

CADC and CANFAR: An Integrated VO-Enabled Framework

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Canadian Astronomy Data Centre

- National facility for open access
- Telescope collections:
 - Multiple missions, facilities and wavelengths
 - Pointed and survey observations
 - 12 telescopes
 - 6 advanced data collections
- Services
 - Archive services
 - Data curation
 - Community projects
- Many international collaborations
- Development and operations hub for CANFAR

The screenshot shows the Canadian Astronomy Data Centre (CADC) website. At the top, there is a blue header with the text "Canadian Astronomy Data Centre" and a red maple leaf logo. To the right of the header is the "Canada" logo. Below the header is a navigation bar with links for "Telescope Data Products", "Advanced Data Products", "Services", "Advanced Search", and "Login". The main content area features a search bar with the text "Search for data by target" and a "Search" button. Below the search bar is a grid of icons representing various telescope data products and services. The grid is organized into three columns: "Telescope Data Products", "Advanced Data Products", and "Services". Each column contains several icons with labels, such as "Gemini", "CFHT", "JCMT", "MegaPipe", "HLA", "Meetings", "Community", "HST", "BLAST", "MOST", "IRIS", "CGPS", "SSOIS", "CANFAR", "DAQ", "MACHO", "OMM", "CFHTLS", and "WIRWolf". At the bottom of the page, there is a footer with links for "Terms and conditions", "Transparency", "News", and "Contact us". The date "Date modified: 2014-04-28" is also visible in the footer.



The Canadian Astronomy Data Centre

If you have used CADCC facilities for your research, please include the following acknowledgment:

This research used the facilities of the Canadian Astronomy Data Centre operated

by the National Research Council of Canada with the support of the Canadian Space Agency.

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Search by Target:

All Archives ▾

Search

[Advanced Search](#)

[English](#) | [Français](#)

NRC is currently renovating this web site to improve its functionality in both official languages. Due to the complexity of the site, these improvements are taking place in stages. We regret the inconvenience to our users and will update this notice to report our progress.

In the meanwhile, if you are unable to access the information you require, please contact us at cadc@nrc.gc.ca for assistance in the official language of your choice.

Thank you for your patience.



Advanced Query Service



Astronomy Meetings



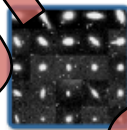
CFHT Legacy Survey



CFHT MegaCat Stacks



Canadian Virtual Observatory Services



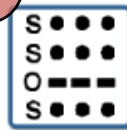
Community Projects



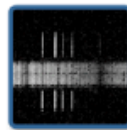
NRC/CFHT WISE/SDSS stacks



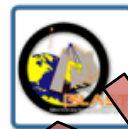
Programmatic Archive Access



Solar System Object Search



DAO Spectroscopic Plate Archive



BLAST



CFHT



CGPS



CFHT



FUSE



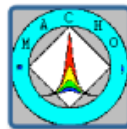
GSA



HST



JCMT



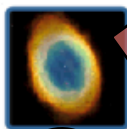
MACHO



MOST



AstroCat



Digitized Sky Survey



Guide Stars



U.S. Naval Observatory A2 Catalog



VizieR



CANFAR



Advanced Search

- Enabled by CAOM (CADDC's Common Archive Observation Model)
- Single query interface to "all" CADC collections
- With proprietary metadata and data access
- Support VO DAL/DM with views
- Many years in the making
- Released September 2013

Canadian Astronomy Data Centre

Canada

Telescope Data Products | **Advanced Data Products** | Services | **Advanced Search** | Login

CADC Home > Advanced Search

Advanced Search

Search Results Error ADQL Help

Search Reset

Observation Constraints

- ▶ Observation ID
- ▶ P.I. Name
- ▶ Proposal ID
- ▶ Proposal Title
- ▶ Proposal Keywords

Science and Calibration data

Spatial Constraints

- ▶ Target
- ▶ Pixel Scale
- Do Spatial Cutout

Temporal Constraints

- ▶ Observation Date
- ▶ Integration Time
- ▶ Time Span

Spectral Constraints

- ▶ Spectral Coverage
- ▶ Spectral Sampling
- ▶ Bandpass Width
- ▶ Rest-frame Spectral Coverage
- Do Spectral Cutout

Additional Constraints

Band	Collection	Instrument	Filter	Calibration Level	Data Type	Observation Type
All (8)	DAOPLATES	All (9)	All (584)	All (3)	All (2)	All (1)
Gamma-ray	FUSE	ACS	182NM_MBP	(1) Raw Standard	image	object
Infrared	HST	FOC	191NM_MBP_(CIII)	(2) Calibrated	spectrum	
Millimeter	HSTHLA	FOS	270NM_MBP	(3) Product		
Optical	IRIS	HRS	280NM_NBP(MG1)			
Radio	JCMT	NICMOS	Blank			
UV	MACHO	STIS	CLEAR_FOC/96			
X-ray	OMM	WFPC3	CLEAR_HRC			
Unknown	UKIRT	WFPC	CLEAR_NIC1			
	VGPS	WFPC2	CLEAR_NIC2			

Date modified: 2014-05-01

Terms and conditions | Transparency

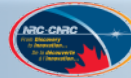
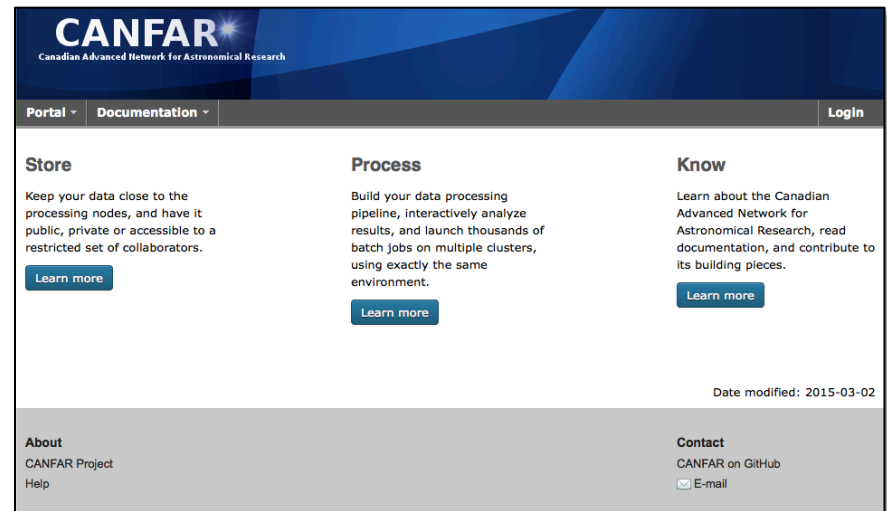
News

About us
Our mandate
Acknowledgements

Contact us
Email
Address

Canadian Advanced Network for Astronomical Research

- A cloud ecosystem for data intensive astronomy
- A platform supporting many virtual organisations
- User services
 - Store and share data
 - Create and share VMs
 - Run VMs close to data
 - Interactive for data exploration
 - Persistent for SaaS
 - Batch processing in Virtual Clusters
- Federated research cloud resources
 - Compute Canada
- Integrated:
 - Authentication and authorization
 - Access to telescope data
 - Access to user storage
- In operation since 2011

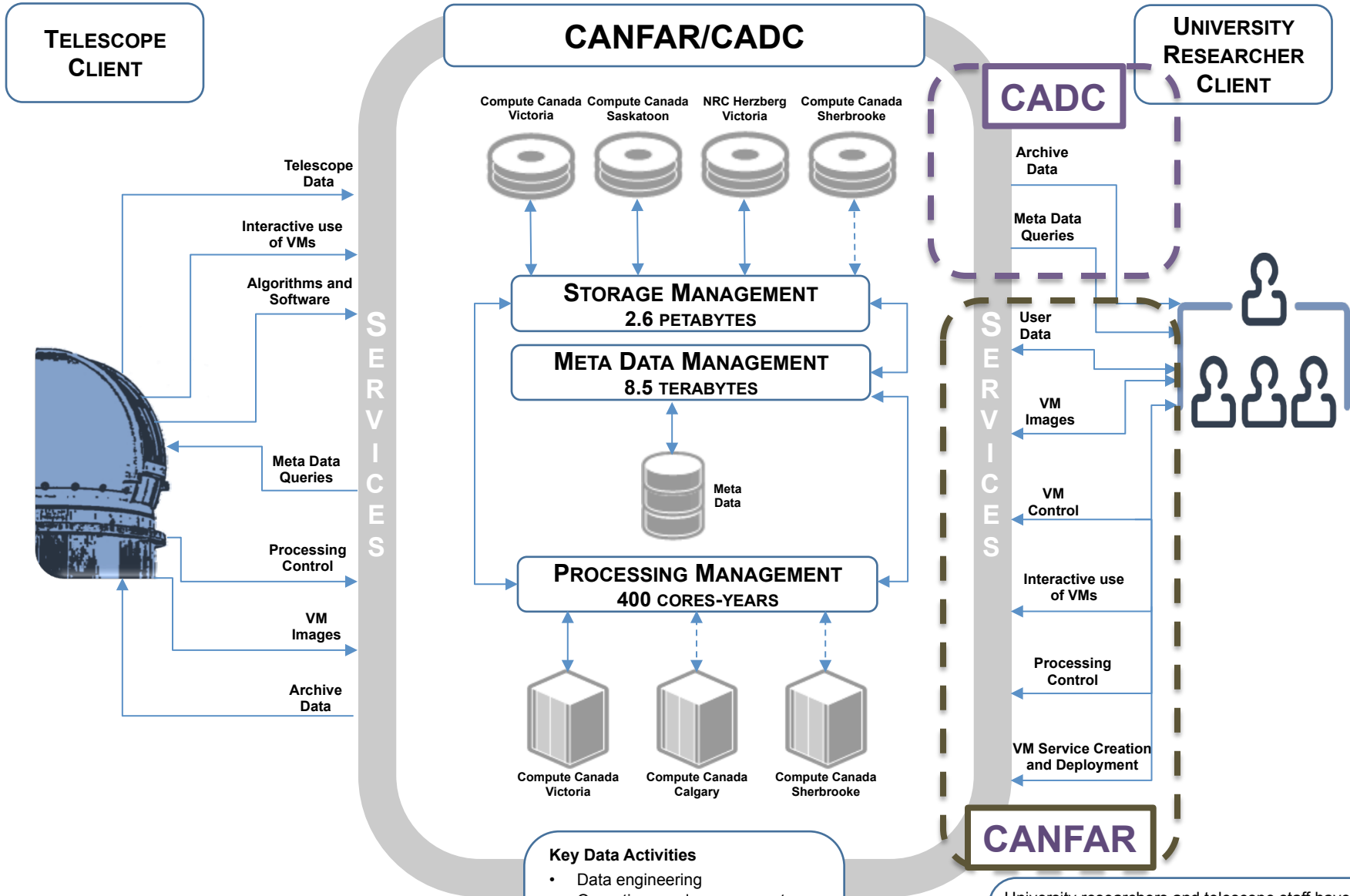


CANFAR/CADC 2014

- Size:
 - 233M files (932M files)
 - 597 TiB (2.3 PiB)
- Users
 - Authenticated access: 762
 - Anonymous access: 7,544
 - Registered: 7,018
- Data handled in the last year
 - TiB: 1,106
 - Files: 91M
- Batch processing
 - 488 Core-years
 - 2.7M jobs

The screenshot shows the CANFAR website homepage. At the top, the logo reads "CANFAR Canadian Advanced Network for Astronomical Research". Below the logo is a navigation bar with "Portal" and "Documentation" menus, and a "Login" link. The main content area is divided into three columns: "Store", "Process", and "Know". Each column contains a brief description and a "Learn more" button. The "Store" section describes keeping data close to processing nodes. The "Process" section describes building data processing pipelines. The "Know" section describes learning about the network and contributing. At the bottom right, it says "Date modified: 2015-03-02". A footer contains "About CANFAR Project Help" and "Contact CANFAR on GitHub E-mail".

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TELESCOPE CLIENT

CANFAR/CADC

UNIVERSITY RESEARCHER CLIENT

CADC

CANFAR

SERVICES

SERVICES

Compute Canada Victoria Compute Canada Saskatoon NRC Herzberg Victoria Compute Canada Sherbrooke

Compute Canada Victoria Compute Canada Calgary Compute Canada Sherbrooke

STORAGE MANAGEMENT
2.6 PETABYTES

META DATA MANAGEMENT
8.5 TERABYTES

PROCESSING MANAGEMENT
400 CORES-YEARS

Meta Data

Archive Data

Meta Data Queries

User Data

VM Images

VM Control

Interactive use of VMs

Processing Control

VM Service Creation and Deployment

Telescope Data

Interactive use of VMs

Algorithms and Software

Meta Data Queries

Processing Control

VM Images

Archive Data

Key Data Activities

- Data engineering
- Operations and user support
- Software development
- Software integration
- Data processing
- Data management
- User web services
- User web interfaces

University researchers and telescope staff have privileges to upload data, create VMs and install science applications, run interactive VM sessions, submit batch processing jobs to VMs, share their VMs, control the life-cycle for their VMs, offer software-as-a-service applications in their VMs.

Definition: VM – Virtual Machine

	Data In		Data Out	
	# of files	Terabytes	# of files	Terabytes
Peak per day	2,169,190	8.0	648,093	16.8
Avg per day	130,952	0.4	99,253	2.6

IVOA Standards

- ADQL 2.0
- CDP 1.0
- DALI 1.0
- DataLink 1.0
- ObsCore 1.0
- SIA 1.0
- SimpleDALRegExt 1.0
- SSO 1.01
- TAP 1.0
- TAPRegExt 1.0
- UWS 1.0
- VODataService 1.1
- VOResource 1.03
- VOSI 1.0
- VOSpace 2.0
- VOTable 1.1, 1.2, 1.3
- RegistryInterfaces 1.0

PR and WD implementations

Reference Implementations of Proposed Recommendations

- *DataLink 1.0*
- SIA 2.0

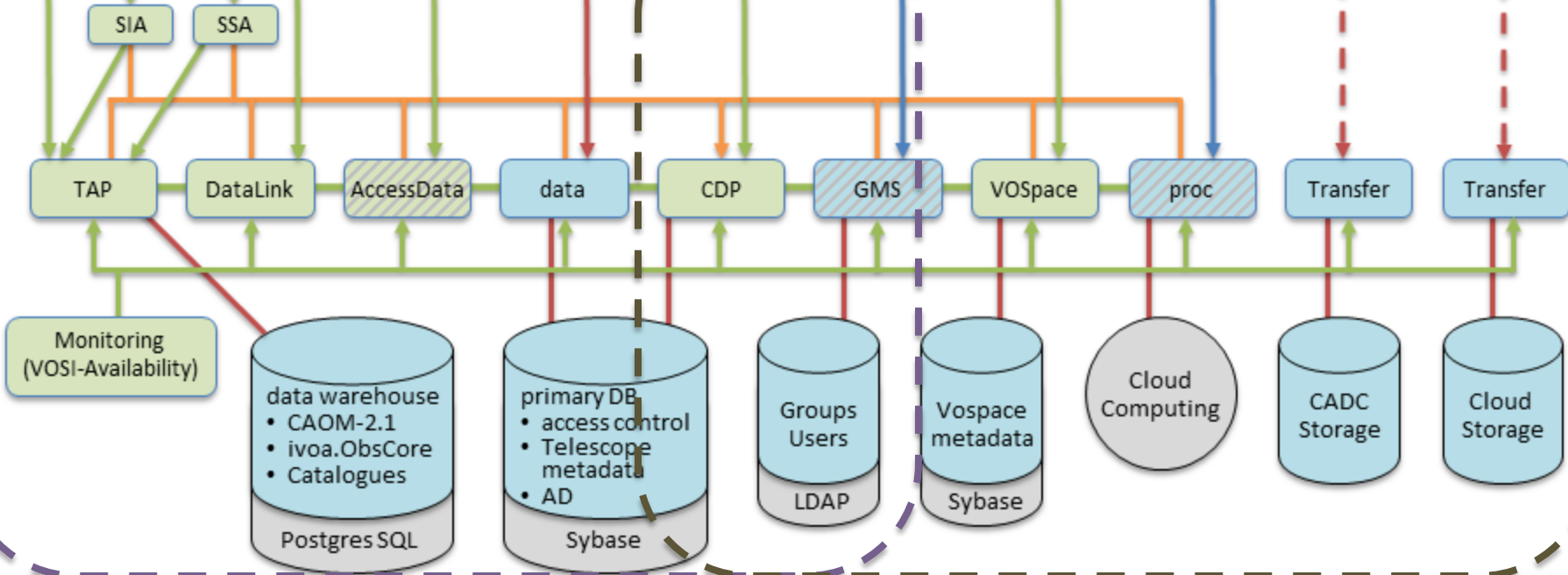
Prototype implementations of Working Drafts

- ObsCore 1.1
- UWS 1.1
- SSO 2.0
- VOSpace 2.1
- TAP 1.1
- AccessData 1.0
- VOSI-tables 1.1

Users: client applications, browser-based applications, scripts & tools, etc

CADC

CANFAR



Legend

Service API



Private API



Internal



IVOVA Standard

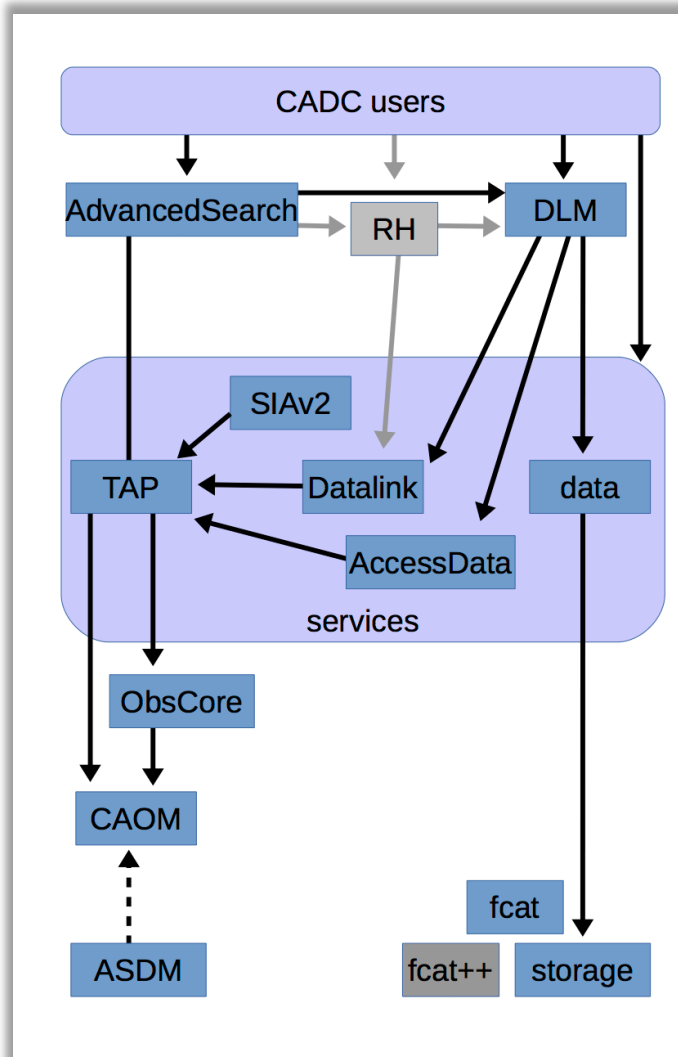
Draft Standard

CADC

Future Standard

Off-the-shelf

AdvancedSearch and VO standards



Canadian Astronomy Data Centre  Canada

Telescope Data Products | Advanced Data Products | Services | Advanced Search | Login

CADC Home > Advanced Search

Advanced Search

Search Results Error ADQL Help

Search [Reset]

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Millimeter	HSTHLA	FOS	270NM_MBP	(3) Product		
Optical	IRIS	HRS	280NM_NBP(MG1)			
Radio	JCMT	NICMOS	Blank			
UV	MACHO	STIS	CLEAR_FOC/96			
X-ray	OMM	WFPC3	CLEAR_HRC			
Unknown	UKIRT	WFPC	CLEAR_NIC1			
	VGPS	WFPC2	CLEAR_NIC2			

Date modified: 2014-05-01

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VO Discovery and Access

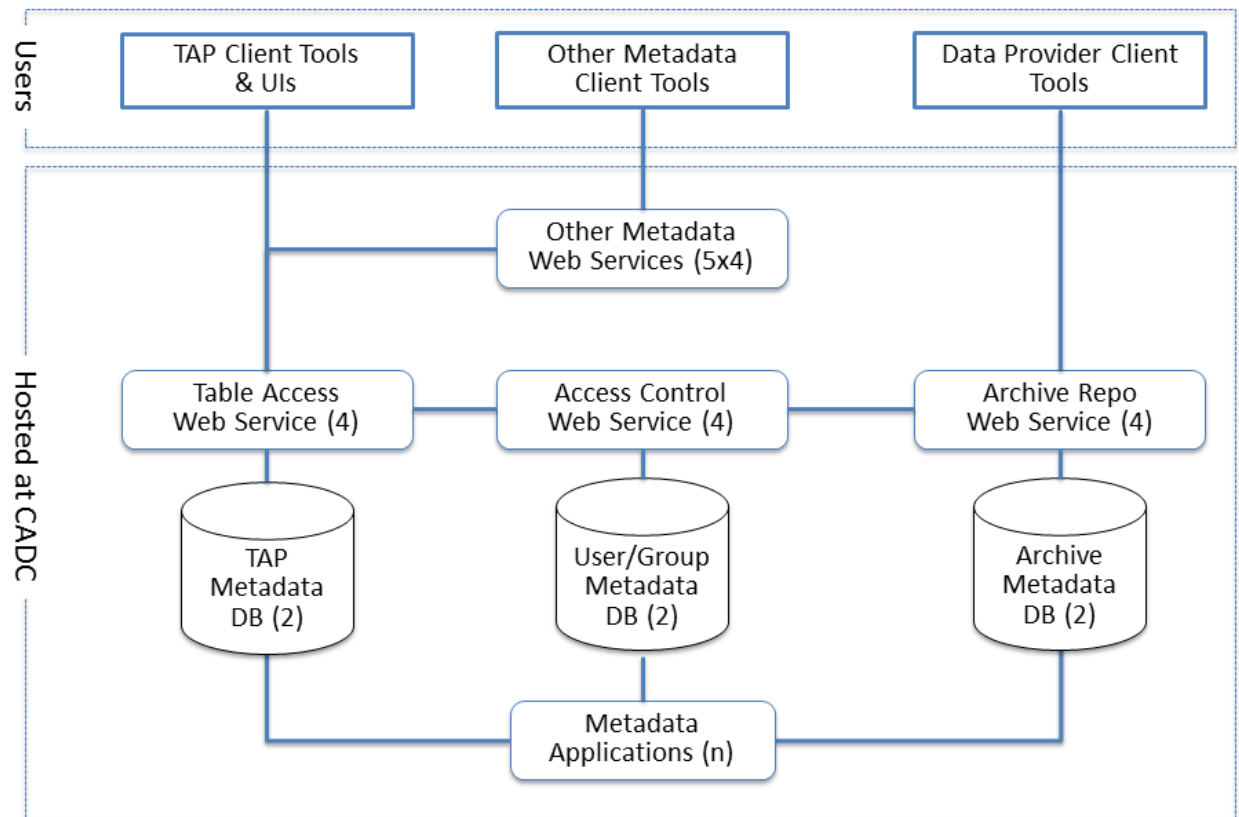
- The VO models are views on CAOM:
 - **ObsCore**: observation.intent = "science" and plane.calibrationLevel is not null
 - **SIAv2**: ObsCore and plane.dataProductType in ("image", "cube")
 - **SIAv1**: observation.intent="science" and plane.calibrationLevel > 1 and plane.dataProductType = "image" and artifact.productType = "science"
 - **SSA***: observation.intent="science" and plane.calibrationLevel > 1 and *and plane.dataProductType = "spectrum"*

Data Model	All Collections	CFHT	Gemini	HST	JCMT	UKIRT
CAOM with VO Table Access Protocol (TAP)	9,156,115	2,326,217	1,040,051	2,506,648	1,329,312	1,288,458
VO ObsCore with Table Access Protocol (TAP)	6,166,103	1,595,230	313,580	1,694,645	1,095,414	975,765
VO Simple Image Access (SIA)	3,970,840	1,357,035	313,580	1,675,171	217,076	-
VO Simple Image Access Version 2 (SIAv2)	4,141,400	1,414,808	313,580	1,671,236	333,734	-
<i>VO Simple Spectral Access (SSA)</i>	<i>513,508</i>	<i>180,475</i>	-	<i>23,409</i>	<i>226,392</i>	-

**Not yet implemented*

Publishing Data with CAOM

- Supported by:
 - python and java libraries
 - java application
- Web service for persistence and retrieval
- [Google Code repository](#)
- Tools for user contributed publishing



10 items, 49.95 GB available

Actions

- Add files
- Add folder
- Upload folder
- Add link
- Add bookmark link
- Download
- Delete
- Move
- Edit permissions

[Manage Groups](#)

<input type="checkbox"/> Name ▲	Size	Last Modified (UTC)
<input type="checkbox"/> ..	--	
<input type="checkbox"/> ESAC_talks	16.93 MB	2012-09-19 - 23:55:11
<input type="checkbox"/> Euclid_Bologna	12.50 MB	2012-09-21 - 10:18:35
<input type="checkbox"/> HST_previews	1.97 MB	2012-09-19 - 23:54:52
<input type="checkbox"/> rsstest	2.41 MB	2012-09-19 - 23:53:25
<input type="checkbox"/> rsstestpub	1.85 MB	2012-09-19 - 23:53:25
<input type="checkbox"/> Sao_Paolo	11.92 MB	2012-11-15 - 00:36:11
<input type="checkbox"/> Talks	2.19 MB	2012-10-01 - 06:21:09
<input type="checkbox"/> TAP	98.75 kB	2013-02-21 - 16:39:14
<input type="checkbox"/> TAP_queries	100.58 kB	2012-09-19 - 23:54:52
<input type="checkbox"/> vm	0 bytes	2011-05-09 - 22:59:45

Powered by

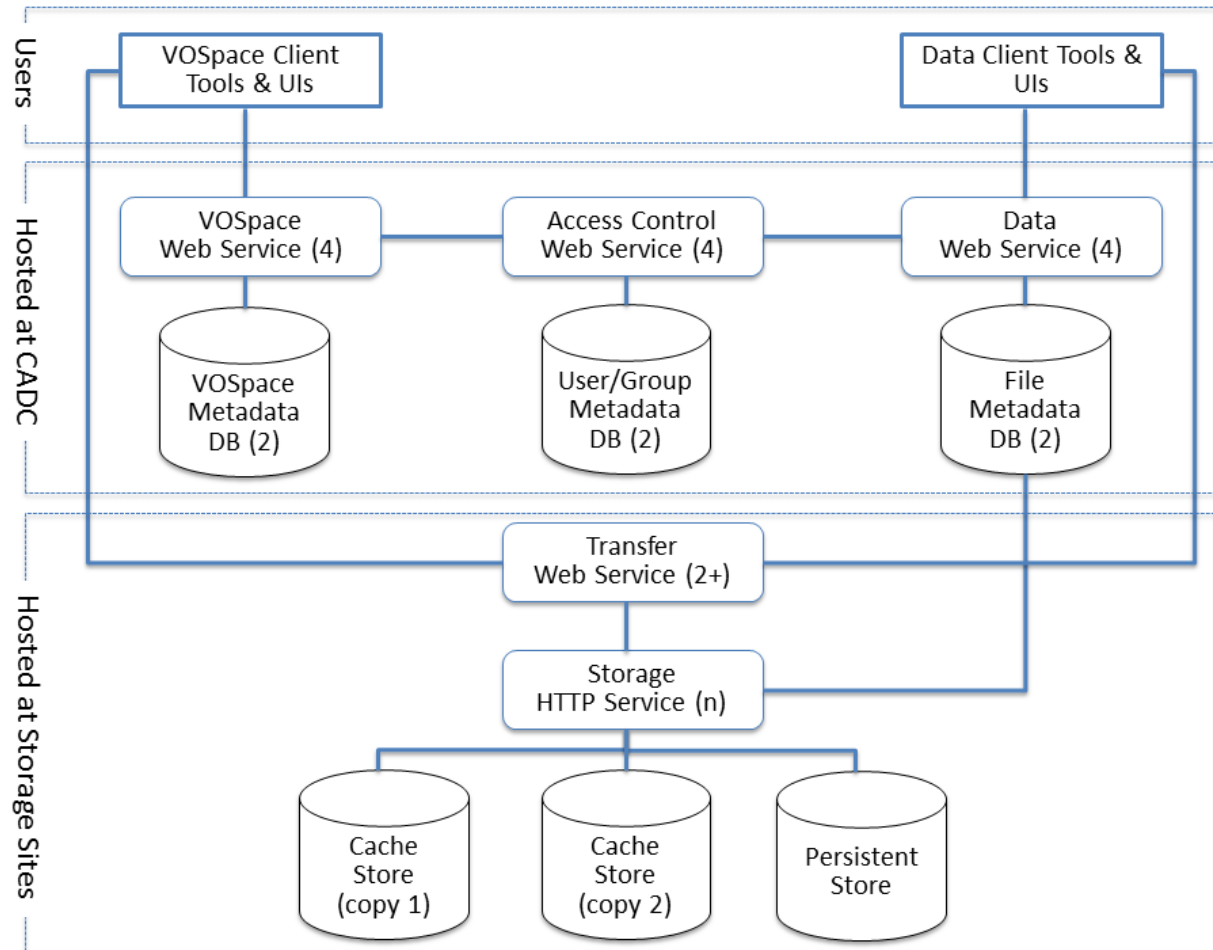


canarie



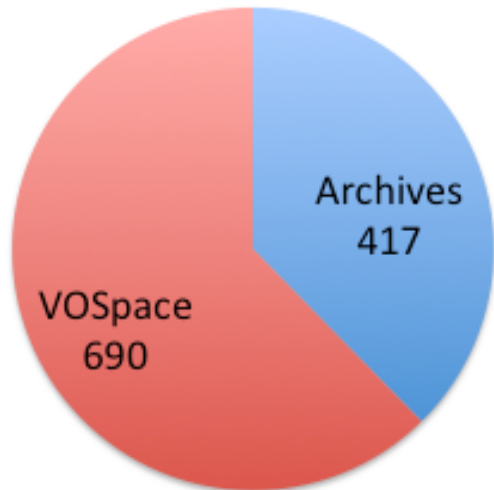
VOSpace

- Storage web services using several distributed storage resources
- Optimization and QoS strategies not user nor provider dependent
- Same system for both archive and users
- File in/File out



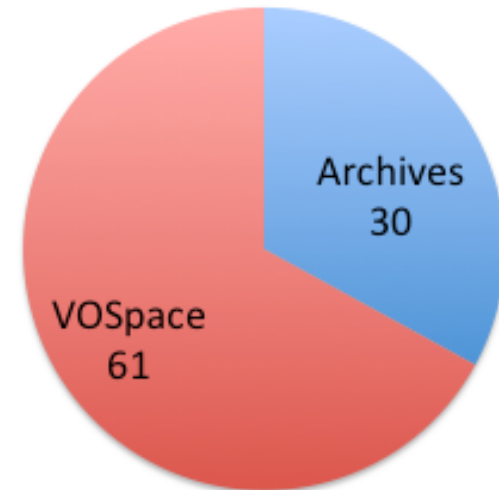
VOSpace usage in 2014

TiB



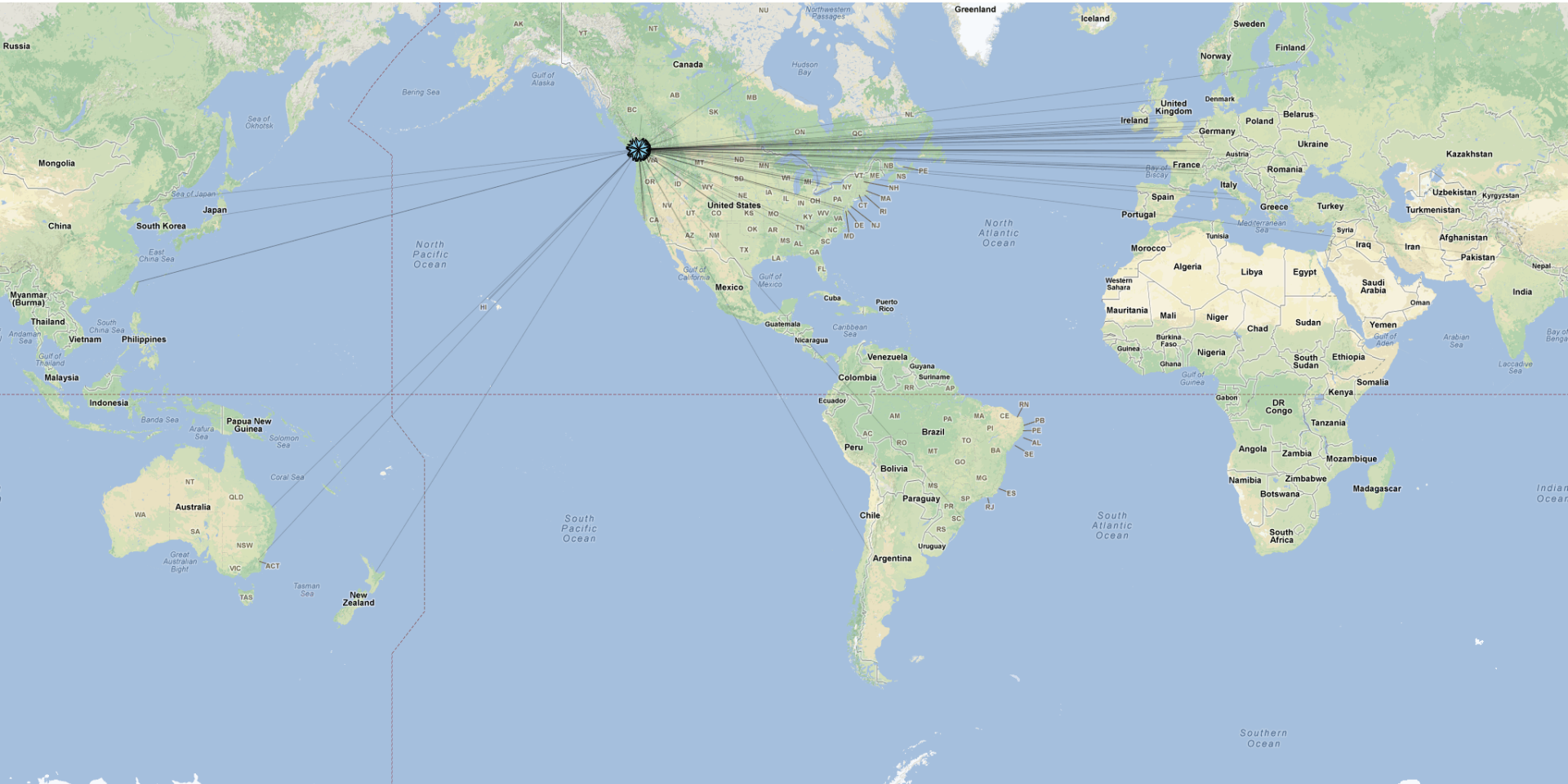
62% VOSpace
Average per week: 13.3
Peak week: 39.0

Files (M)

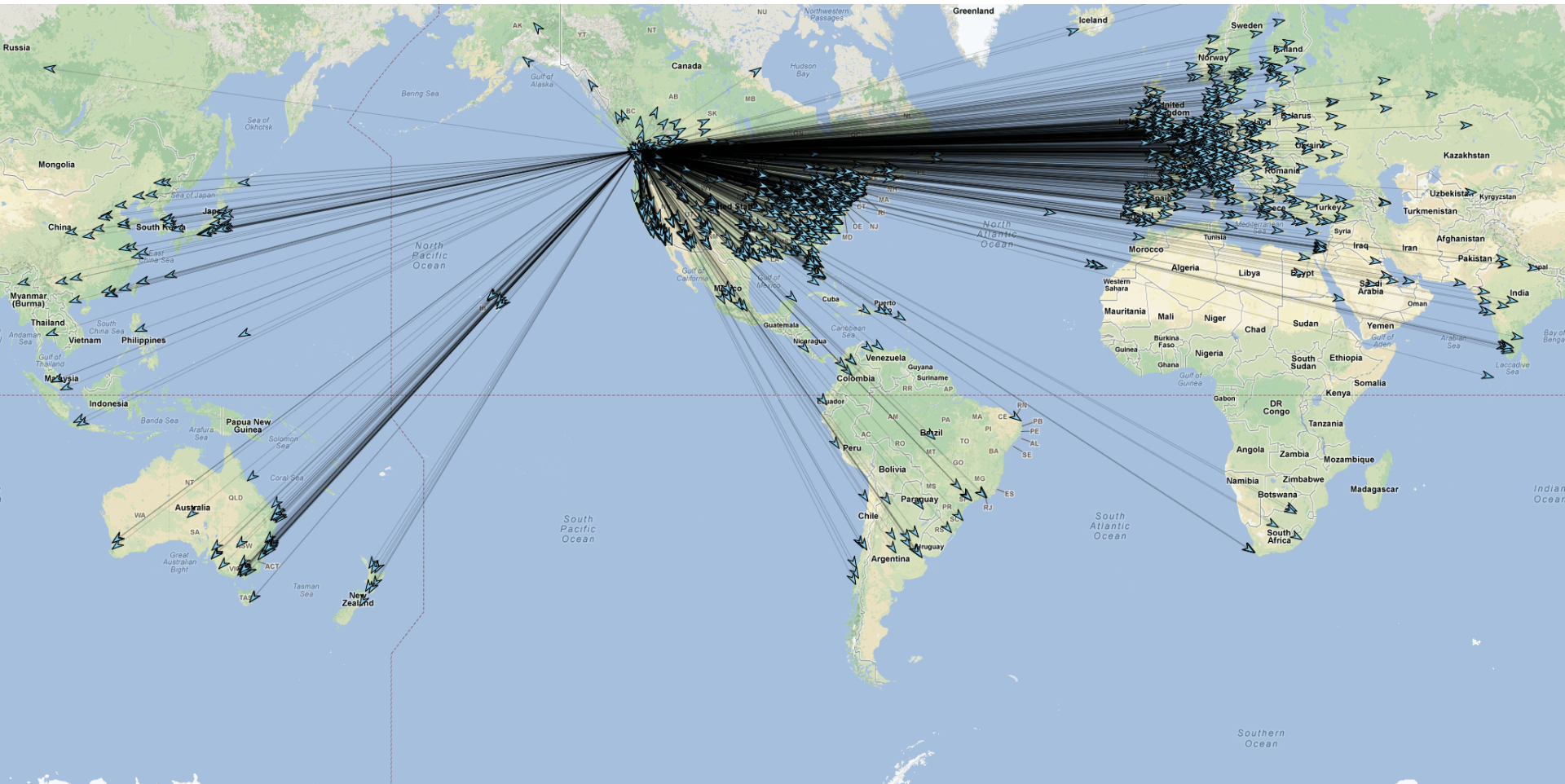


67% VOSpace
Average per week: 1.2M
Peak week: 11.7M

Geography of VOSpace PUTs



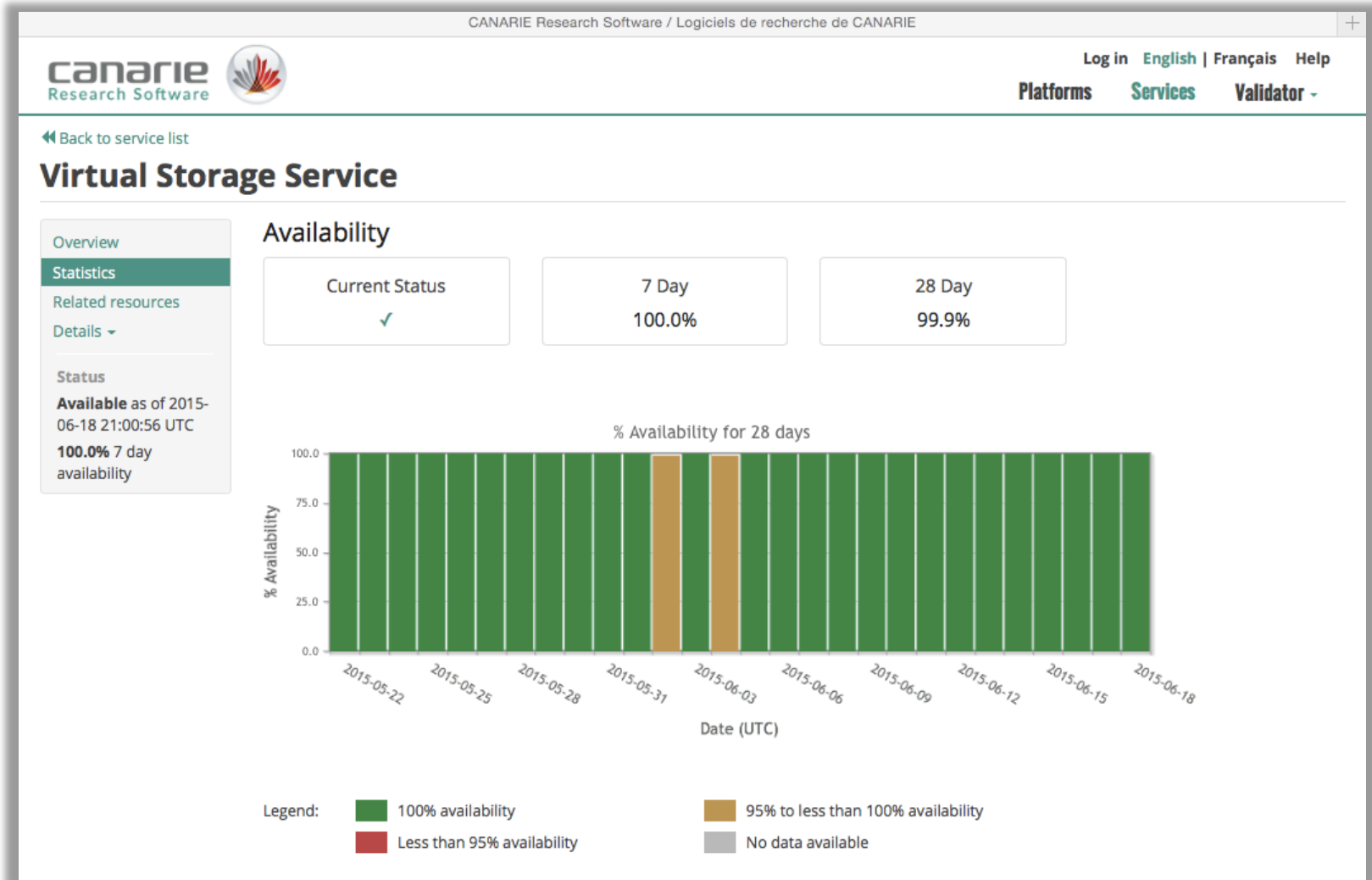
Geography of VOSpace GETs



Usage Numbers

Service	Kibana query	May 2015	Average per day
CDP	service:"cred_ws" AND phase:"END"	3,729,581	120,309
TAP	service:"tap_ws" AND phase:"END"	211,500	6,823
UWS	method:"UWS"	14,099,486	454,822
SIAv1	service:"sia_ws" AND "/sia/query" AND phase:"END"	3,848	124
VOspace	service:"vospace_ws" AND phase:"END"	6,447,554	207,986
DataLink	service:"caom2ops_ws" AND datapath:"/caom2ops/datalink"	44,610	1,439
AccessData	msg:"cutout" AND msg:"http" AND !msg:"Cutout request."	205	7
SIAv2	service:"sia_ws" AND "/sia/v2query" AND phase:"END"	29	1
GMS	(service:"ac_ws" OR service:"gms_ws") AND phase:"END"	4,452,772	143,638
Proc	service:"proc_ws" AND phase:"END"	441	14

Example: Service Registration and Monitoring



The background is a solid blue color with several overlapping circular and curved shapes. A large, dark blue circle is positioned in the upper right quadrant. A lighter blue, semi-transparent circle is located in the lower right quadrant. A network of thin, light blue lines forms a complex, web-like pattern on the right side of the image. The text "Questions?" is centered in the middle of the image.

Questions?