments
- **Cannot be handled by default / automatic client**

Special UWS client

UWS client
web app



STOP Home **LVG -** LIME About Contact

LVG service

Main Grid Plot

Geometry

semi-infinite expanding slab
expanding sphere
uniform sphere

Column density

min	max	n	<input checked="" type="checkbox"/> log
<input type="text" value="1e+14"/> in cm-2	<input type="text" value="1e+16"/> in cm-2	<input type="text" value="5"/>	

Collision partner density

min	max	n	<input checked="" type="checkbox"/> log
<input type="text" value="100000.0"/> in cm-3	<input type="text" value="10000000.0"/> in cm-3	<input type="text" value="5"/>	

Temperature

min	max	n	<input checked="" type="checkbox"/> log
<input type="text" value="10"/> in K	<input type="text" value="300"/> in K	<input type="text" value="10"/>	

Demo

Project status

after 8 months (6 to go)

- UWS support in DaCHS ✓
- `uws-client` fixed ✓
- LVG: client and server ✓
- LIME: server ✓

- LVG finishing
- LIME client & result visualizer
- SLURM dispatcher

Message to take away

- Have long-running jobs and/or tired from legacy software: UWS is for you
- **DaCHS**: stable and mature, highly recommended for UWS and other VO data center tasks
- **python + Django**: very convenient for research applications, highly recommended

Thanks