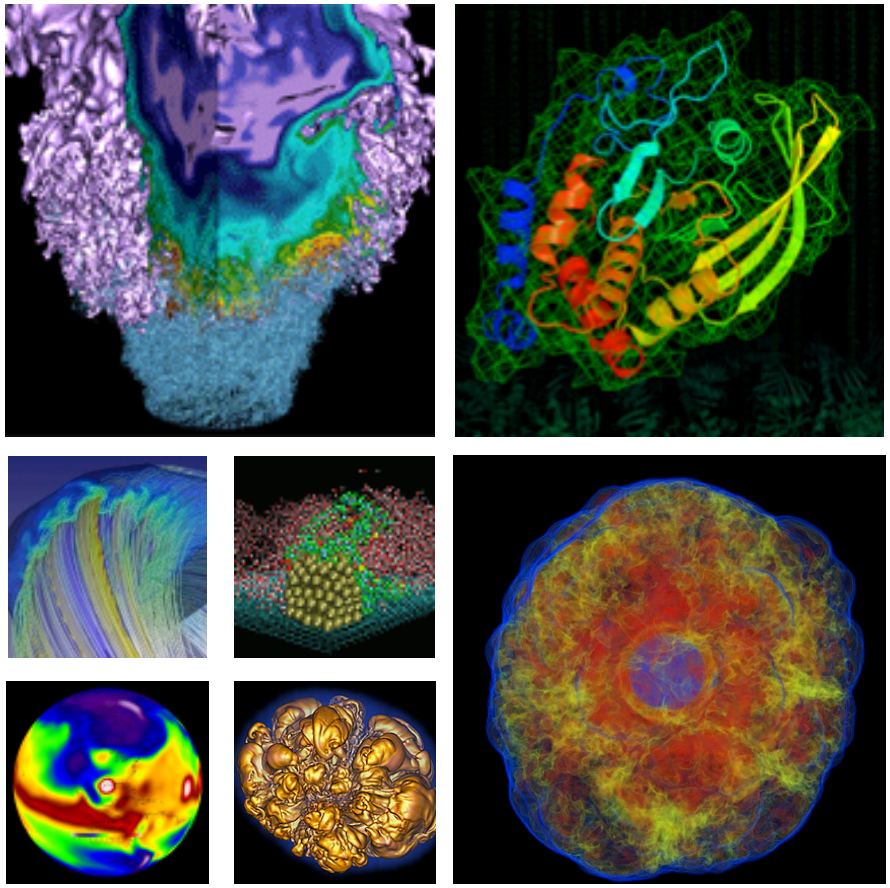
How To Share Data With Your Collaborators



Shreyas Cholia

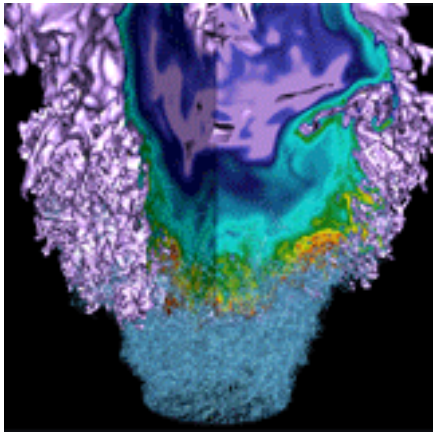
Data and Analytics Services, NERSC

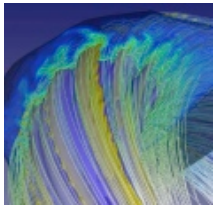
Joint Facilities User Forum on Data-Intensive Computing, Oakland, June 18, 2014

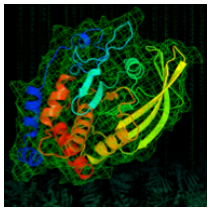
Overview

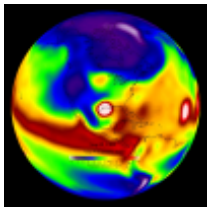
- Introduction
- Data Sharing over HTTP
- APIs
- High Performance Data Access
- Data Management Systems
- We'll try to do a few live demos along the way

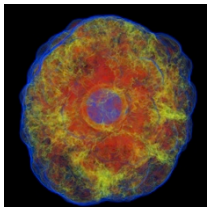
Introduction

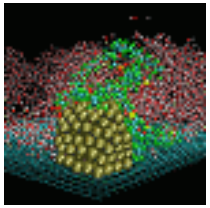












Data Islands

- Data is still heavily siloed and inaccessible.
- Data sits on a machine somewhere, and you give people local accounts to access it.
- Good luck combining multiple datasets
- Does not scale!

- This is 2014 – we can do better!

OSTP Requirements

- **OSTP requirements around data management**
  - All proposals submitted to the Office of Science for research funding are required to include a Data Management Plan (DMP).
  - **DMPs must provide a plan for making all research data displayed in publications resulting from the proposed research digitally accessible at the time of publication.**
  - researchers that plan to work at an Office of Science User Facility as part of the proposed research should consult the published data policy of that facility.

Data Sharing = Better Science

J.M. Wicherts, M. Bakker, and D. Molenaar:

Willingness to Share Research Data Is Related to the Strength of the Evidence and the Quality of Reporting of Statistical Results

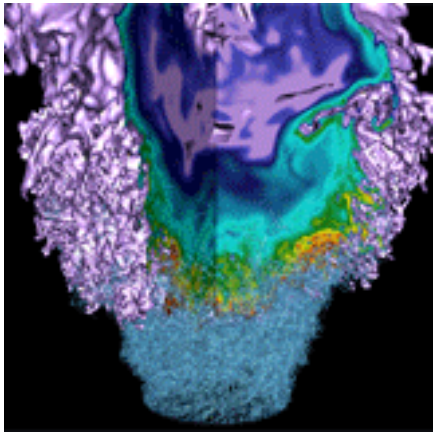
***PLoS ONE*, 6(11): e26828, 2011, doi:10.1371/journal.pone.0026828.**

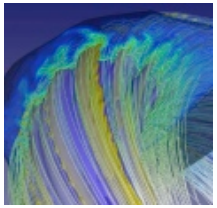
Content for this slide courtesy Greg Wilson, Software Carpentry

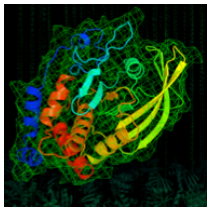
Data Sharing

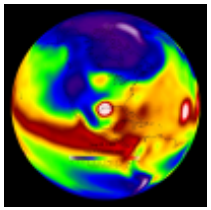
- Common access to data enables collaboration
- Opens up the possibility of cross comparisons, combining multiple datasets from different sources
- Enables new science use cases

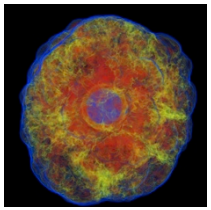
Data Sharing over HTTP

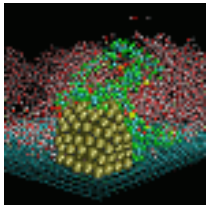








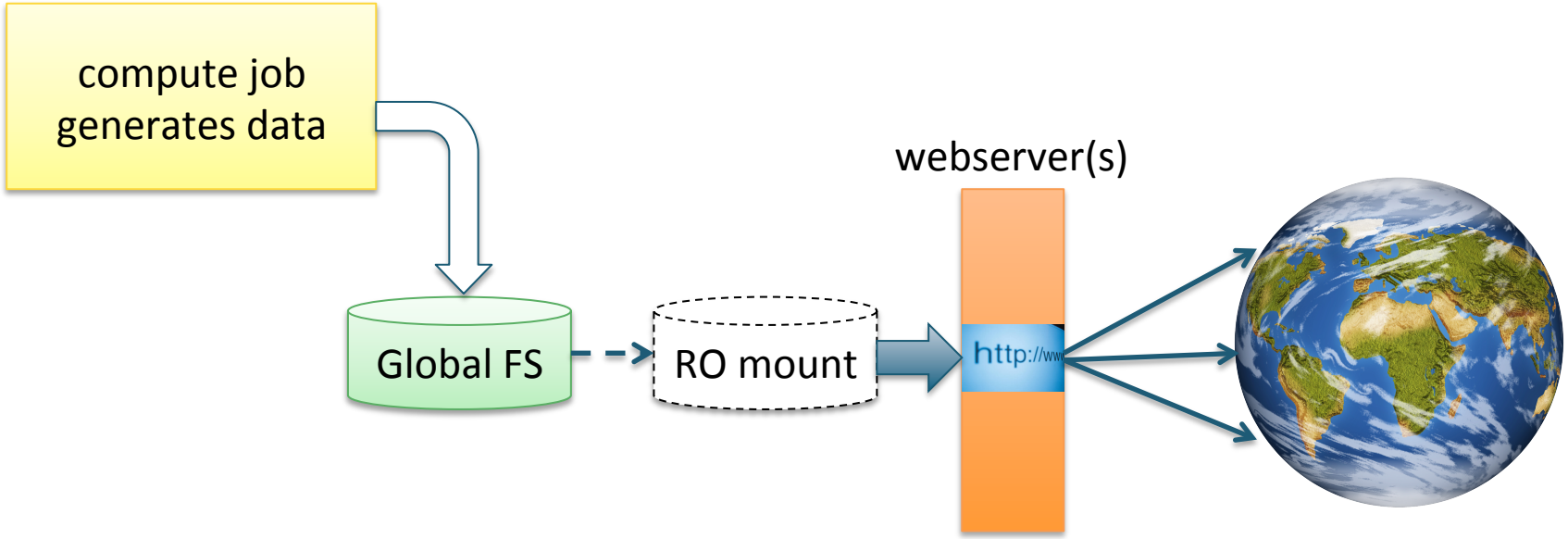




Sharing Data Over The Web

- **Provide projects with a landing spot for data within the center boundary**
  - High performance access to filesystems, backend resources etc.
- **Serve up landing spot via web server**
  - Minimally provides a very simple publication sharing system

Data Sharing Over The Web

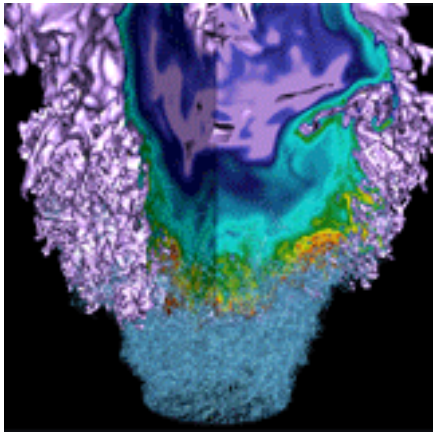


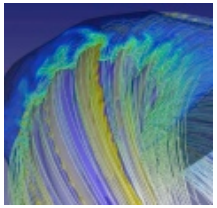
- **Store data on persistent global filesystem**
- **Designate an area for export**
- **Mount export area RO on a web node using a shared FS**
- **Run a webserver on web node to share with world**
- **Add AuthNZ to web server configuration**
- **Demo time!**

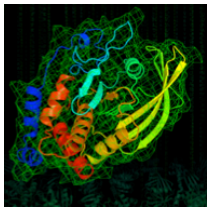
Authorization

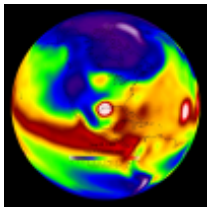
- **Authorization: Access privileges for a given identity**
  - What is the user allowed to do?
- **Data portals see some combination of the following sharing modes:**
  - Public – data are publicly viewable to all users
  - Protected – data are only visible to members within a designated group or collaboration
  - Private – data are private to the individual user

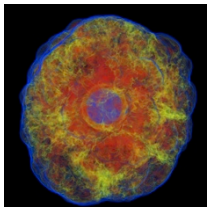
APIs

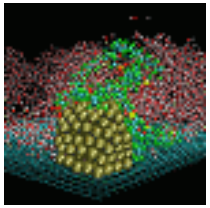












APIs Drive Programmatic Access to Data

- **Make your data available as a Web API to enable more fine-grained queries**
- **Use HTTP Method + URLS + parameters to query and access data**
- **Users just download what they need, server does heavy lifting in terms of search and sub-selection**
  - eg. Google maps - you don't download the map just the tiles you are interested in.
- **Enable rich interactions and applications around your data**
- **eg. OpenDAP connects NETCDF/HDF5 datasets with web clients**
  - Demo: http://portal.nersc.gov/pydap

Data Browsers

- HTML5/JavaScript + Server Side APIs to build data browsers and viewers
- Make callouts to REST API for all server-side information
- eg. https://openmsi.nersc.gov

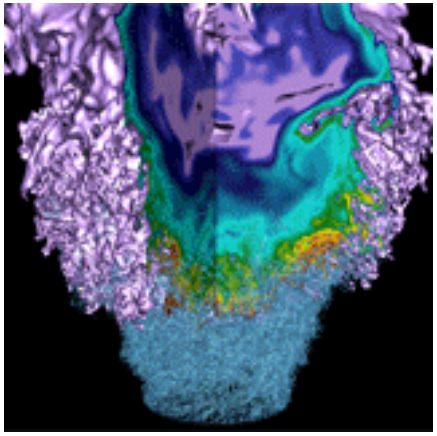
Getting started – Hello World API

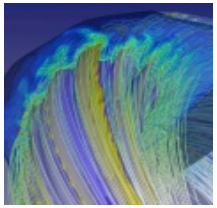
```
> pip install flask
```

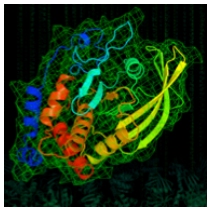
flask_demo.py

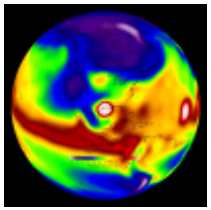
```python
from flask import Flask
from flask import jsonify
app = Flask(__name__)

# http://localhost:5000/object_id - returns object
@app.route('/<object_id>')
def get_data(object_id):
    obj = get_object_from_db(object_id)
    return jsonify(obj)

# http://localhost:5000/ - returns all objects
@app.route('/')
def get_all_data():
    obj_list = get_data_from_db()
    return jsonify(obj_list)

if __name__ == "__main__":
    app.run()
```

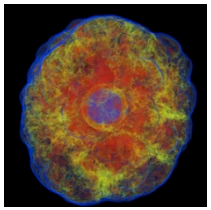
High Performance Data Sharing

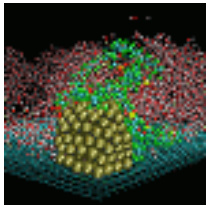










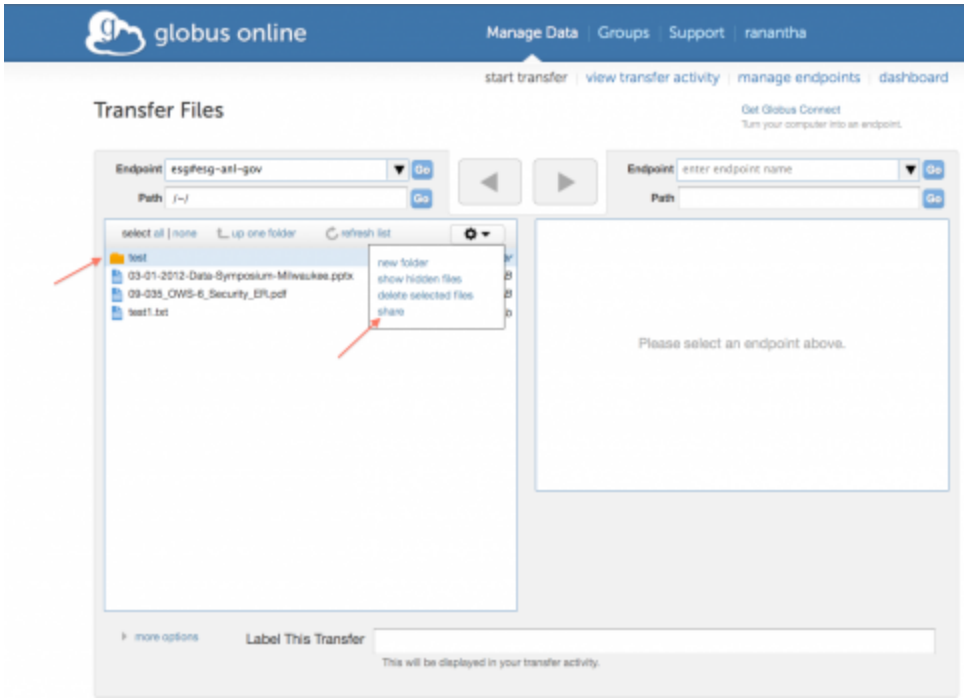


High Performance Data Sharing

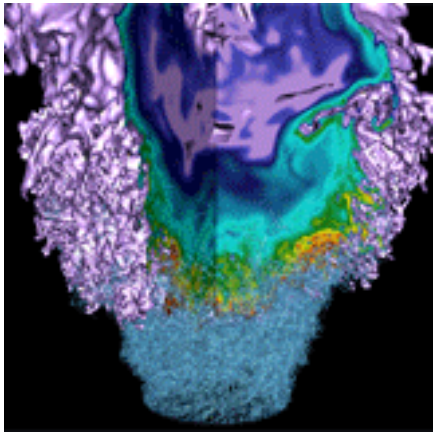
- **Globus**
- **webdav + xrootd**
- **Aspera (Commercial Tool)**

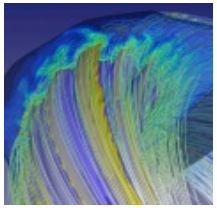
Globus Sharing

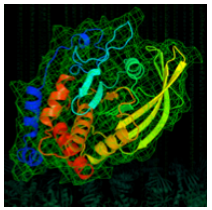
- **Enable high performance GridFTP access to your data**
- **Share with designated groups or individuals**
- **https://www.globus.org/data-sharing**

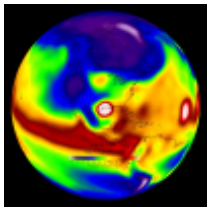


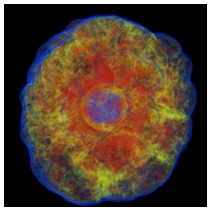
Data Management Portals

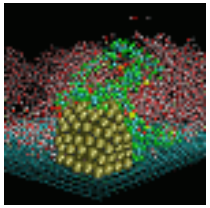








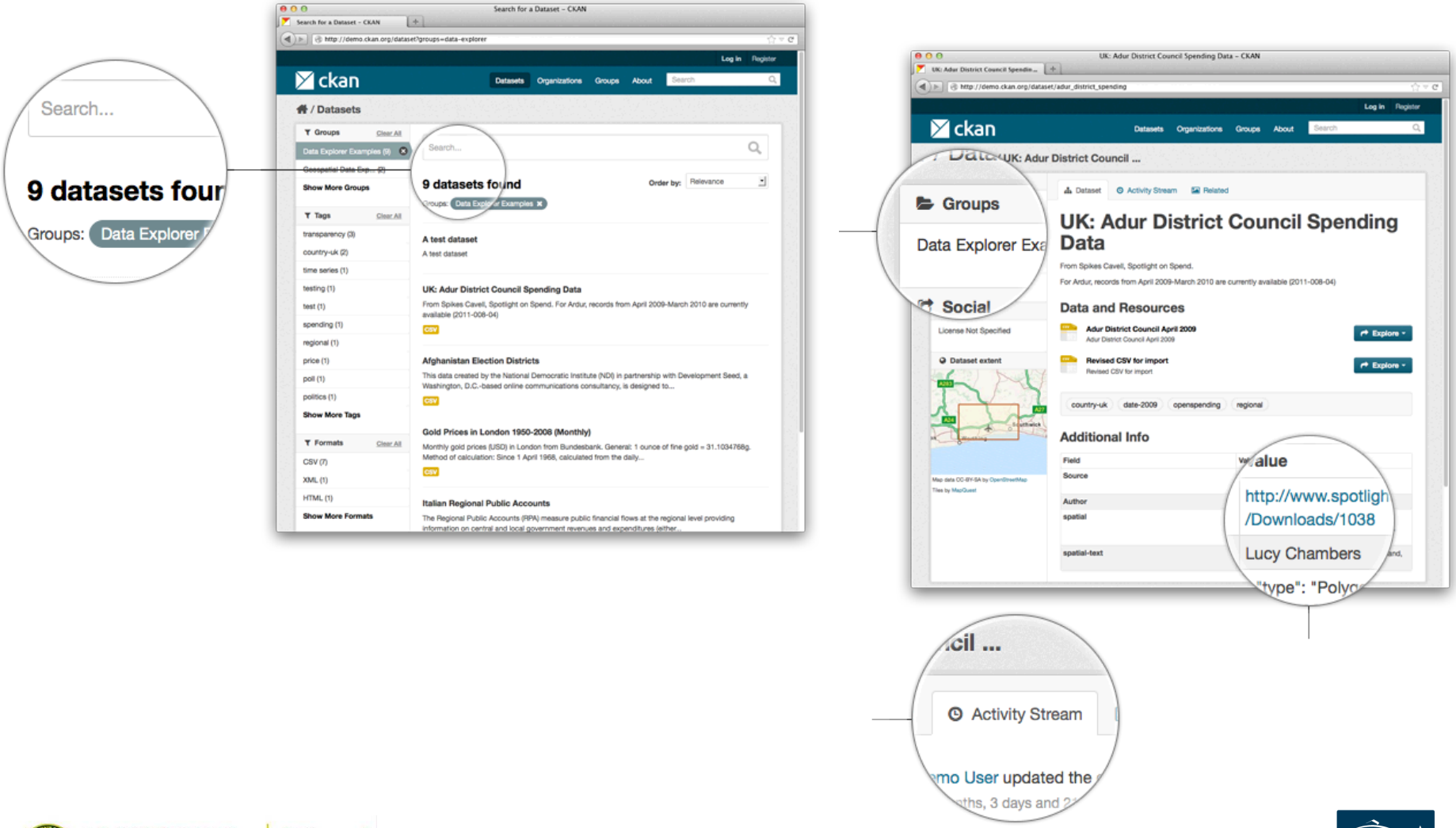




Data Management Systems (DMS)

- **Data Management System (like a CMS but with a focus on Data)**
- **CKAN – open source tool for data publishing & management used by data.gov.uk and publicdata.eu**
  - Publish and Manage Data
  - Search and Discovery
  - Metadata
  - Geospatial and Visualization Features
  - Community
  - Link to Filesets or store within portal
  - Data Provenance
  - Extensibility and APIs
  - Federation

CKAN


Search...
9 datasets four
Groups: Data Explorer
Search for a Dataset - CKAN
http://demo.ckan.org/dataset?groups=data-explorer
ckan
Datasets
Organizations
Groups
About
/ Datasets
Groups
Data Explorer Examples (9)
Show More Groups
Tags
transparency (3)
country-uk (2)
time series (1)
testing (1)
test (1)
spending (1)
regional (1)
price (1)
poll (1)
politics (1)
Show More Tags
Formats
CSV (7)
XML (1)
HTML (1)
Show More Formats
9 datasets found
Order by: Relevance
A test dataset
A test dataset
UK: Adur District Council Spending Data
From Spikes Cavell, Spotlight on Spend. For Ardur, records from April 2009-March 2010 are currently available (2011-008-04)
Afghanistan Election Districts
This data created by the National Democratic Institute (NDI) in partnership with Development Seed, a Washington, D.C.-based online communications consultancy, is designed to...
Gold Prices in London 1950-2008 (Monthly)
Monthly gold prices (USD) in London from Bundesbank. General: 1 ounce of fine gold = 31.1034768g. Method of calculation: Since 1 April 1968, calculated from the daily...
Italian Regional Public Accounts
The Regional Public Accounts (RPA) measure public financial flows at the regional level providing information on central and local government revenues and expenditures (either...
UK: Adur District Council Spending Data - CKAN
http://demo.ckan.org/dataset/adur_district_spending
Groups
Data Explorer Ex
Social
Dataset
Activity Stream
Related
UK: Adur District Council Spending Data
From Spikes Cavell, Spotlight on Spend.
For Ardur, records from April 2009-March 2010 are currently available (2011-008-04)
Data and Resources
Adur District Council April 2009
Revised CSV for import
Explore
License Not Specified
Dataset extent
country-uk
date-2009
openspending
regional
Additional Info
Field
Value
Source
http://www.spotligh
/Downloads/1038
Author
Lucy Chambers
spatial
spatial-text
Activity Stream
mo User updated the

CKAN demo

- http://ckan.org

Federated Data

- In some cases data may be distributed across multiple locations
- There are federated portals like ESGF which enable searching across data from multiple locations
- Metadata is federated but data is ultimately downloaded from source portal

ESGF – Federated Search

Current Selections

- (x) query:cmor

Search Categories

- Project
- Institute
- Model
- SubModel
- Instrument
- Experiment Family
- Experiment
- SubExperiment
- Time Frequency
- Product
- Realm
- Variable
- Variable Long Name

cmor | Search

Examples: *temperature*, *"surface temperature"*, *climate AND project:CMIP5 AND variable:hus*.
To download data: add datasets to your Data Cart, then click on *Expand* or *wget*.

Temporal Search
Clear search constraints and datacart
Search Help
Search Controlled Vocabulary

☑ **Search All Sites** ☐ **Show All Replicas** ☐ **Show All Versions**

< 1 2 3 … 6518 6519 > displaying 1 to 10 of 65186 search results

Display 10 datasets per page

Add All Displayed to Datacart Remove All Displayed from Datacart

Results | Data Cart

project=CMIP5,model=EC-EARTH consortium,experiment=10- or 30-year run initialized in year 1960,time_frequency=day,modeling realm=sealce,ensemble=r10i3p1,version=20140318
Data Node: esg-dn1.nsc.liu.se
Version: 20140318
Description: EC-EARTH model output prepared for CMIP5 10- or 30-year run initialized in year 1960
Further options: Add To Cart Visualize and Analyze Model Documentation

project=CMIP5,model=EC-EARTH consortium,experiment=10- or 30-year run initialized in year 1960,time_frequency=day,modeling realm=sealce,ensemble=r1i3p1,version=20140318
Data Node: esg-dn1.nsc.liu.se
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The End

- **Contact:**
  - Shreyas Cholia: scholia@lbl.gov
- **Questions? Comments?**