Building the Modern Research Data Portal

Developer Tutorial

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www.globusworld.org/workshop2016

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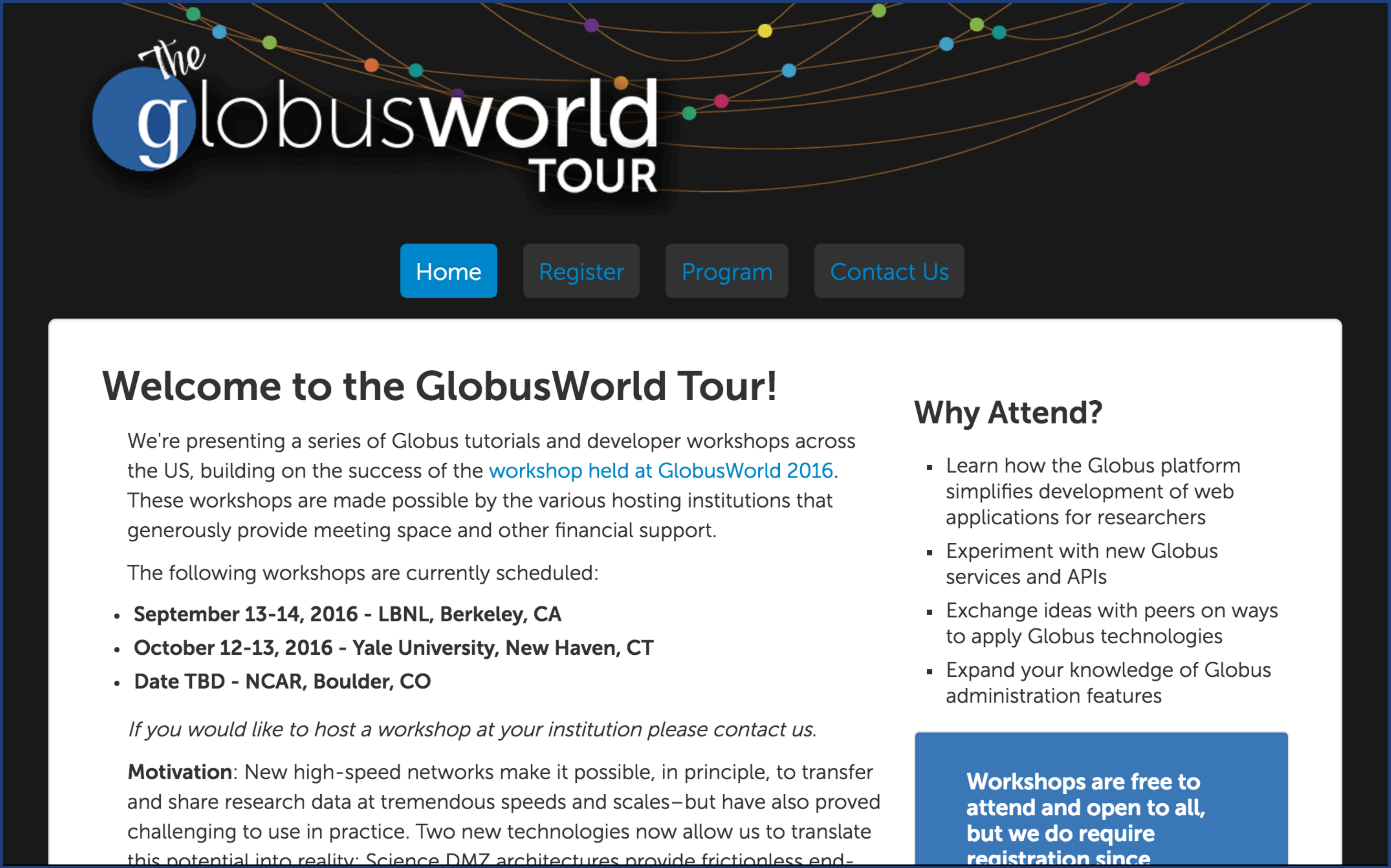
GlobusWorld Developer Workshops



Welcome to the GlobusWorld Tour!

We're presenting a series of Globus tutorials and developer workshops across the US, building on the success of the workshop held at GlobusWorld 2016. These workshops are made possible by the various hosting institutions that generously provide meeting space and other financial support.

The following workshops are currently scheduled:

- **September 13-14, 2016 - LBNL, Berkeley, CA**
- **October 12-13, 2016 - Yale University, New Haven, CT**
- **Date TBD - NCAR, Boulder, CO**

If you would like to host a workshop at your institution please contact us.

Motivation: New high-speed networks make it possible, in principle, to transfer and share research data at tremendous speeds and scales–but have also proved challenging to use in practice. Two new technologies now allow us to translate this potential into reality: Science DMZ architectures provide frictionless end-

Why Attend?

- Learn how the Globus platform simplifies development of web applications for researchers
- Experiment with new Globus services and APIs
- Exchange ideas with peers on ways to apply Globus technologies
- Expand your knowledge of Globus administration features

Workshops are free to attend and open to all, but we do require registration since

https://www.globusworld.org/tour/

Building the Modern Research Data Portal

Introduction

globus

Cloud has transformed how software and platforms are delivered

Software as a service: **SaaS**

(web & mobile apps)

Tripit from Concur

NETFLIX

salesforce

Platform as a service: **PaaS**

amazon web services

Microsoft Azure

force.com cloud platform

Infrastructure as a service: **IaaS**

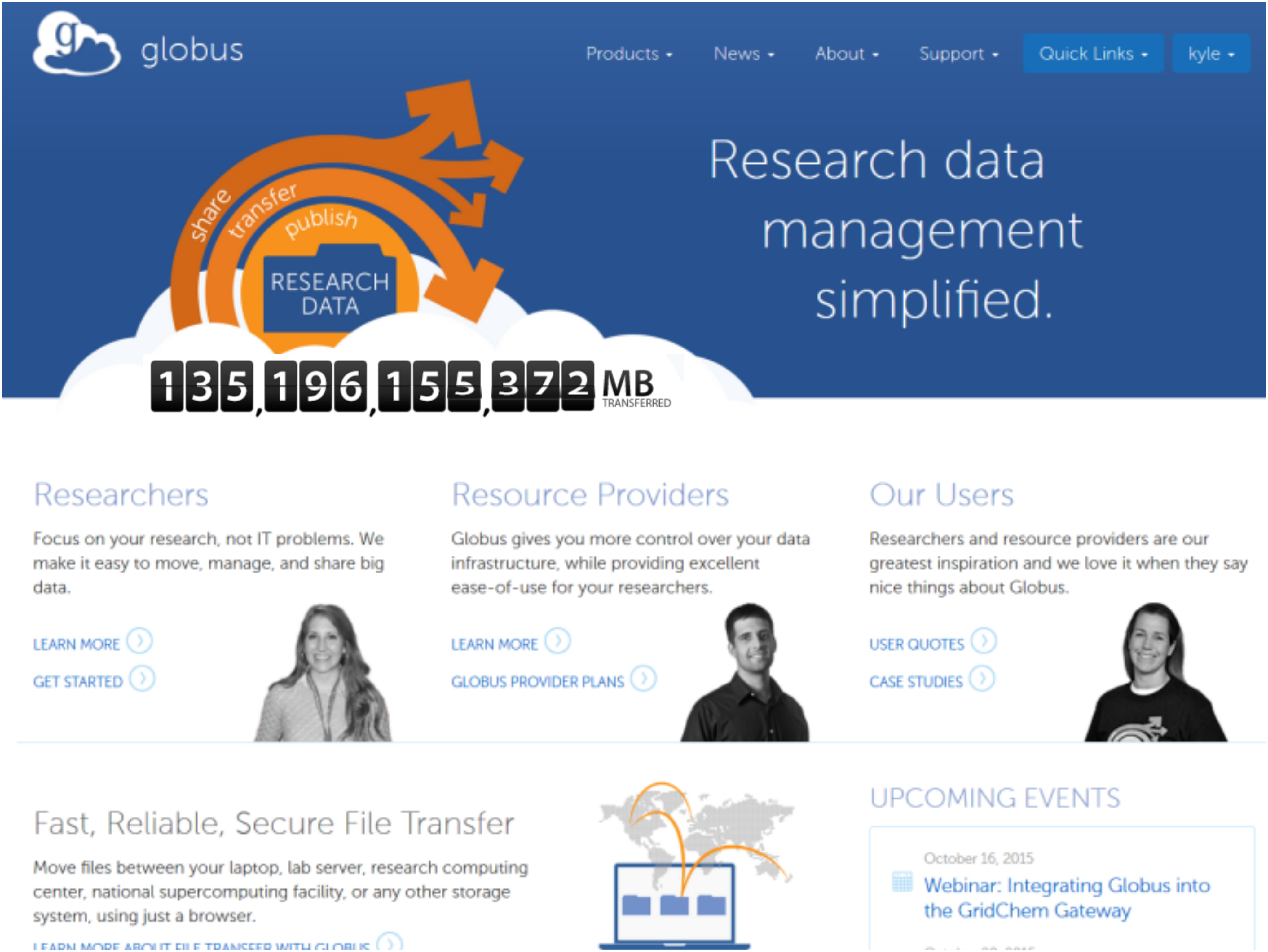
amazon web services™ EC2

amazon web services™ S3

Microsoft Azure

Google Compute Engine

PaaS enables more rapid, cheap, and scalable delivery of powerful (SaaS) apps



Research data management simplified.

135,196,155,372 MB TRANSFERRED

Researchers

Focus on your research, not IT problems. We make it easy to move, manage, and share big data.

Resource Providers

Globus gives you more control over your data infrastructure, while providing excellent ease-of-use for your researchers.

Our Users

Researchers and resource providers are our greatest inspiration and we love it when they say nice things about Globus.

Fast, Reliable, Secure File Transfer

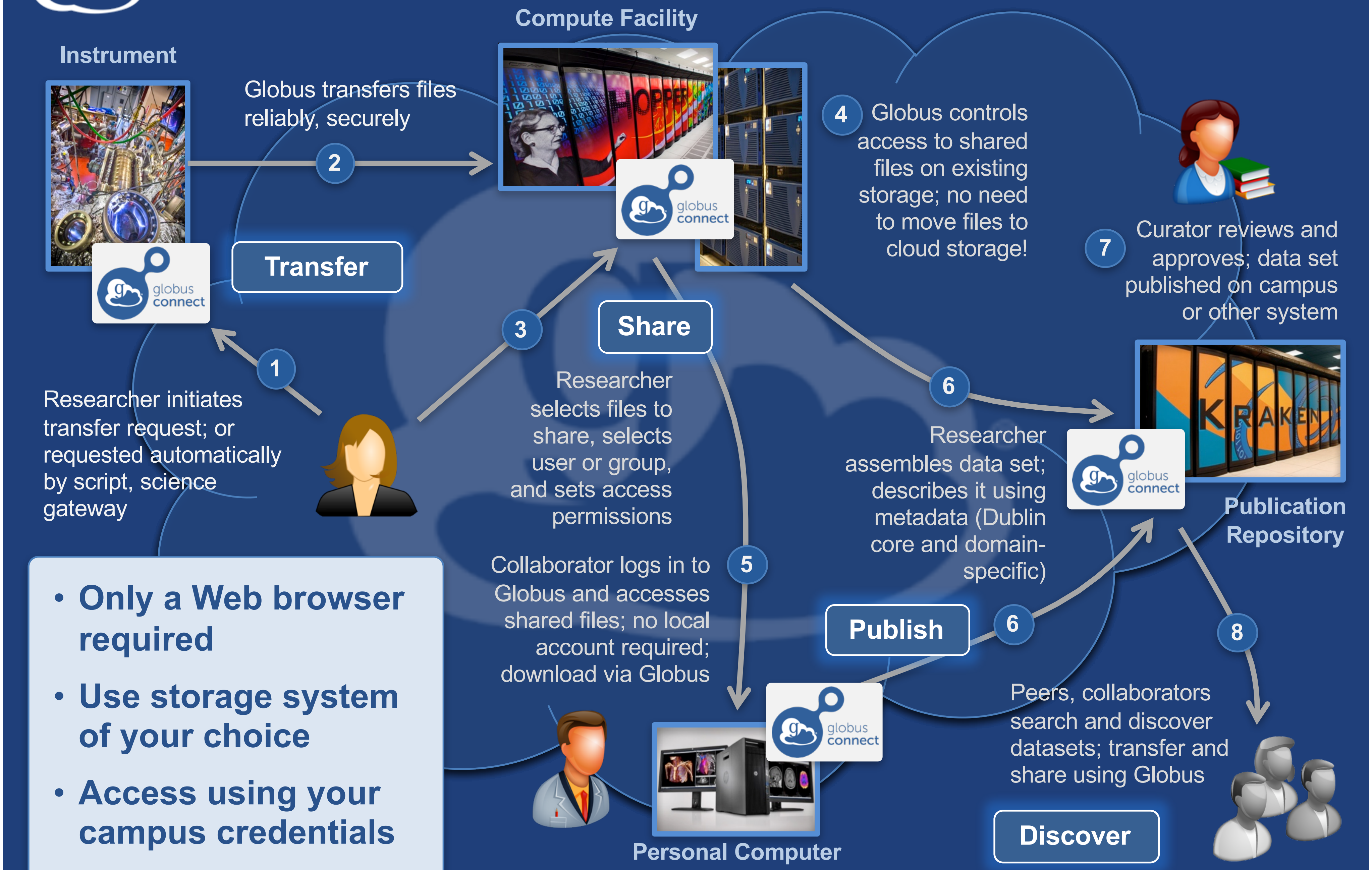
Move files between your laptop, lab server, research computing center, national supercomputing facility, or any other storage system, using just a browser.

UPCOMING EVENTS

October 16, 2015

Webinar: Integrating Globus into the GridChem Gateway

Globus SaaS: Research data lifecycle



1 Researcher initiates transfer request; or requested automatically by script, science gateway

2 Globus transfers files reliably, securely

3 Researcher selects files to share, selects user or group, and sets access permissions

4 Globus controls access to shared files on existing storage; no need to move files to cloud storage!

5 Collaborator logs in to Globus and accesses shared files; no local account required; download via Globus

6 Researcher assembles data set; describes it using metadata (Dublin core and domain-specific)

7 Curator reviews and approves; data set published on campus or other system

8 Peers, collaborators search and discover datasets; transfer and share using Globus

- **Only a Web browser required**
- **Use storage system of your choice**
- **Access using your campus credentials**

Demo (from end-user perspective)

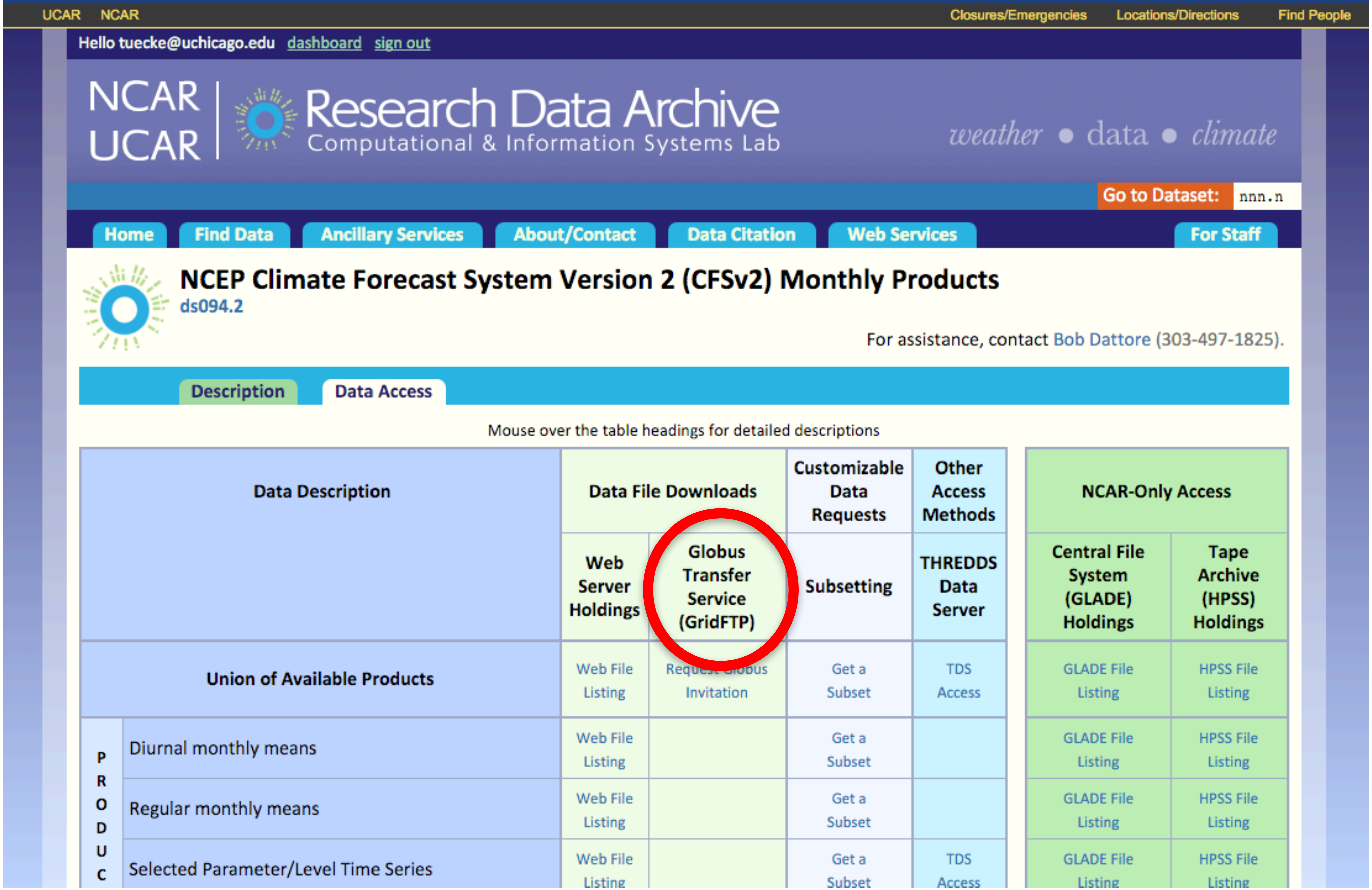
- Logging into Globus with any identity
- Endpoint search
- Transfer
- HTTPS access
- Sharing with any identity
- Management Console

Platform Questions

- How do you leverage Globus services in your own applications?
- How do you extend Globus with your own services?

- How do we empower the research community to create an integrated ecosystem of services and applications?

Research data portal



UCAR NCAR Closures/Emergencies Locations/Directions Find People

Hello tuecke@uchicago.edu dashboard sign out

NCAR
UCAR
Research Data Archive
Computational & Information Systems Lab

weather ● data ● climate

Go to Dataset: nnn.n

Home | Find Data | Ancillary Services | About/Contact | Data Citation | Web Services | For Staff

NCEP Climate Forecast System Version 2 (CFSv2) Monthly Products

ds094.2

For assistance, contact Bob Dattore (303-497-1825).

Description | Data Access

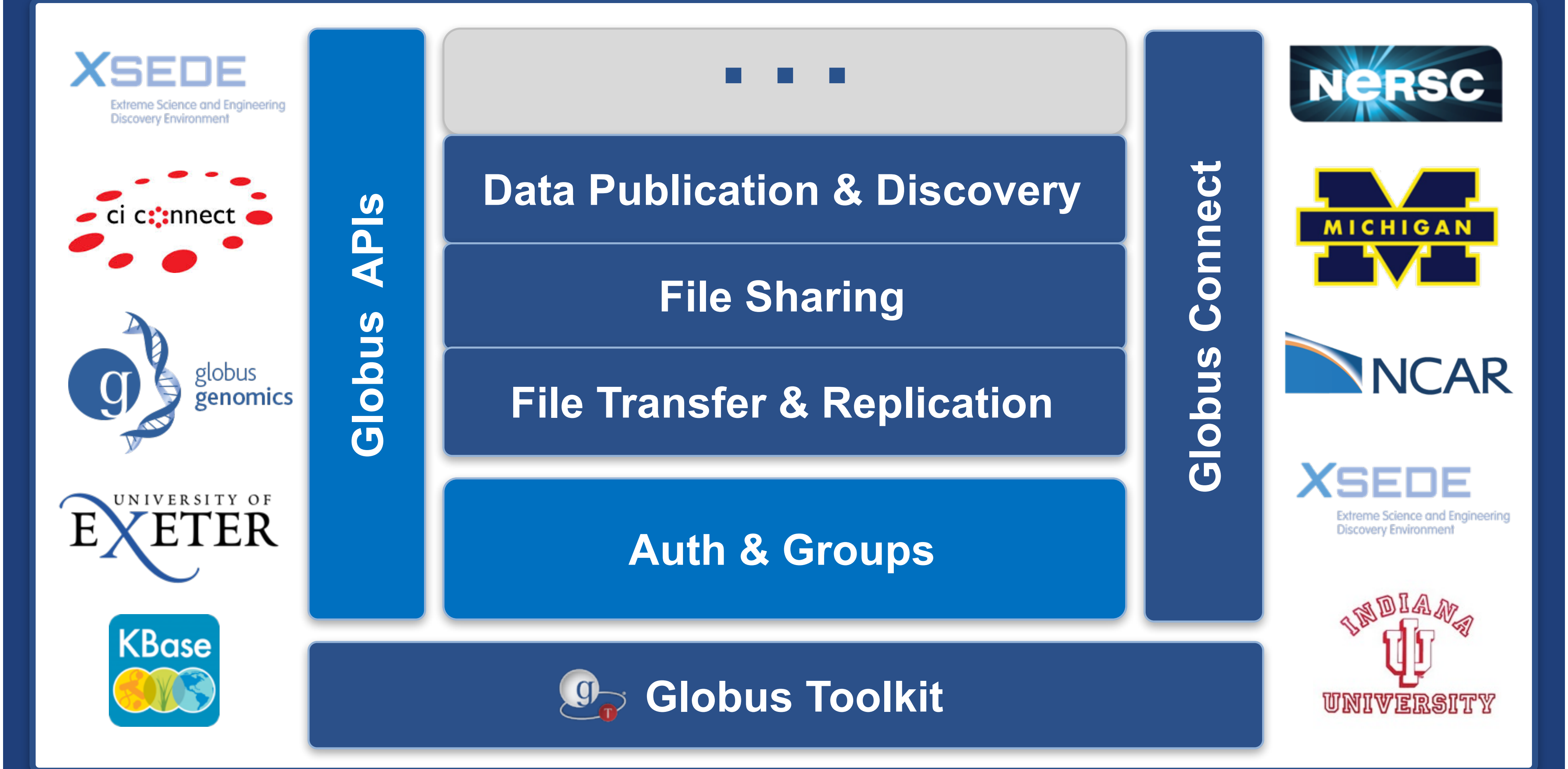
Mouse over the table headings for detailed descriptions

	Data Description	Data File Downloads		Customizable Data Requests	Other Access Methods	NCAR-Only Access	
		Web Server Holdings	Globus Transfer Service (GridFTP)	Subsetting	THREDDS Data Server	Central File System (GLADE) Holdings	Tape Archive (HPSS) Holdings
	Union of Available Products	Web File Listing	Request Globus Invitation	Get a Subset	TDS Access	GLADE File Listing	HPSS File Listing
P R O D U C	Diurnal monthly means	Web File Listing		Get a Subset		GLADE File Listing	HPSS File Listing
	Regular monthly means	Web File Listing		Get a Subset		GLADE File Listing	HPSS File Listing
	Selected Parameter/Level Time Series	Web File Listing		Get a Subset	TDS Access	GLADE File Listing	HPSS File Listing

Demo

Sample
Research Data Portal

Globus PaaS



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Data Publication & Discovery

File Sharing

File Transfer & Replication

Auth & Groups

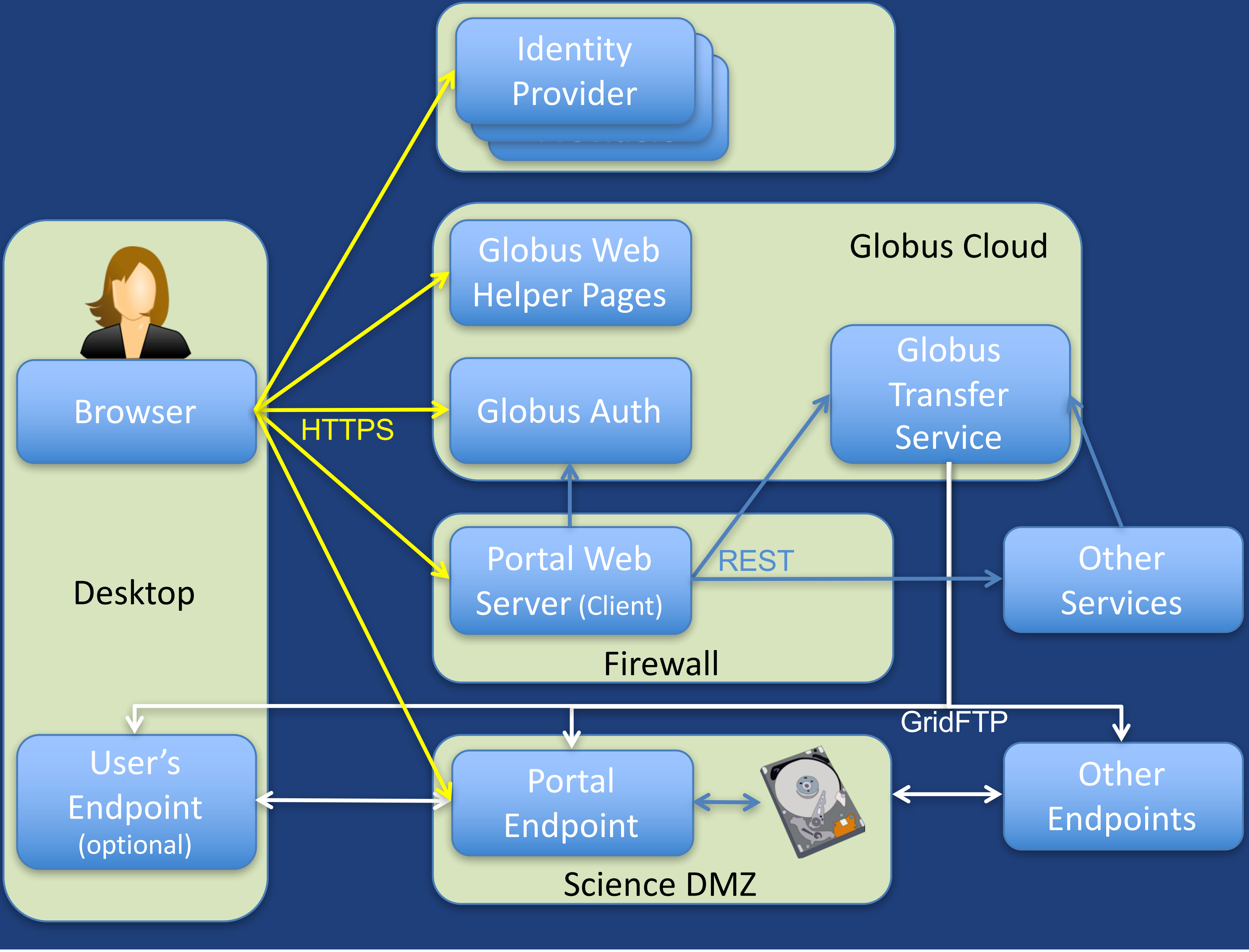
Globus APIs

Globus Connect

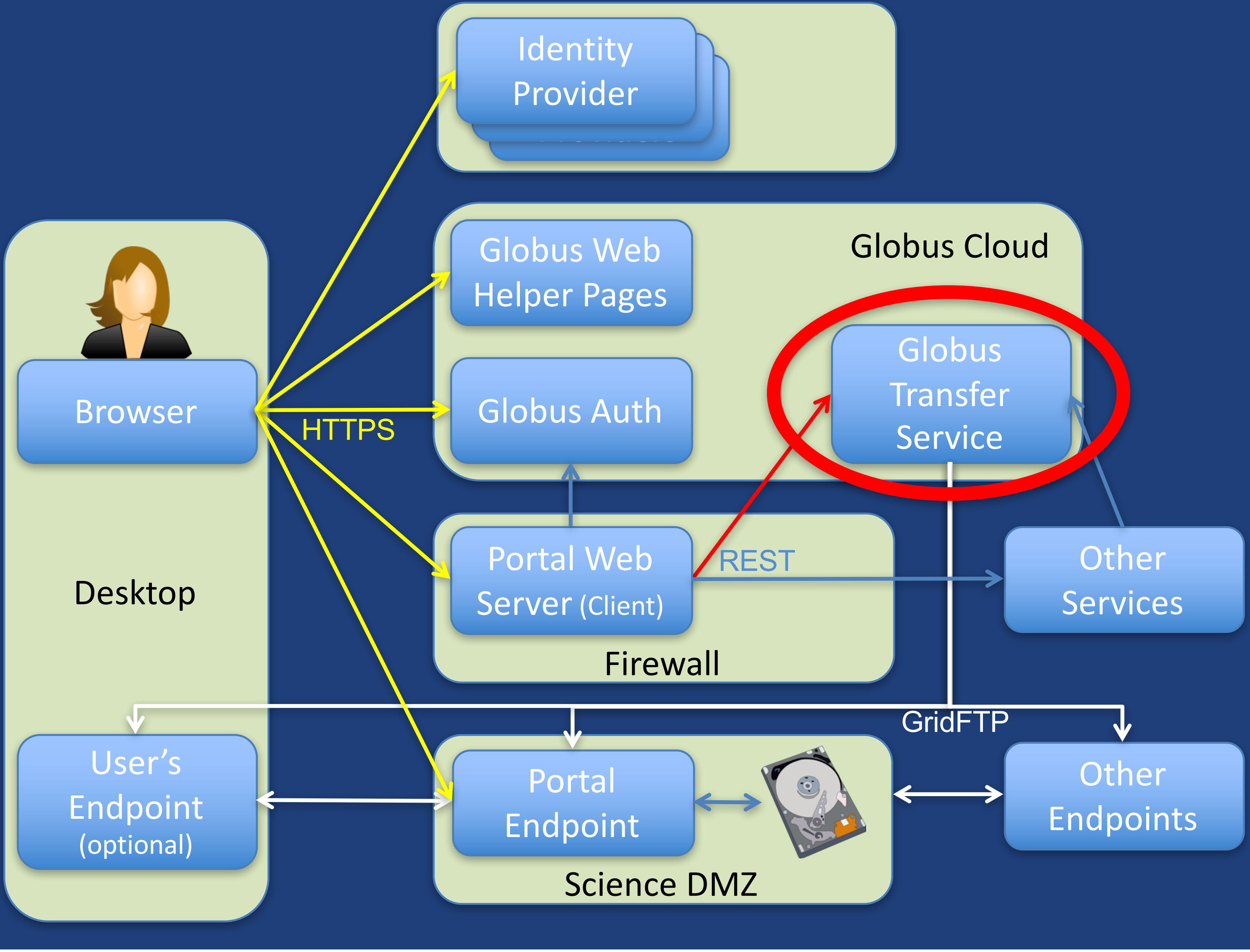
Globus Toolkit

XSEDE
Extreme Science and Engineering Discovery Environment
ci connect
globus genomics
UNIVERSITY OF EXETER
KBase
NERSC
MICHIGAN
NCAR
XSEDE
Extreme Science and Engineering Discovery Environment
INDIANA UNIVERSITY

Prototypical research data portal



Prototypical research data portal



Introduction to REST APIs

- **Remote operations on resources via HTTPS**
  - POST ~= Create (or other operations)
  - GET ~= Read
  - PUT ~= Update
  - DELETE ~= Delete
- **Globus APIs use JSON for documents and resource representations**
- **Resource named by URL**
  - Query params allow refinement (e.g., subset of fields)
- **Requests authorized via OAuth2 access token**
  - Authorization: Bearer asdflkqhafsdafeawk

Globus Transfer API

- **Nearly all Globus Web App functionality implemented via public Transfer API**

https://docs.globus.org/api/transfer/

- **Overview…**
- **Fairly stable, but small changes coming**
  – Deprecation policy

Globus Python SDK

- **Python client library for the Globus Auth and Transfer REST APIs**

http://globus.github.io/globus-sdk-python/

- **Overview…**
- **Public beta, likely to change some**

TransferClient class

- **globus_sdk.TransferClient class**

```
from globus_sdk import TransferClient
tc = TransferClient()
```

- **Handles connection management, security, framing, marshaling**

TransferClient low-level calls

- **Thin wrapper around REST API**
  - post(), get(), update(), delete()

get(path, params=None, headers=None, auth=None, response_class=None)

- path – path for the request, with or without leading slash
- params – dict to be encoded as a query string
- headers – dict of HTTP headers to add to the request
- response_class – class for response object, overrides the client's default_response_class
- Returns: GlobusHTTPResponse object

TransferClient higher-level calls

- **One method for each API resource and HTTP verb**
- **Largely direct mapping to REST API**

```
endpoint_search(filter_fulltext=None,
                filter_scope=None,
                num_results=25,
                **params)
```

Python SDK Jupyter notebook

- **Jupyter (iPython) notebook demonstrating use of Python SDK**

https://github.com/globus/globus-jupyter-notebooks

- **Overview…**
- **Open source, enjoy**

Endpoint Search

- **Plain text search for endpoint**
  - Searches owner, display name, keywords, description, organization, department
  - Full word and prefix match
- **Limit search to pre-defined scopes**
  - all, my-endpoints, recently-used, in-use, shared-by-me, shared-with-me
- **Returns: List of endpoint documents**

Endpoint Management

- **Get endpoint (by id)**
- **Update endpoint**

- **Create & delete (shared) endpoints**
- **Manage endpoint servers**

Endpoint Activation

- **Activating endpoint means binding a credential to an endpoint for login**
- **Globus Connect Server endpoint that have Myproxy or MyProxy OAuth identity provider require login via web**
- **Auto-activate**
  - Globus Connect Personal and shared endpoints use Globus-provided credential
  - An endpoint that shares an identity provider with another activated endpoint will use credential
- **Must auto-activate before any API calls to endpoints**

File operations

- **List directory contents (ls)**
- **Make directory (mkdir)**
- **Rename**

- **Path encoding & UTF gotchas**
- **Don't forget to auto-activate first**

Task submission

- **Asynchronous operations**
- **Get submission_id, followed by submit**
  - Once and only once submission
- **Transfer**
  - Sync level option
- **Delete**

Task management

- Get task by id
- Get task_list
- Update task by id (label, deadline)
- Cancel task by id
- Get event list for task
- Get task pause info

Bookmarks

- **Get list of bookmarks**
- **Create bookmark**
- **Get bookmark by id**
- **Update bookmark**
- **Delete bookmark by id**

- **Cannot perform other operations directly on bookmarks**
  - Requires client-side resolution

Shared endpoint access rules (ACLs)

- Get list of access rules
- Get access rule by id
- Create access rule
- Update access rule
- Delete access rule

- Access manager role

Management API

- **Allow endpoint administrators to monitor and manage all tasks with endpoint**
  - Task API is essentially the same as for users
  - Information limited to what they could see locally
- **Cancel tasks**
- **Pause rules**

Join the Globus developer community

- **Join developer-discuss@globus.org mailing lists**

  https://www.globus.org/mailing-lists

- **Python SDK is open source**
  - https://github.com/globus/globus-sdk-python
  - Submit issues, pull requests
  - Discussions on developer-discuss@globus.org
- **Jupyter notebook & sample data portal are also open source on github**

Building the Modern Research Data Portal

Exercises: Transfer API in Jupyter

globus®

Install Jupyter notebook

- **Either locally or on EC2 instance**

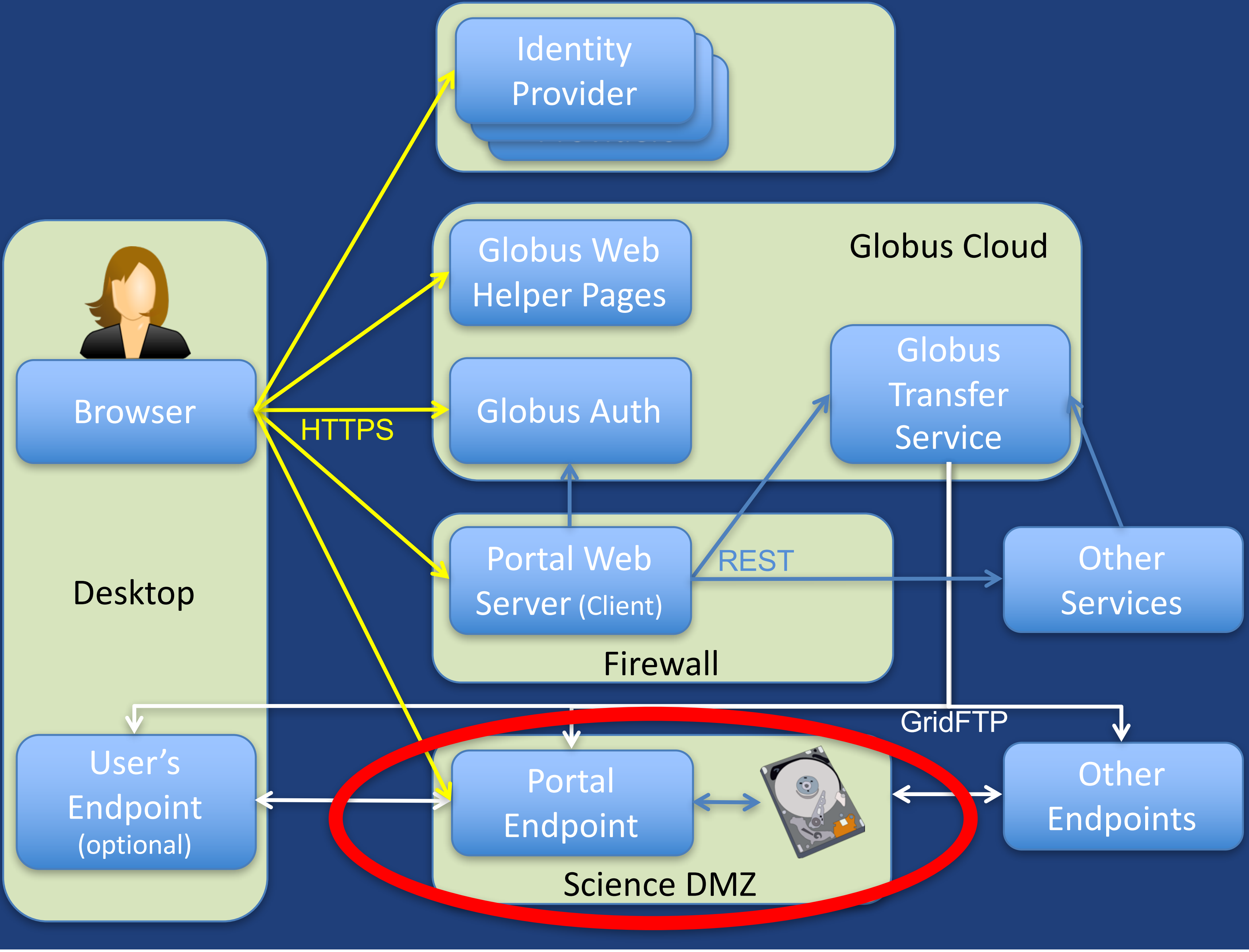
https://github.com/globus/globus-jupyter-notebooks.git

- **EC2 instance login:**
  - Username:
    Password:

Transfer API exercises
Modify Jupyter notebook to:

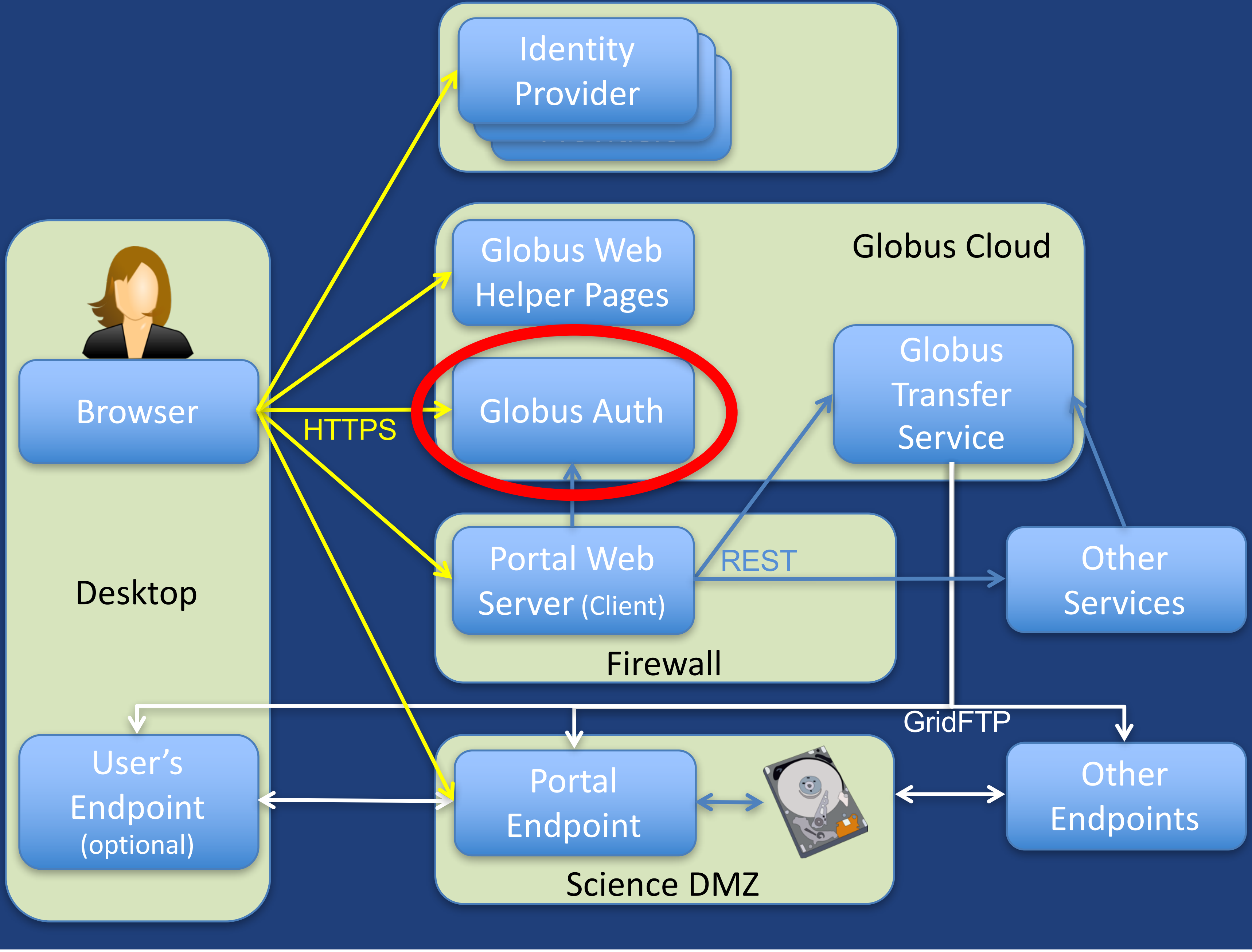
1. Find the endpoint id for XSEDE Comet
2. Set all the metadata fields on your shared endpoint
3. Modify mkdir so that an existing directory does not raise an exception, but all other errors do.
4. Set access manager role on your shared endpoint, and query both roles and ACLs to see the result.
5. Perform an ls given a bookmark name.
6. Perform a transfer akin to ‘rsync –av –delete’.
7. Transfer all files in a directory named *.txt to another endpoint.
8. Perform a transfer, monitor for completion, and monitor the event log. If a fault occurs, then cancel the job for some fault types (e.g., file not found), but not others (e.g., permission denied).
9. Anything else you want to try out...

Prototypical research data portal



ESnet Slides

Prototypical research data portal



Challenge

- **How to provide:**
  - Login to apps
    - Web, mobile, desktop, command line
  - Protect all REST API communications
    - App → Globus service
    - App → non-Globus service
    - Service → service
- **While:**
  - Not introducing even more identities
  - Providing least privileges security model
  - Being agnostic to programming language and framework
  - Being web friendly
  - Making it easy for users and developers

Globus Auth

- **Foundational identity and access management (IAM) platform service**
- **Simplify creation and integration of advanced apps and services**
- **Brokers authentication and authorization interactions between:**
  - end-users
  - identity providers: InCommon, XSEDE, Google, portals
  - services: resource servers with REST APIs
  - apps: web, mobile, desktop, command line clients
  - services acting as clients to other services

Based on widely used web standards

- **OAuth 2.0 Authorization Framework**
  - aka OAuth2
- **OpenID Connect Core 1.0**
  - aka OIDC

- **Allows use of standard OAuth2 and OIDC libraries**
  - E.g., Google OAuth Client Libraries (Java, Python, etc.), Apache mod_auth_openidc

Globus Auth

- **Identity and access management PaaS**

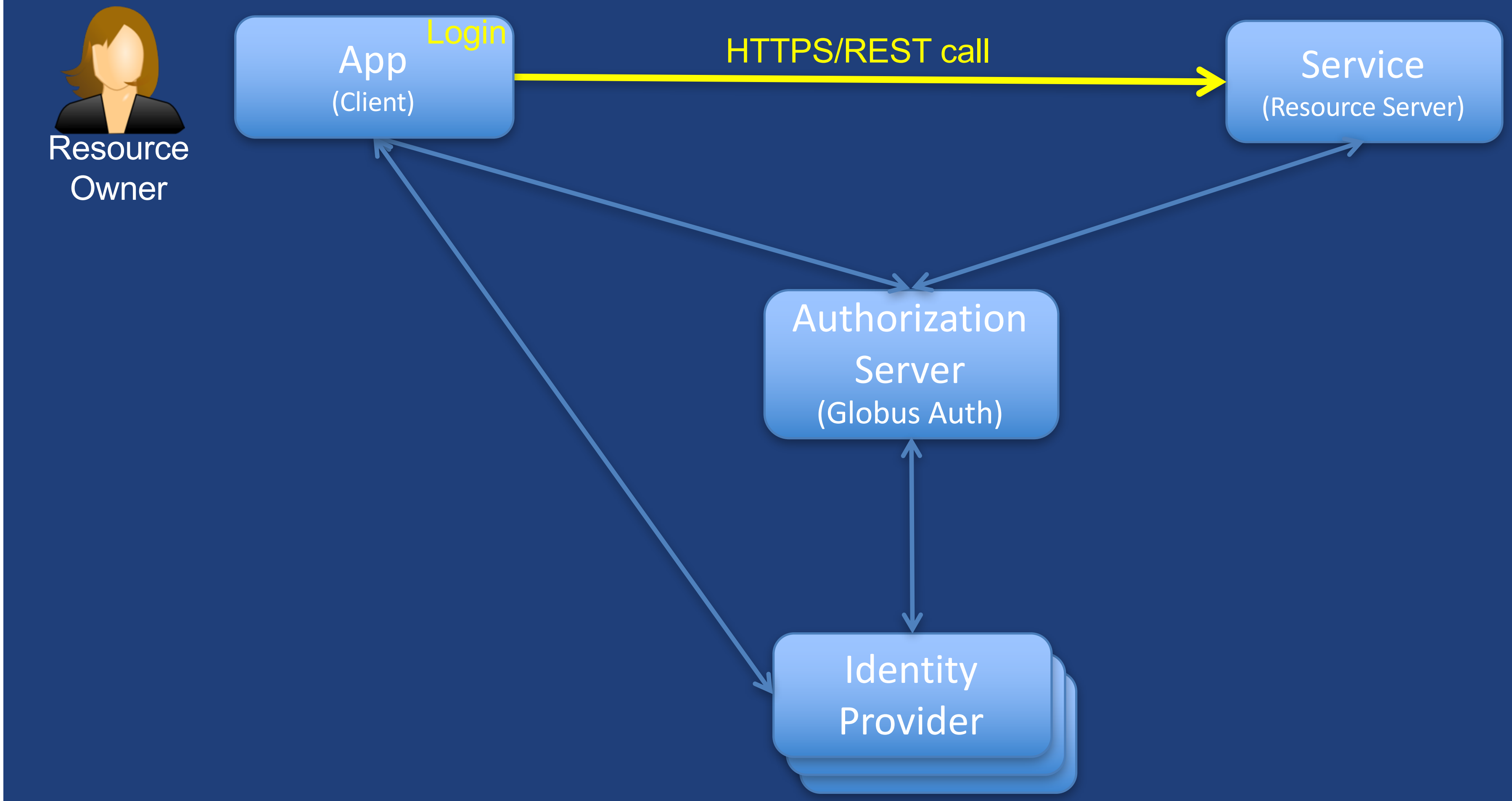
https://docs.globus.org/api/auth/

- **Introduction**
- **Reference**

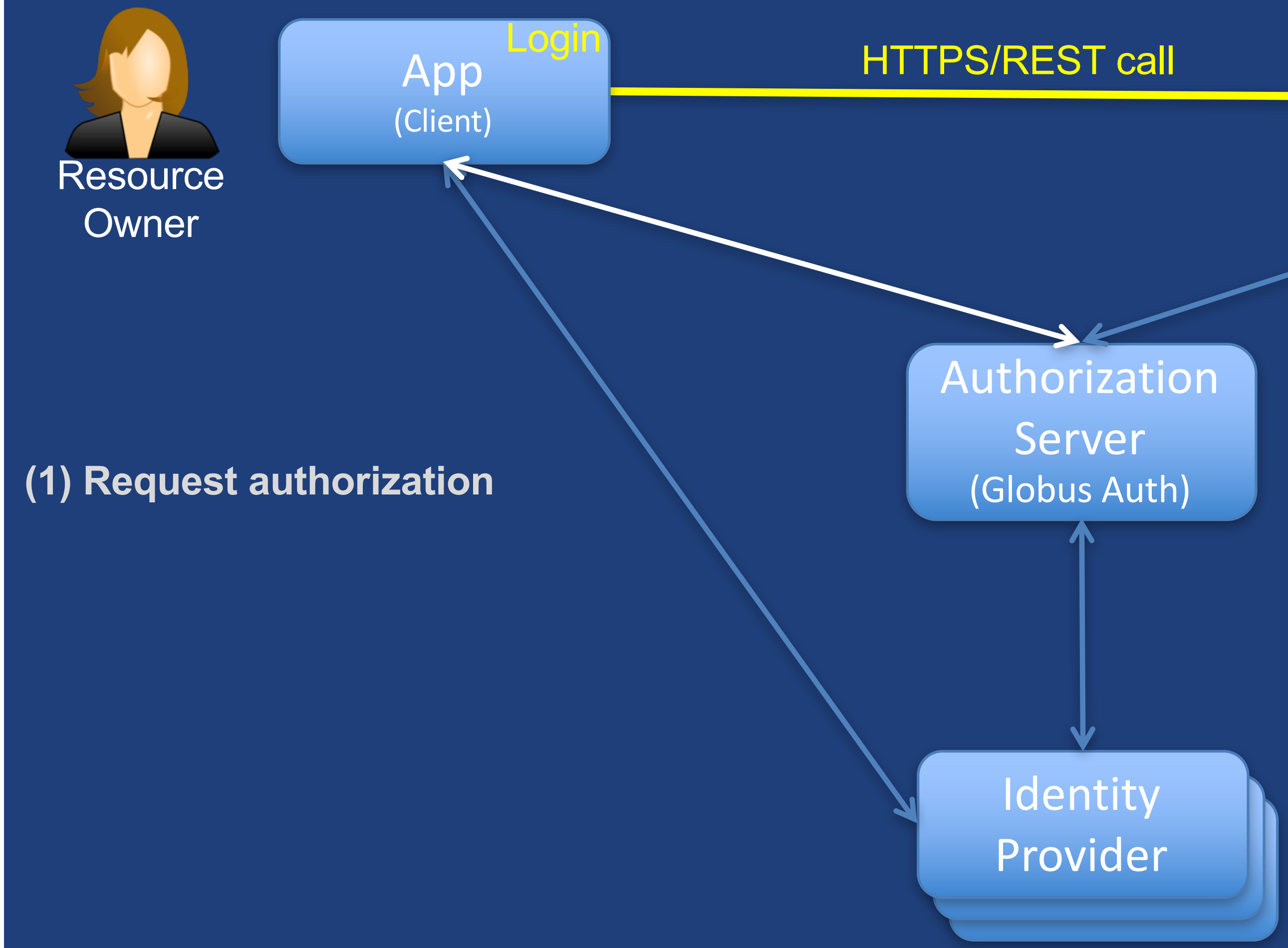
Globus account

- **A Globus account is a set of identities**
  - A *primary identity*
    - Identity can be primary of only one account
  - One or more *linked identities*
    - Identity can (currently) be linked to only one account
- **Account does not have own identifier**
  - An account is uniquely identified using its primary identity

Globus Auth interactions



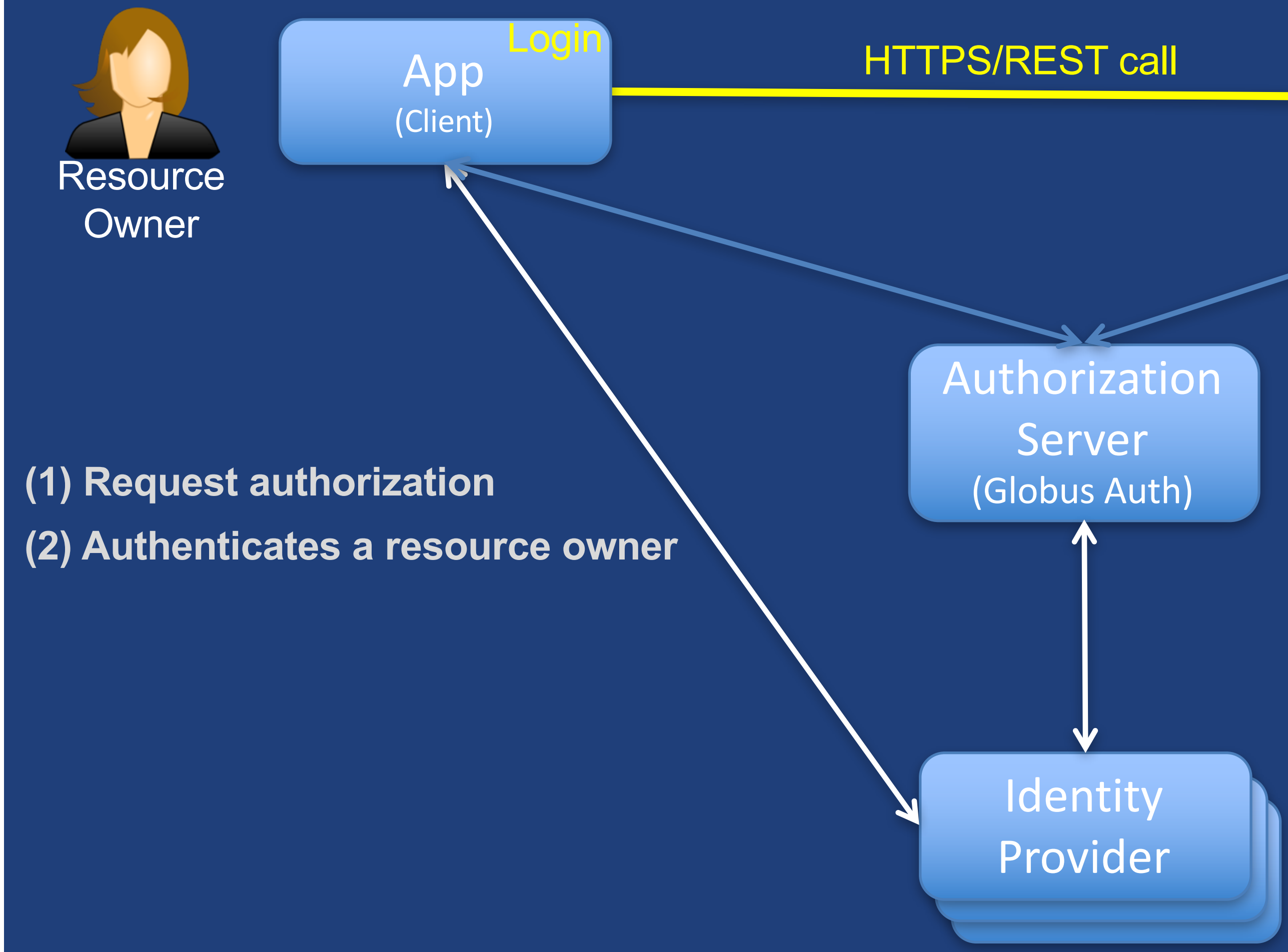
Globus Auth interactions



(1) Request authorization

- **For a set of scopes**
  - Login: openid, email, profile
  - HTTPS/REST APIs
- **User selects identity provider**

Globus Auth interactions

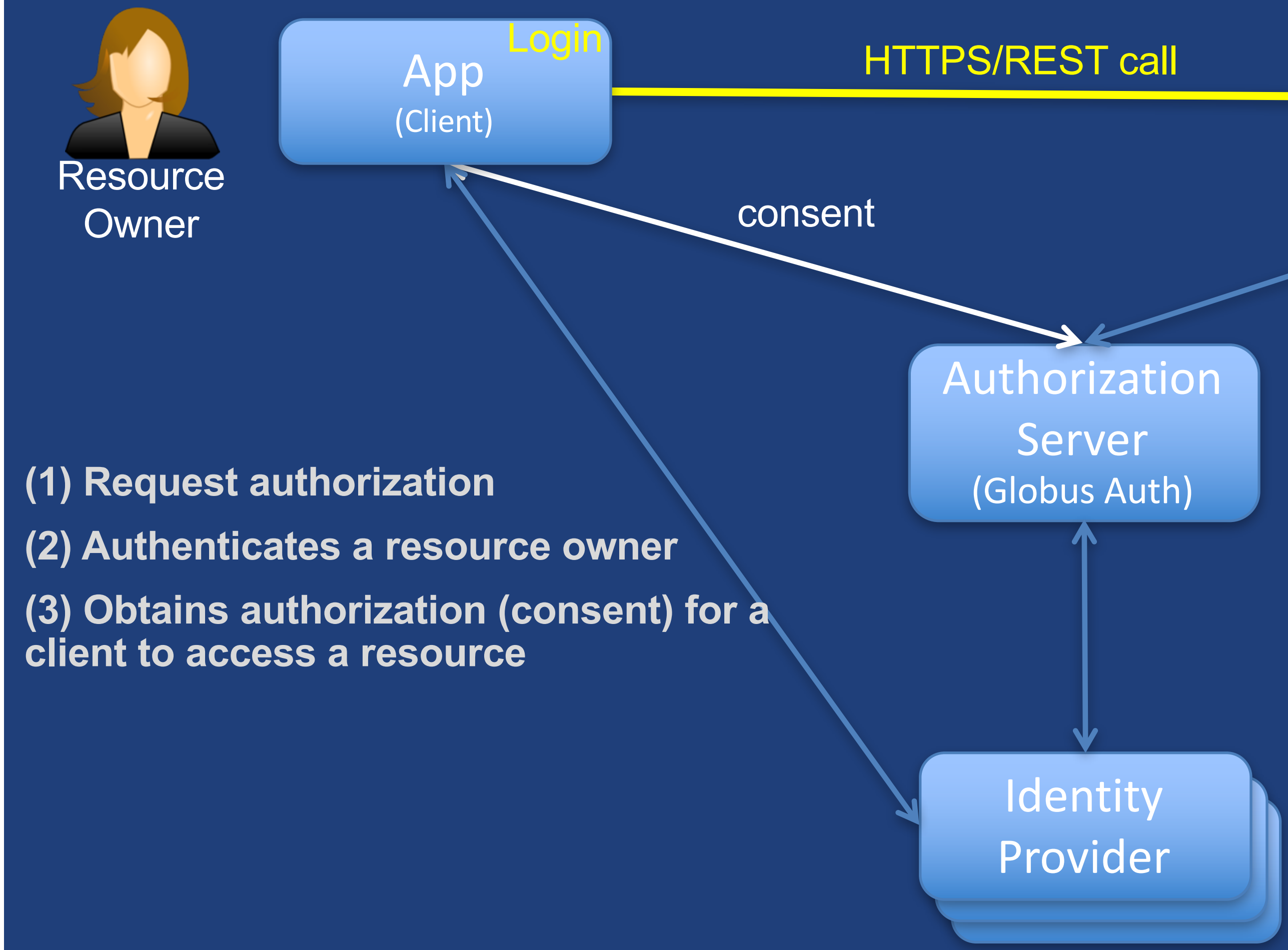


(1) Request authorization

(2) Authenticates a resource owner

- **Using existing identities:**
  - XSEDE, University (via InCommon), Google, web app, etc.
- **User can link multiple identities into a single Globus Account**
- **No Globus username & password (Globus ID) required**
- **Globus Auth handles naming details (e.g., ePPN vs ePTID)**

Globus Auth interactions



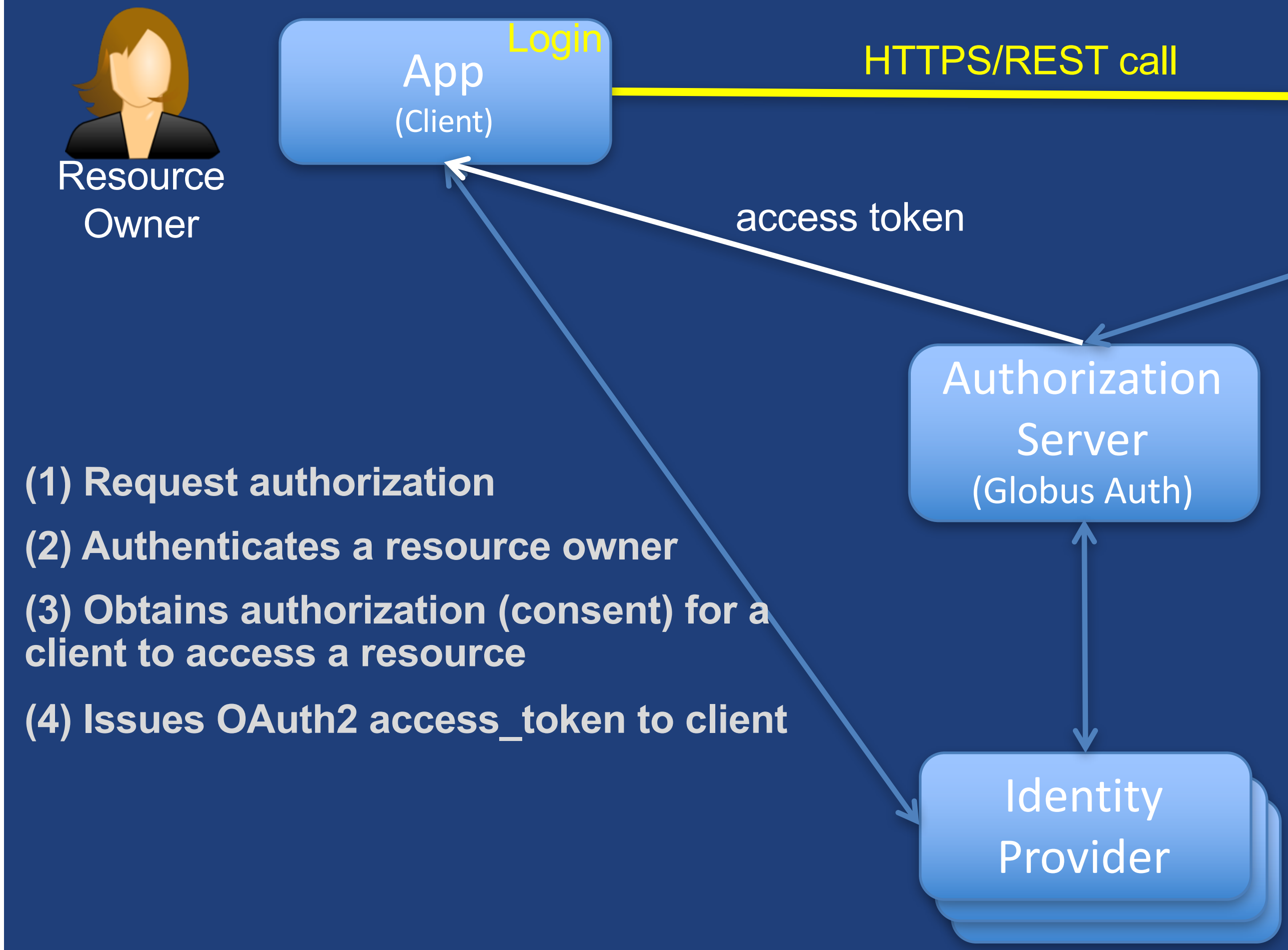
(1) Request authorization

(2) Authenticates a resource owner

(3) Obtains authorization (consent) for a client to access a resource

- Resource is provided by a resource server
- Limited by a scope

Globus Auth interactions



(1) Request authorization

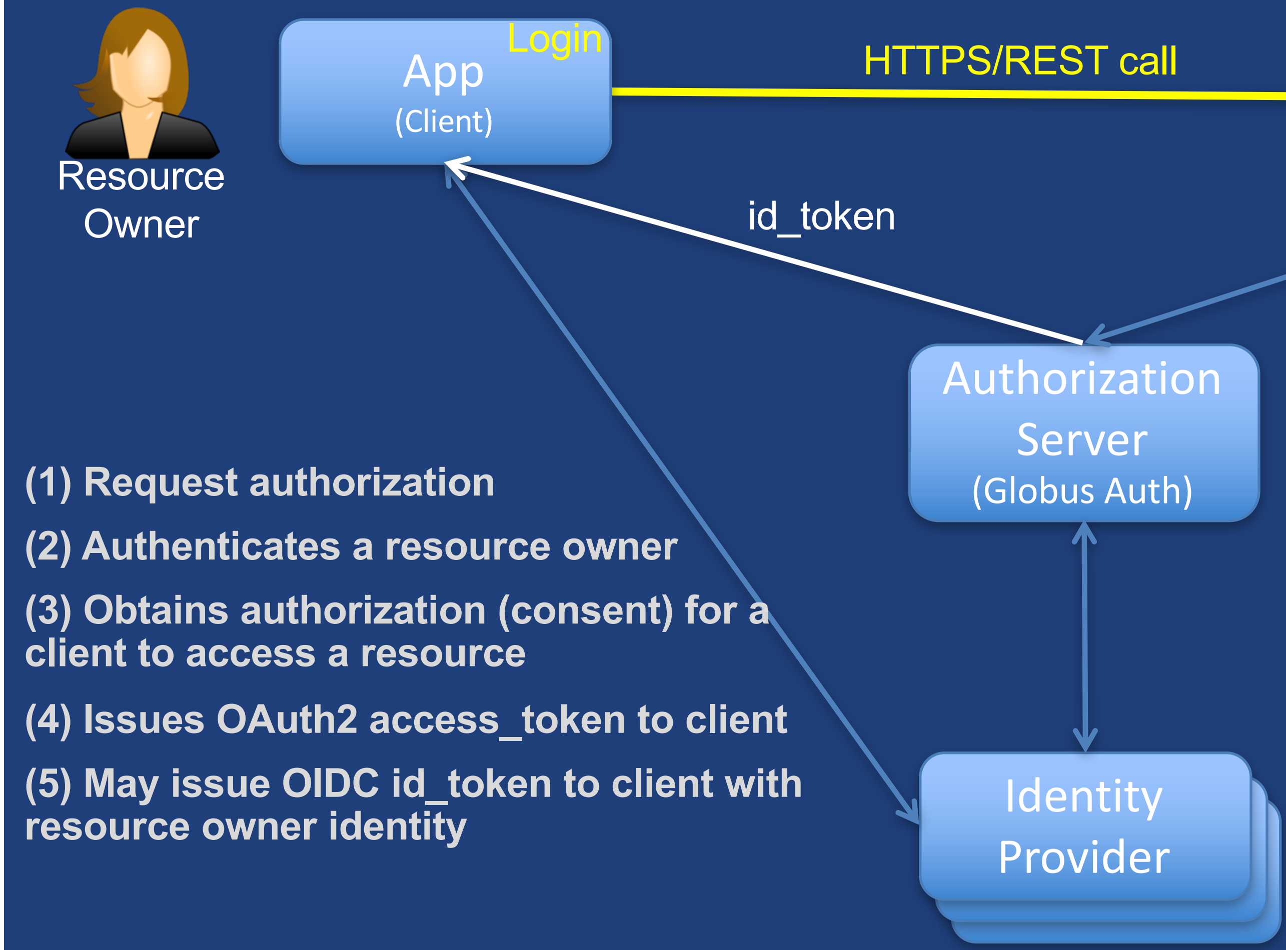
(2) Authenticates a resource owner

(3) Obtains authorization (consent) for a client to access a resource

(4) Issues OAuth2 access_token to client

- Some grant types issue authorization code, which client exchanges for access token
- Access token is opaque to client
- May include a refresh token, for offline access

Globus Auth interactions



(1) Request authorization

(2) Authenticates a resource owner

(3) Obtains authorization (consent) for a client to access a resource

(4) Issues OAuth2 access_token to client

(5) May issue OIDC id_token to client with resource owner identity

JWT id_token:

sub: Globus Auth identity id

iss: https://auth.globus.org

name: full name

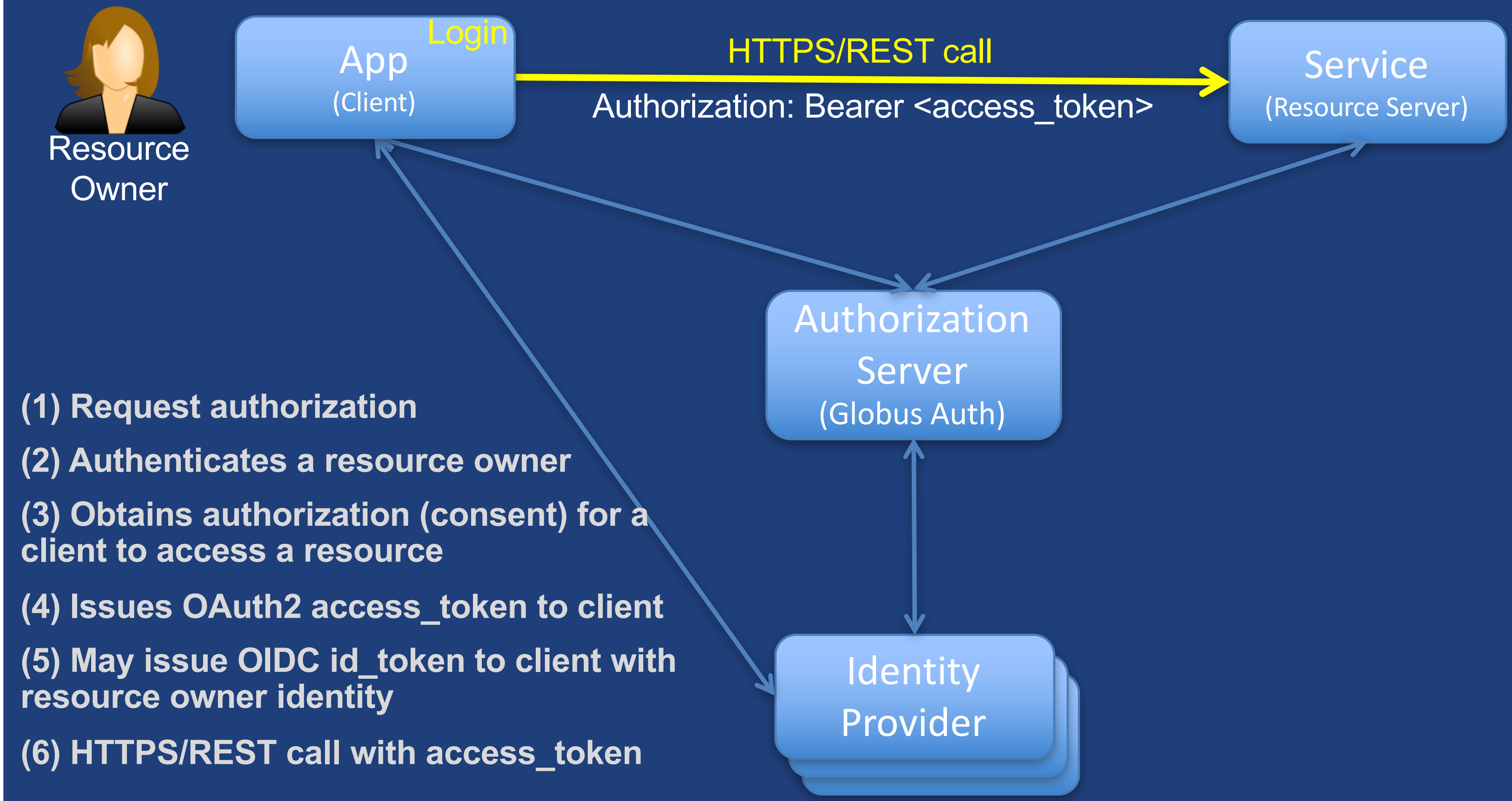
preferred_username:

e.g., tuecke@uchicago.edu

email: email contact

other standard OIDC claims

Globus Auth interactions



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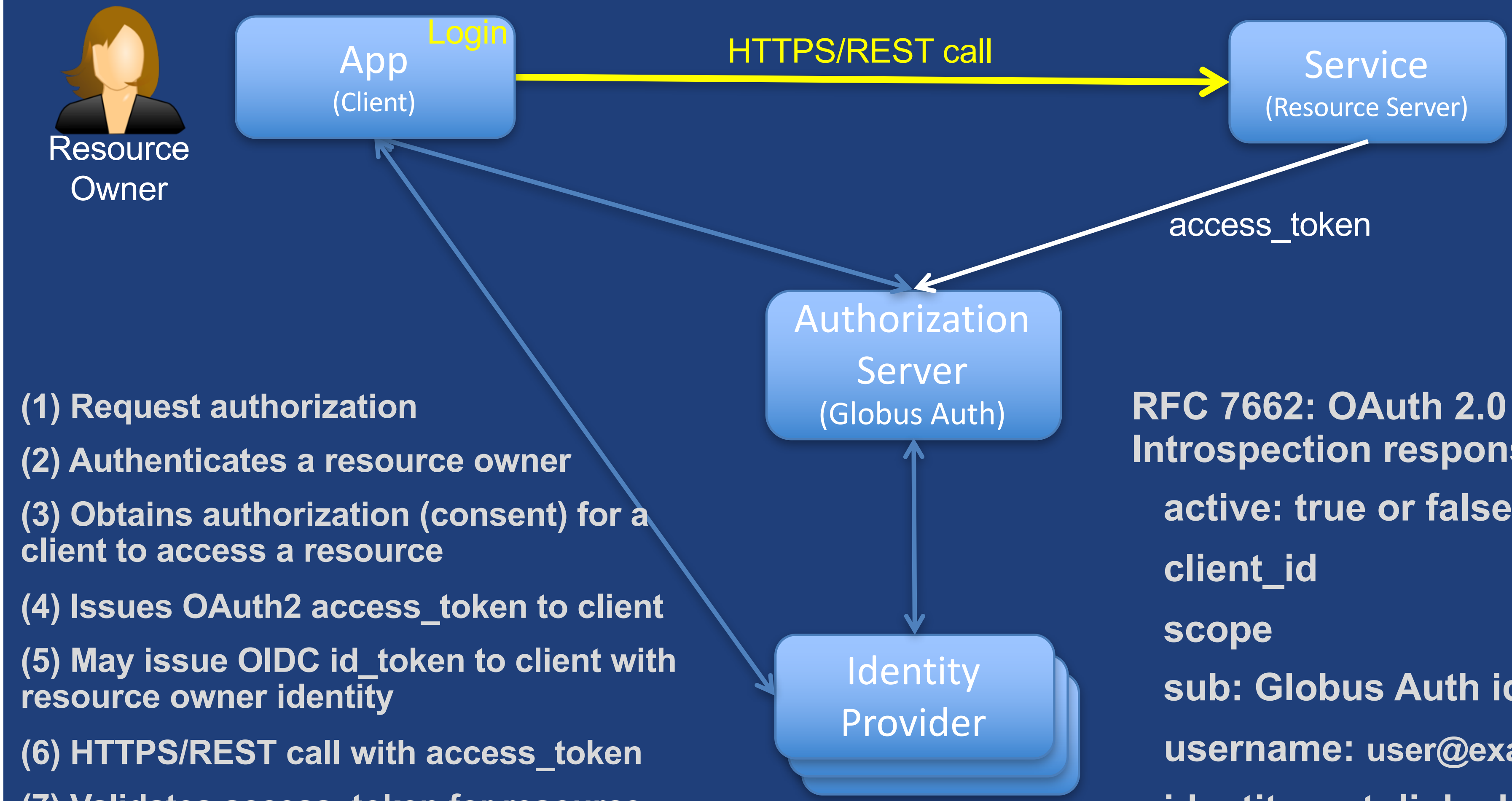
(6) HTTPS/REST call with access_token

Globus Auth interactions



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(5) May issue OIDC id_token to client with resource owner identity

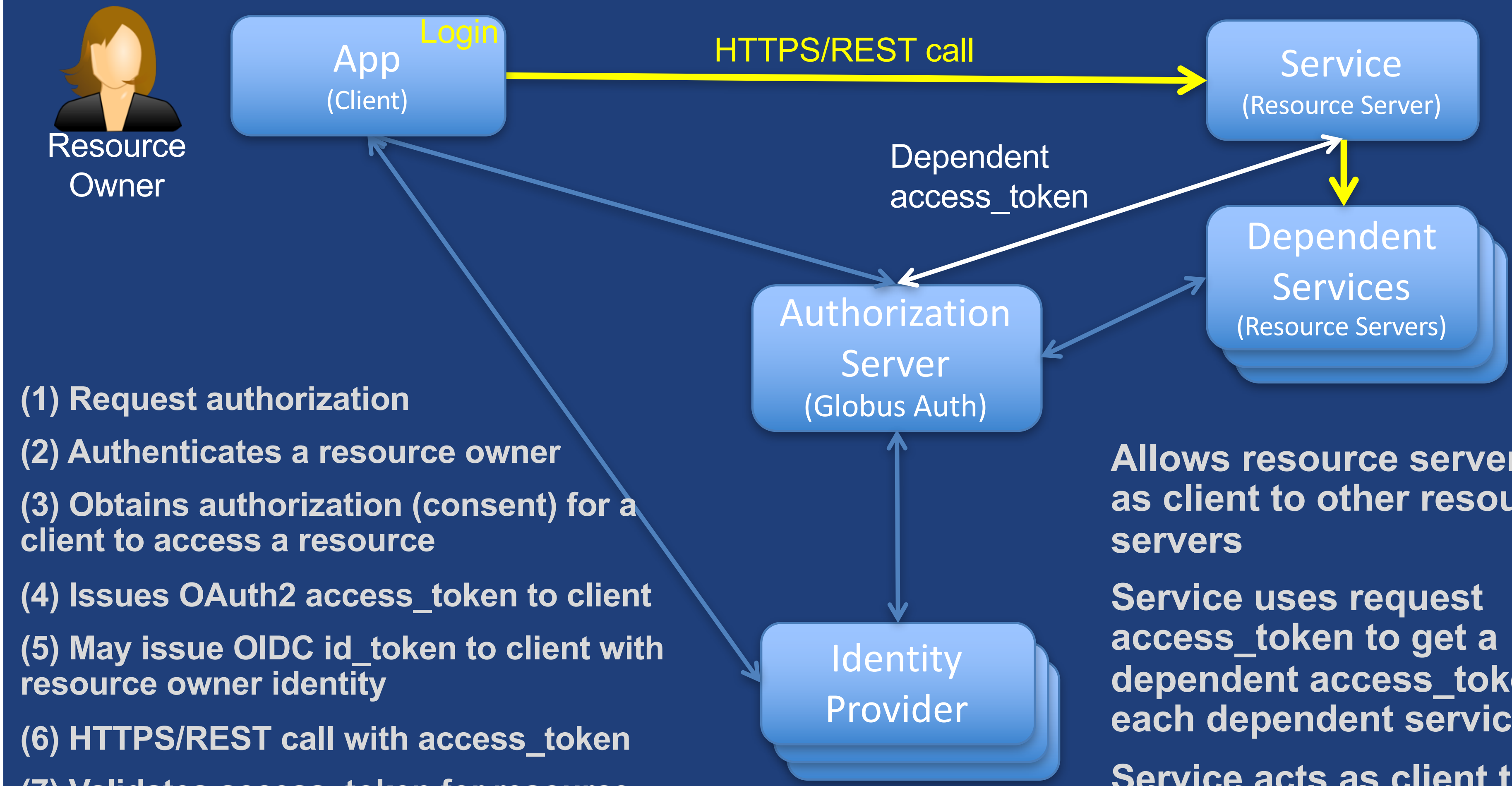
(6) HTTPS/REST call with access_token

(7) Validates access_token for resource server, and gets additional information

RFC 7662: OAuth 2.0 Token Introspection response:

- active: true or false
- client_id
- scope
- sub: Globus Auth identity id
- username: user@example.com
- identity_set: linked identities
- email
- name
- other standard claims

Globus Auth interactions



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(4) Issues OAuth2 access_token to client

(5) May issue OIDC id_token to client with resource owner identity

(6) HTTPS/REST call with access_token

(7) Validates access_token for resource server, and gets additional information

(8) Issues dependent access tokens to resource server

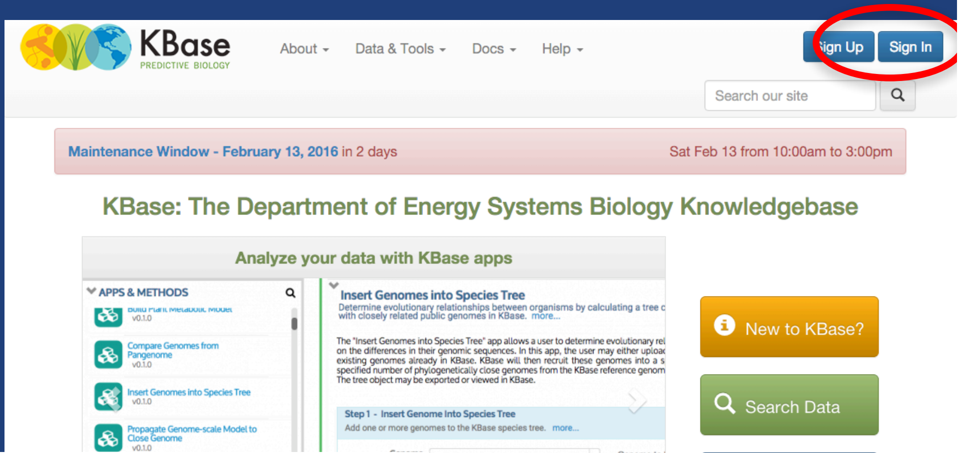
Allows resource server to act as client to other resource servers

Service uses request access_token to get a dependent access_token for each dependent service

Service acts as client to its dependent services

Log in with Globus

- Similar to
  Log in with Google and
  Log in with Facebook
- Using existing identities
- Providing access to community services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Maintenance Window - February 13, 2016 in 2 days Sat Feb 13 from 10:00am to 3:00pm

KBase: The Department of Energy Systems Biology Knowledgebase

Analyze your data with KBase apps

APPS & METHODS
Build Plant Metabolic Model v0.1.0
Compare Genomes from Pangenome v0.1.0
Insert Genomes into Species Tree v0.1.0
Propagate Genome-scale Model to Close Genome v0.1.0

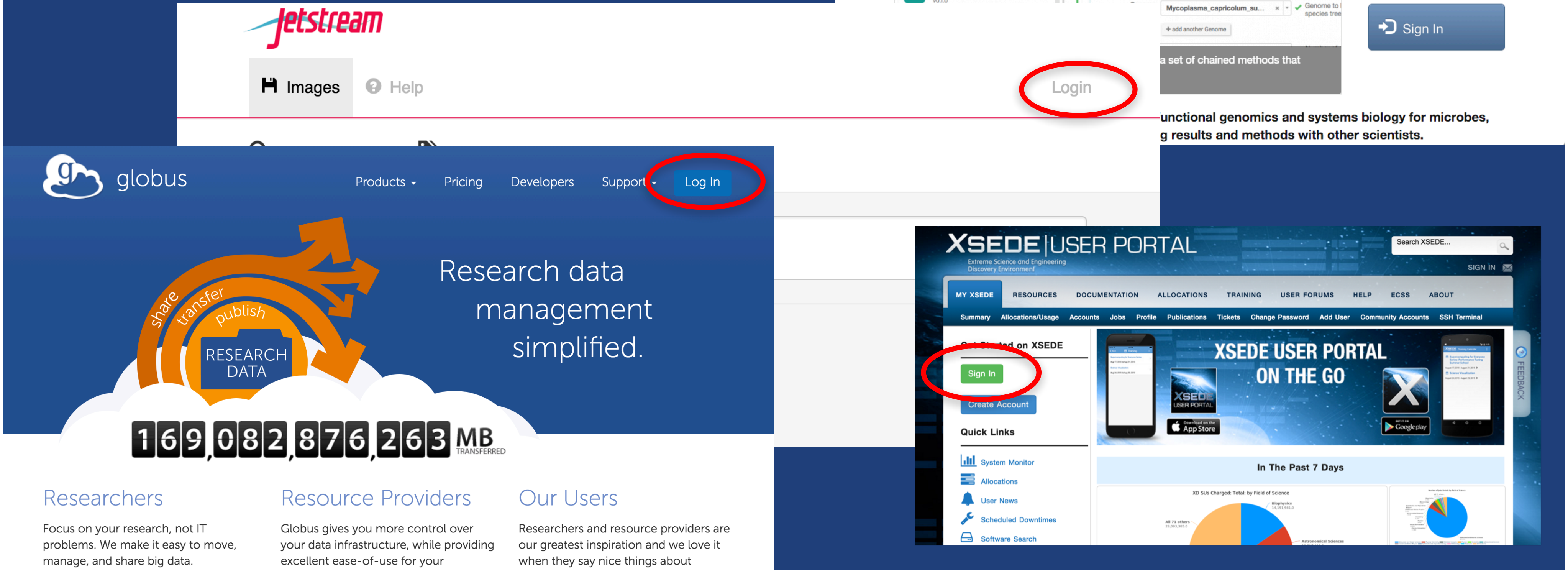
Insert Genomes into Species Tree

Determine evolutionary relationships between organisms by calculating a tree c with closely related public genomes in KBase. more...

The "Insert Genomes into Species Tree" app allows a user to determine evolutionary rel on the differences in their genomic sequences. In this app, the user may either uploac existing genomes already in KBase. KBase will then recruit these genomes into a s specified number of phylogenetically close genomes from the KBase reference genom The tree object may be exported or viewed in KBase.

Step 1 - Insert Genome Into Species Tree

Add one or more genomes to the KBase species tree. more...



a set of chained methods that

unctional genomics and systems biology for microbes,
g results and methods with other scientists.

Research data management simplified.

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Researchers

Focus on your research, not IT problems. We make it easy to move, manage, and share big data.

Resource Providers

Globus gives you more control over your data infrastructure, while providing excellent ease-of-use for your

Our Users

Researchers and resource providers are our greatest inspiration and we love it when they say nice things about

Demo

Log in to Jetstream App

OAuth2 / OIDC client

- **Globus Auth should work with any compliant client**
  - We recommend Google OAuth client libraries
  - Python, Java, PHP, Javascript, .NET

https://developers.google.com/api-client-library/

Identity id vs. username

- **Identity id:**
  - Guaranteed unique among all Globus Auth identities, and will never be reused
  - UUID
  - Always use this to refer to an identity
- **Identity username:**
  - Unique at any point in time
    - May change, may be re-used
  - Case-insensitive user@domain
  - Can map to/from id, for user experience
- **Auth API allows mapping back and forth**

Scopes

- **APIs that client is requesting access to**
- **Scope syntax:**

  urn:globus:auth:scope:<service-name>:<scope-name>
- **If client requests multiple scopes**
  - Token response has tokens for first scope
  - other_tokens field in response has list of token responses for other scopes
  - Client must use correct token with each request

Effective identity

- **App can choose to operate only with identities from a particular identity provider**
  - Globus Auth login will require an identity from that provider to be linked to user's account
  - OIDC id_token uses this "effective identity"
- **If app does not set an effective identity policy, then the primary identity of the account is used as the effective identity for that app**

App registration

- **Client_id and client_secret for service**
- **App display name**
- **Declare required scopes**
  - Need long-term, offline refresh tokens?
  - May require authorization from scope admin
- **OAuth2 redirect URIs**
- **Links for terms of service & privacy policy**
- **Effective identity policy (optional)**

Demo

App Registration

Portal accounts

- Your app portal can still have portal accounts for users
- Tie portal account to Globus account identity, rather than username/password
- Associate your profile with this account
- Globus Auth handles authentication of that identity, in order to log user into your portal account

User identity vs portal identity

- **User logging into portal results in portal having user's identity and access token**
  - Used to make requests on the user's behalf
- **Portal may also need its own identity**
  - Access and refresh tokens for this identity
  - Used to make requests on its own behalf

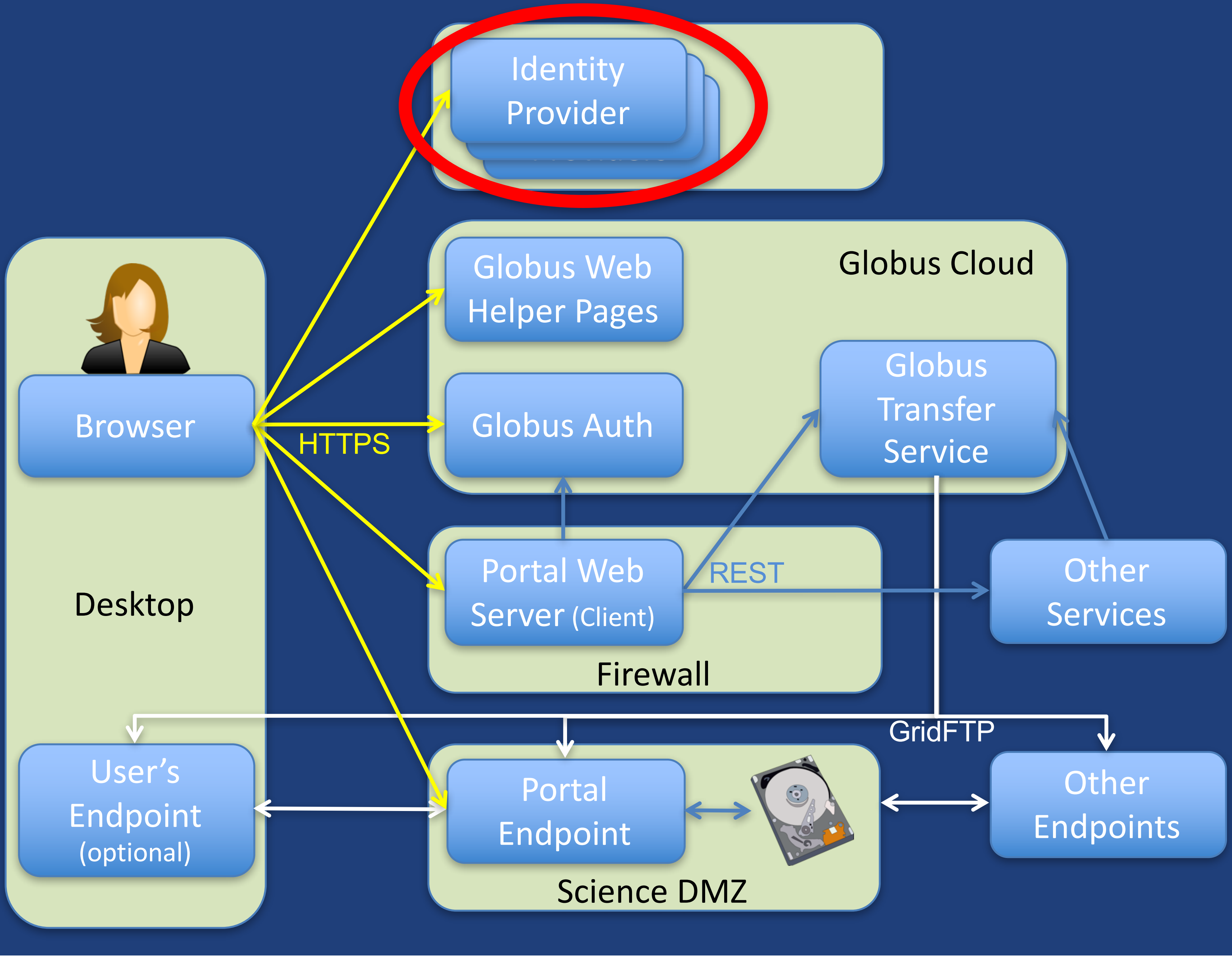
Client identity

- **Portal App has client_id & client_secret**
- **Globus Auth client_id is an identity_id**
  - <client_id>@clients.auth.globus.org
- **Use OAuth2 Client Credentials Grant to authenticate the client identity**
  - Using client_id and client_secret
- **Can use the client_id just like any other identity_id**
  - Sharing access manager role, permissions, group membership, etc.

Consent

- **Resource owner authorization that a client can request access to a service on the resource owner's behalf within a limited scope**
  - If service has dependent scopes, they are part of the consent
- **User can rescind a consent at any time**
  - Invalidates all access, dependent, and refresh tokens originating from the client

Prototypical research data portal



Adding your campus identity provider to Globus

- **InCommon identity providers that release research & scholarship attributes to CILogon** ***(free)***

- **OpenID Connect identity provider supported by Globus Auth** ***(subscription)***

Adding an identity provider

- **If your portal has identities already:**
  - Deploy OIDC server in front of it
    - Globus Python OIDC (coming soon)
    - Any standard OIDC server should work
    - Requires claim that can map to username
    - Optional claims: name, email, organization
  - Can register apps and services with an effective identity policy
    - Requires account to have identity from your identity provider when logging into your app

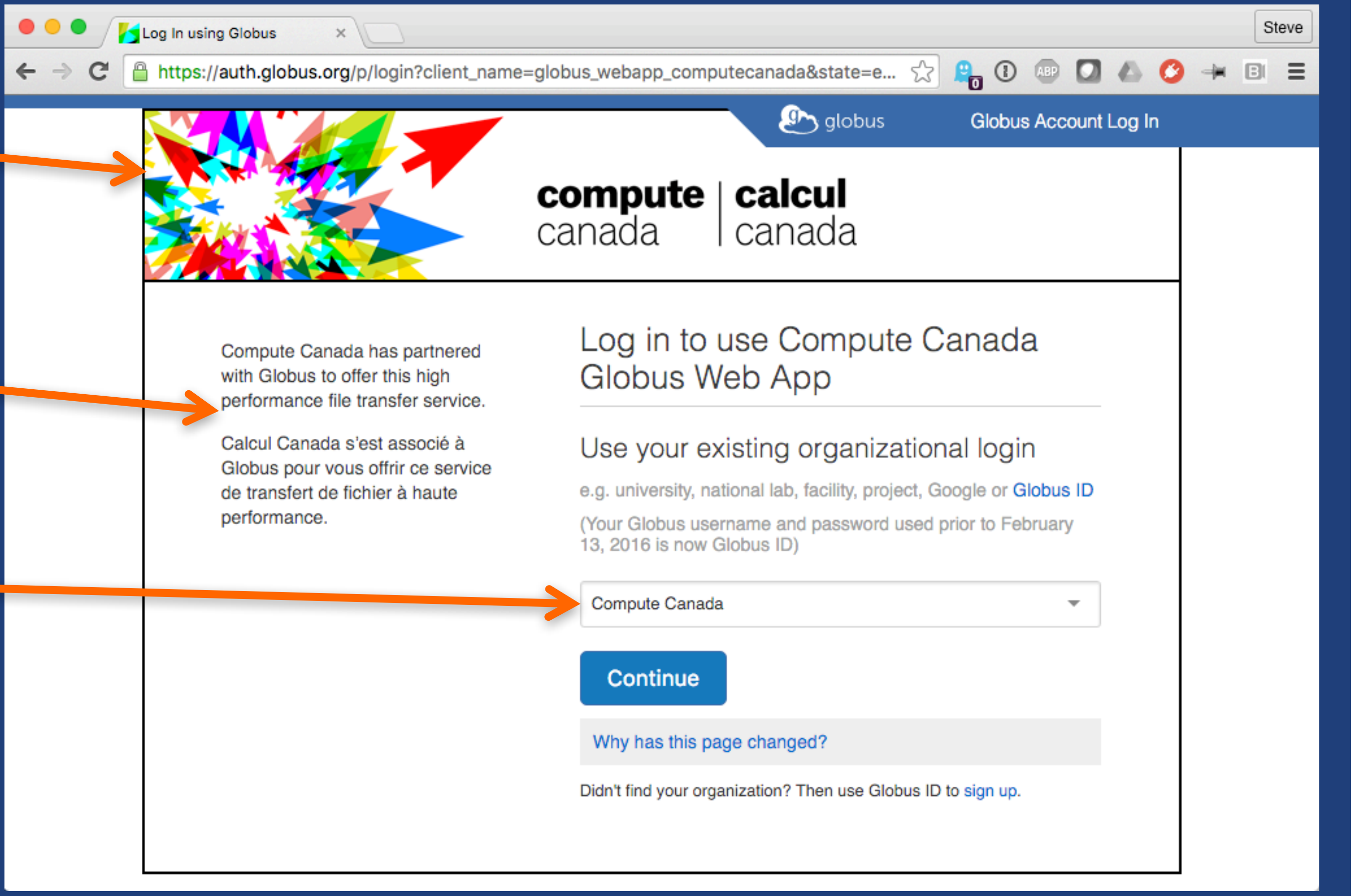
Branding

- **Can skin Globus Auth pages**

Header

Text

Default IDP


Log In using Globus
Steve
https://auth.globus.org/p/login?client_name=globus_webapp_computecanada&state=e...
globus
Globus Account Log In
compute canada
calcul canada

Compute Canada has partnered with Globus to offer this high performance file transfer service.

Calcul Canada s'est associé à Globus pour vous offrir ce service de transfert de fichier à haute performance.

Log in to use Compute Canada Globus Web App

Use your existing organizational login

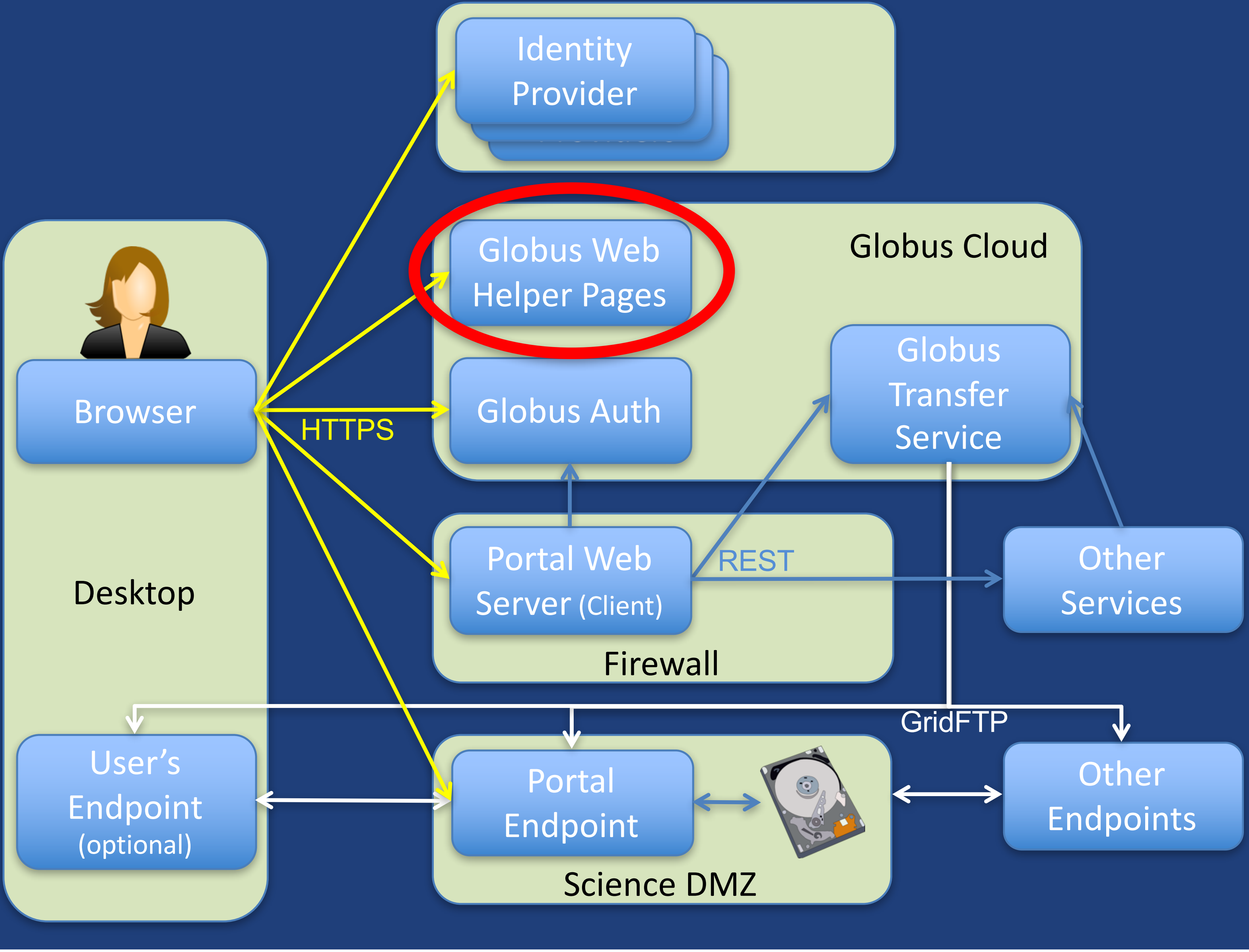
e.g. university, national lab, facility, project, Google or Globus ID

(Your Globus username and password used prior to February 13, 2016 is now Globus ID)

Compute Canada

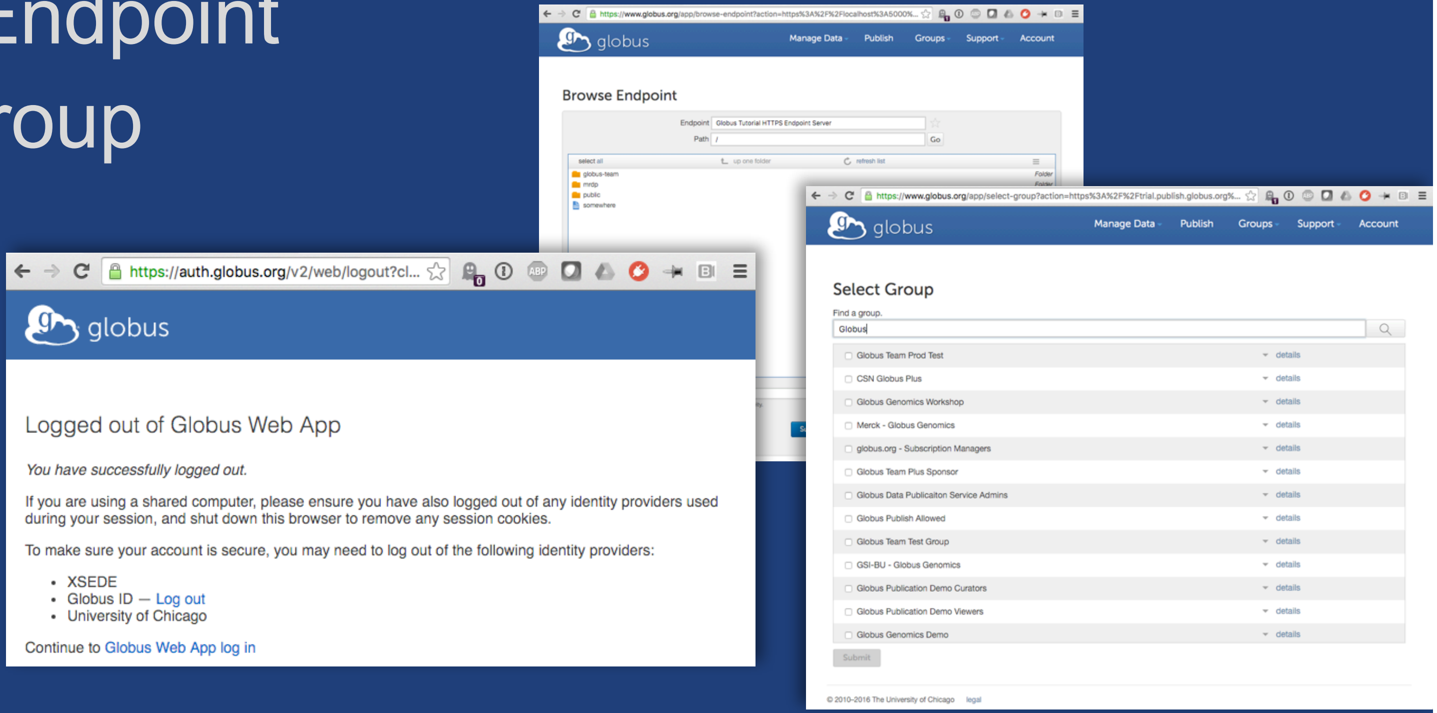
Didn't find your organization? Then use Globus ID to sign up.

Prototypical research data portal



Introduction to Globus Helper Pages

- **Globus provided web pages designed for use by your web apps**
  - Browse Endpoint
  - Select Group
  - Logout



https://www.globus.org/app/browse-endpoint?action=https%3A%2F%2Flocalhost%3A5000%...

Browse Endpoint

Endpoint: Globus Tutorial HTTPS Endpoint Server

Path: /

globus-team	Folder
mrdp	Folder
public	
somewhere	

https://www.globus.org/app/select-group?action=https%3A%2F%2Ftrial.publish.globus.org%...

Select Group

Find a group.

Globus

- ☐ Globus Team Prod Test — details
- ☐ CSN Globus Plus — details
- ☐ Globus Genomics Workshop — details
- ☐ Merck - Globus Genomics — details
- ☐ globus.org - Subscription Managers — details
- ☐ Globus Team Plus Sponsor — details
- ☐ Globus Data Publicaiton Service Admins — details
- ☐ Globus Publish Allowed — details
- ☐ Globus Team Test Group — details
- ☐ GSI-BU - Globus Genomics — details
- ☐ Globus Publication Demo Curators — details
- ☐ Globus Publication Demo Viewers — details
- ☐ Globus Genomics Demo — details

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https://auth.globus.org/v2/web/logout?cl...

Logged out of Globus Web App

You have successfully logged out.

If you are using a shared computer, please ensure you have also logged out of any identity providers used during your session, and shut down this browser to remove any session cookies.

To make sure your account is secure, you may need to log out of the following identity providers:

- XSEDE
- Globus ID — Log out
- University of Chicago

Continue to Globus Web App log in

https://docs.globus.org/api/helper-pages/

Client Logout

- **Call token revocation on access tokens**
  - https://auth.globus.org/v2/oauth2/token/revoke
  - Doc: https://docs.globus.org/api/auth/reference/
  - Note: Does not revoke dependent tokens
- **Delete access tokens**
- **Redirect to logout helper page**
  - https://auth.globus.org/v2/web/logout
  - Doc: https://docs.globus.org/api/helper-pages/

Building the Modern Research Data Portal

Exercises: Install and run your own sample research data portal

globus

Sample Research Data Portal Code Walk-through

Install sample data portal

- **Either locally or on EC2 instance**

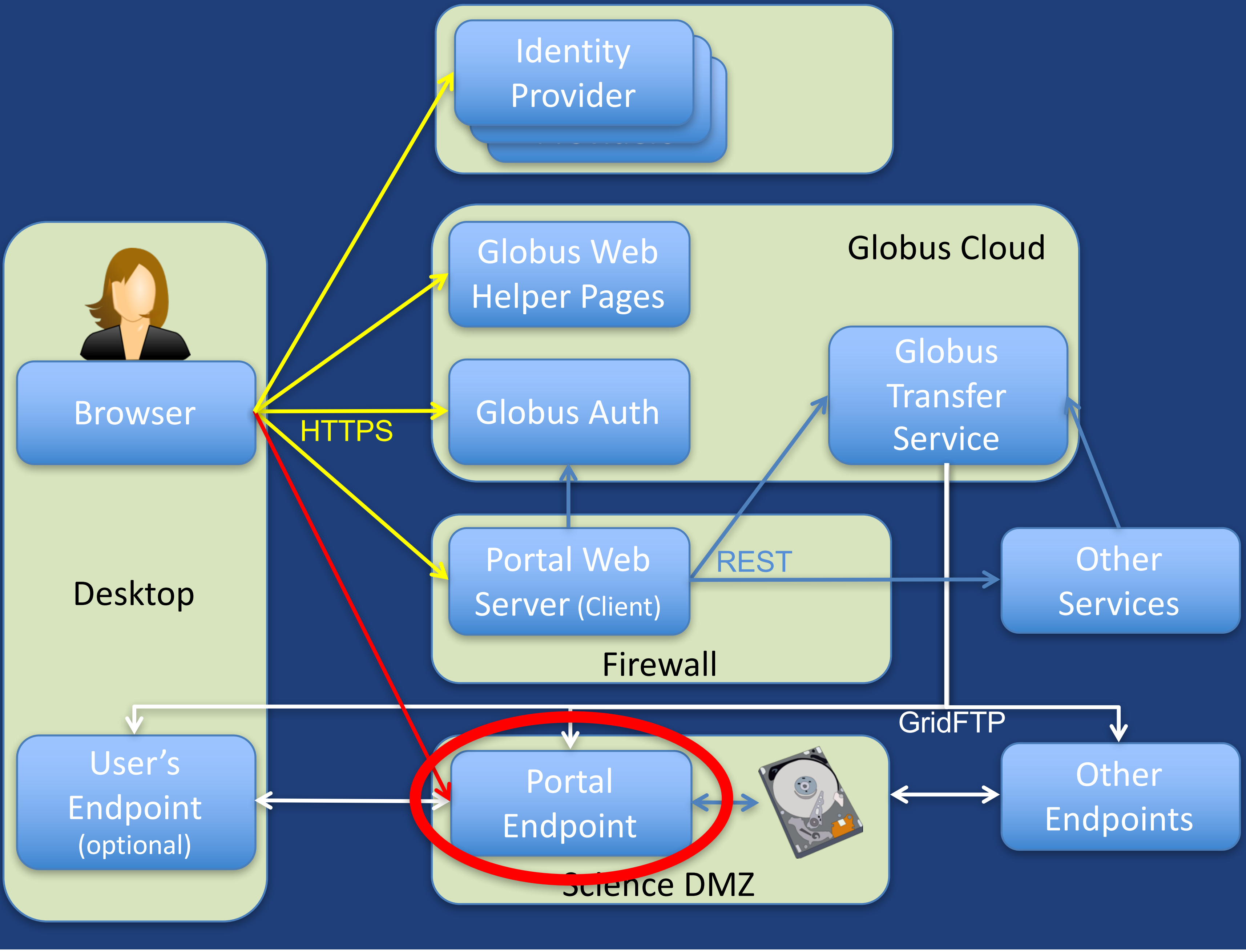
https://github.com/globus/globus-sample-data-portal

- **EC2 instance login:**
  - Username:
    Password:

Portal App exercises
Find and print to console:

1. **Globus Auth URL the portal redirects to for login**
2. **Globus Auth URL the portal redirects to for logout**
3. **Username of the logged in user**
4. **Complete id_token of the logged in user**
5. **URL of the Globus Browse Endpoints helper page used by the portal**
6. **Endpoint and path selected by user as destination of the transfer**
7. **URL to submit transfer, and resulting task id**
8. **Complete task document returned by status**

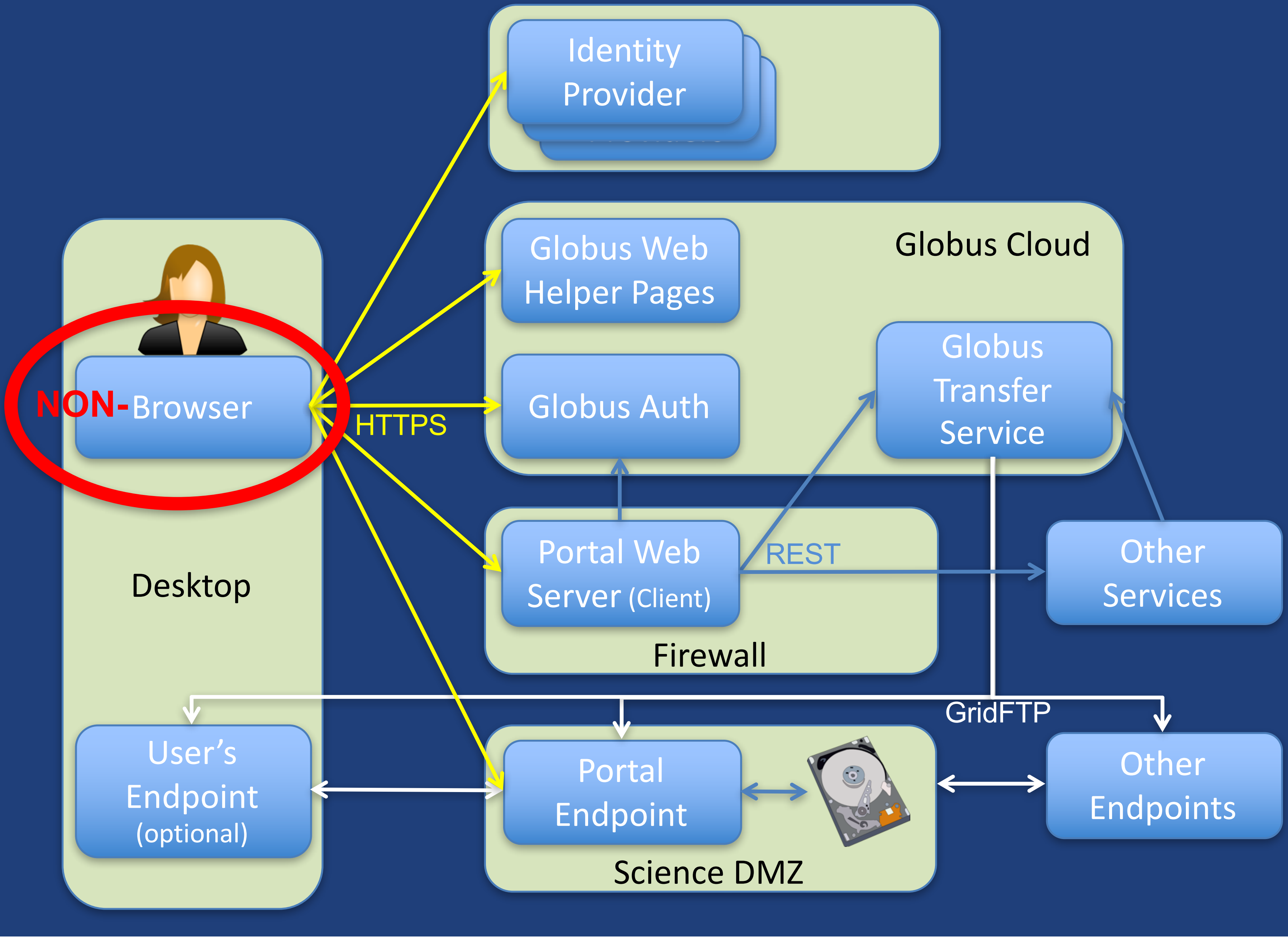
Prototypical research data portal



HTTPS to Endpoints

- **Each endpoint HTTPS server is a Globus Auth service (resource server)**
- **Web page can link to file on server**
  - Browser GET will cause HTTPS server to authorize request via Globus Auth (note SSO)
- **Portal (client) can request scope for endpoint resource server**
  - Use access token in requests

Prototypical research data portal



Mobile apps

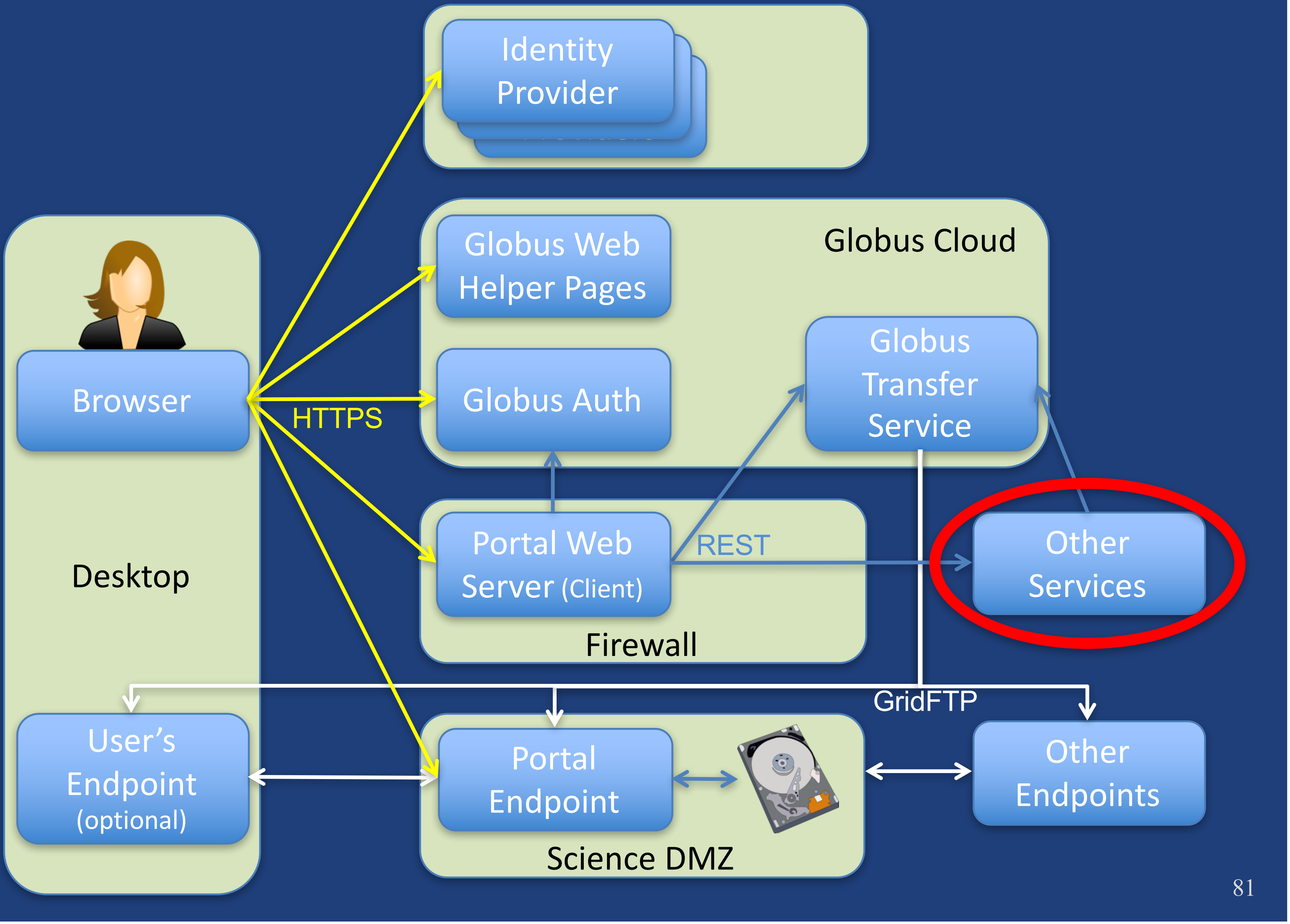
- **Globus Auth adding support for mobile apps**
  - "Log in with Globus" in mobile apps
    - RFC 7636: Proof Key for Code Exchange by OAuth Public Clients (PKCE, pronounced "pixy")
    - Extension to OAuth2 to allow OAuth2 Authorization Code Grant to work from mobile apps
  - Uses mobile browser for web-based login
  - Mobile apps can call any service REST APIs that use Globus Auth
  - iOS and Android
  - Same approach as used by Google, Facebook, etc.

Desktop & command line apps

- **Globus Auth "Native App" PKCE support**
- **Use browser if possible**
  - "OAuth 2.0 for Native Apps"
    - draft-ietf-oauth-native-apps-02
    - Use external browser if possible
    - Embed browser in app
    - Embed mini web server in app
- **Allows copy-n-paste of authorization code**
  - A little like app passwords, but OAuth2 compliant
- **Globus Python SDK and CLI will support Native App login**

- **Limited support for username/password authentication**
  - Not recommended

Prototypical research data portal



Why create your own services?

- **Front-end / back-end within your portal**
  - Remote backend for portal
  - Backend for pure Javascript browser apps

- **Extend your portal with a public REST API, so that other app and service developers can integrate with and extend your portal**

Why Globus Auth for your service?

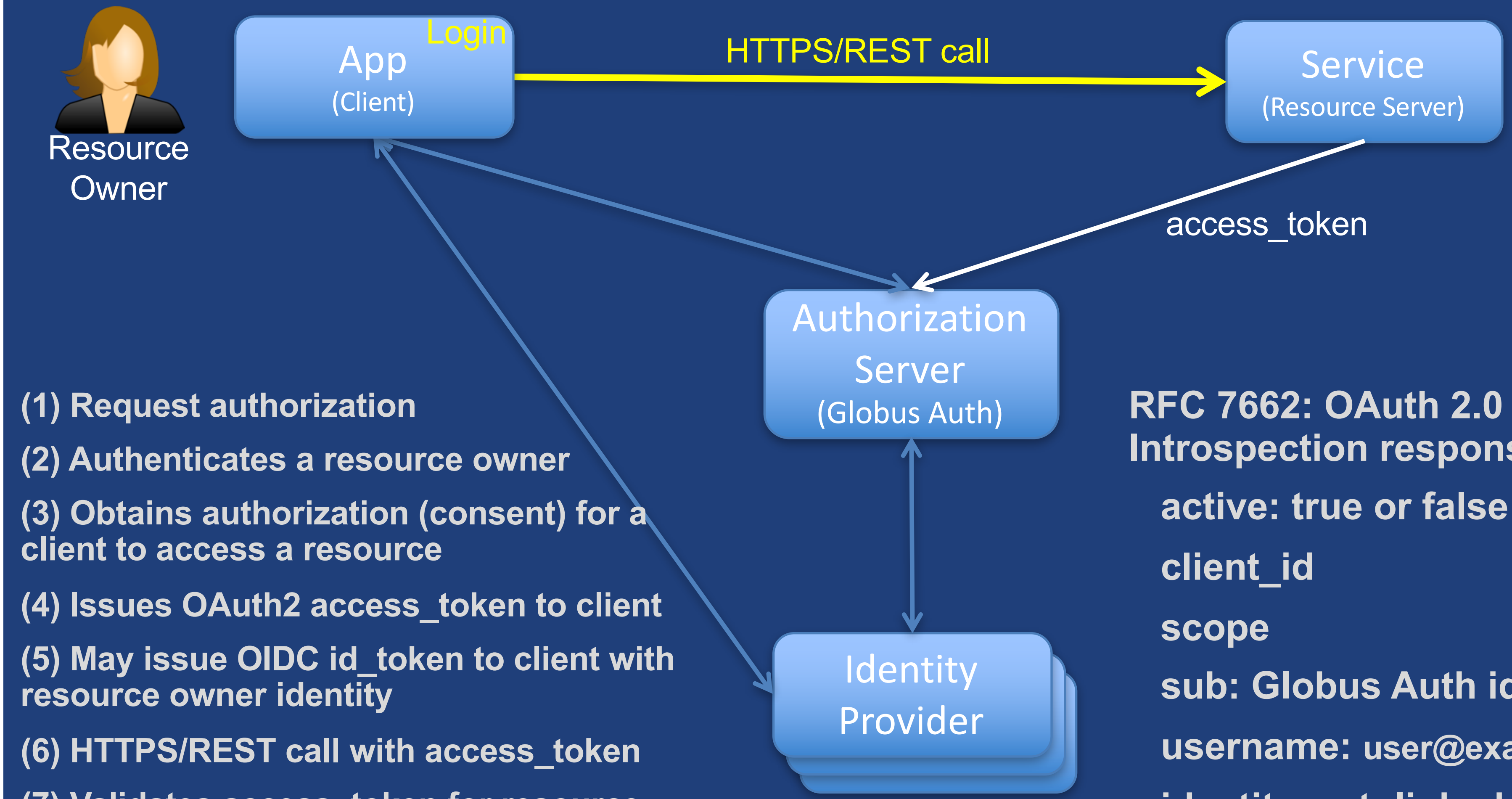
- **Outsource all identity management and authentication**
  - Federated identity with InCommon, Google, etc.
- **Outsource your REST API security**
  - Consent, token issuance, validation, revocation
  - You provide service-specific authorization
- **Apps use your service like all others**
  - Its standard OAuth2 and OIDC
- **Your service can seamlessly leverage other services**
- **Other services can leverage your service**
- **Implement your service using any language and framework**

Add your service to the science cyberinfrastructure platform

Service registration

- **Client_id and client_secret for service**
- **Service display name**
- **Validated DNS name for service**
- **One or more scopes**
- **Authorize clients to use each scope**
  - All clients (public API), or specific clients
- **Declare dependent scopes**
  - Need long-term, offline refresh tokens?
  - May require authorization from scope admin
- **Links for terms of service & privacy policy**
- **Effective identity policy (optional)**

Service interactions with Globus Auth



(1) Request authorization

(2) Authenticates a resource owner

(3) Obtains authorization (consent) for a client to access a resource

(4) Issues OAuth2 access_token to client

(5) May issue OIDC id_token to client with resource owner identity

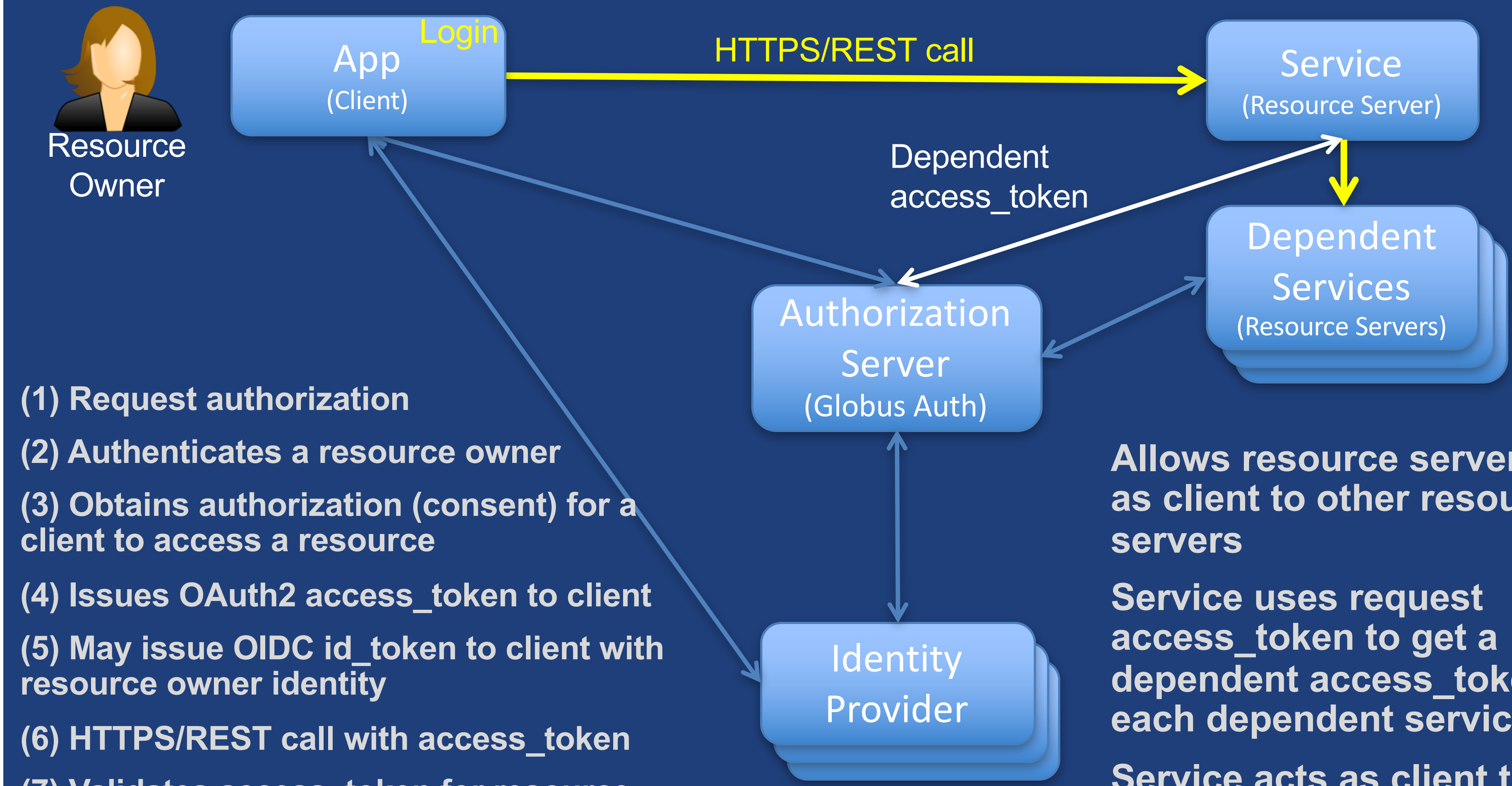
(6) HTTPS/REST call with access_token

(7) Validates access_token for resource server, and gets additional information

RFC 7662: OAuth 2.0 Token Introspection response:

- active: true or false
- client_id
- scope
- sub: Globus Auth identity id
- username: user@example.com
- identity_set: linked identities
- email
- name
- other standard claims

Service interactions with Globus Auth


Resource Owner
App (Client)
Login
HTTPS/REST call
Service (Resource Server)
Dependent access_token
Dependent Services (Resource Servers)
Authorization Server (Globus Auth)
Identity Provider

(1) Request authorization

(2) Authenticates a resource owner

(3) Obtains authorization (consent) for a client to access a resource

(4) Issues OAuth2 access_token to client

(5) May issue OIDC id_token to client with resource owner identity

(6) HTTPS/REST call with access_token

(7) Validates access_token for resource server, and gets additional information

(8) Issues dependent access tokens to resource server

Allows resource server to act as client to other resource servers

Service uses request access_token to get a dependent access_token for each dependent service

Service acts as client to its dependent services

Typical service interactions

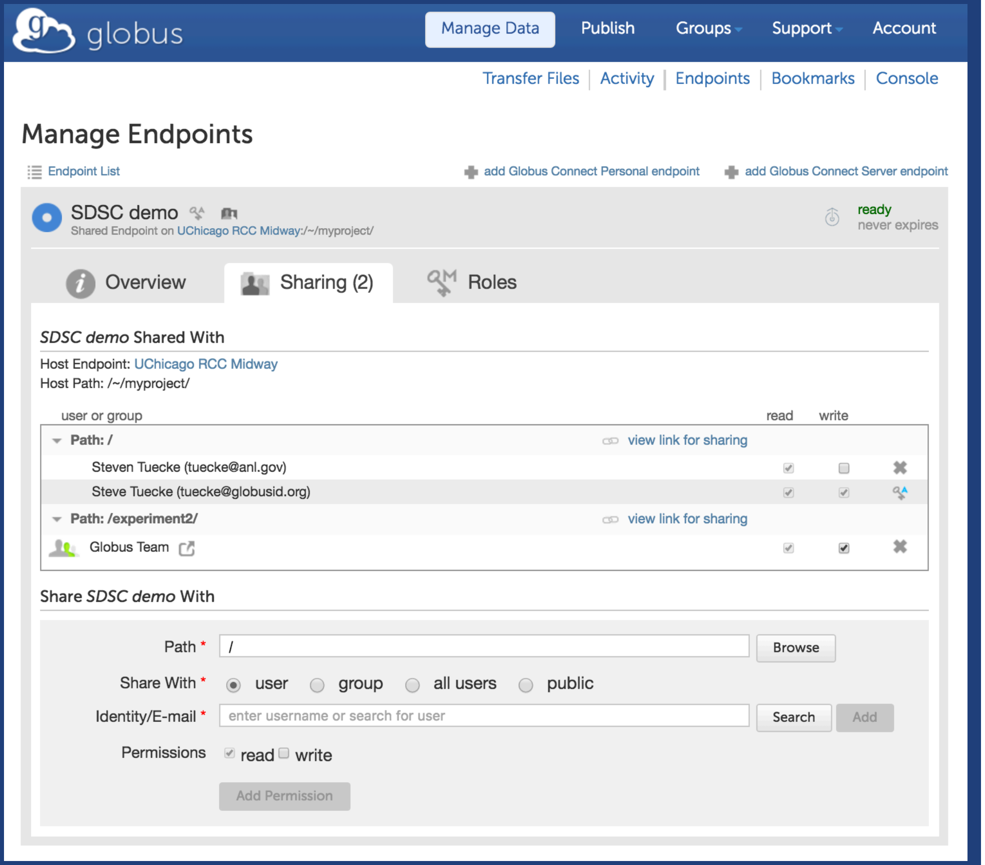
- **Service receives HTTPS request with header**
  - Authorization: Bearer <request-access-token>
- **Introspects the request access token**
  - Auth API: POST /v2/oauth2/token/introspect
  - Authorized by client_id and client_secret
  - Returns: validity, client, scope, effective_identity, identities_set
- **Verifies token info**
- **Authorizes request**
- **If service needs to act as client to other services:**
  - Calls Globus Auth Dependent Token Grant
    - Returns a token for each dependent service
  - Uses correct dependent token for downstream REST call
- **Responds to client HTTPS request as appropriate**

Authorization based on identity set

- **Use identities_set when authorizing a request based on the resource owner associated with an access token**
  - E.g., ACLs on Globus shared endpoints
- **Authorizing based on set of identities is same complexity as authorizing based on group membership set**

Groups

- **Globus group service is identity set aware**
  - "Tell me all groups for all identities of the logged in user"
- **Services can leverage this for authorization**


globus
Manage Data
Publish
Groups
Support
Account
Transfer Files | Activity | Endpoints | Bookmarks | Console

Manage Endpoints

Endpoint List
add Globus Connect Personal endpoint
add Globus Connect Server endpoint

SDSC demo

Shared Endpoint on UChicago RCC Midway:/~/myproject/

ready
never expires

Overview
Sharing (2)
Roles

SDSC demo Shared With

Host Endpoint: UChicago RCC Midway
Host Path: /~/myproject/

user or group		read	write	
Path: /	view link for sharing			
Steven Tuecke (tuecke@anl.gov)		☑	☐	✖
Steve Tuecke (tuecke@globusid.org)		☑	☑	
Path: /experiment2/	view link for sharing			
Globus Team		☑	☑	✖

Share *SDSC demo* With

Path * /   Browse

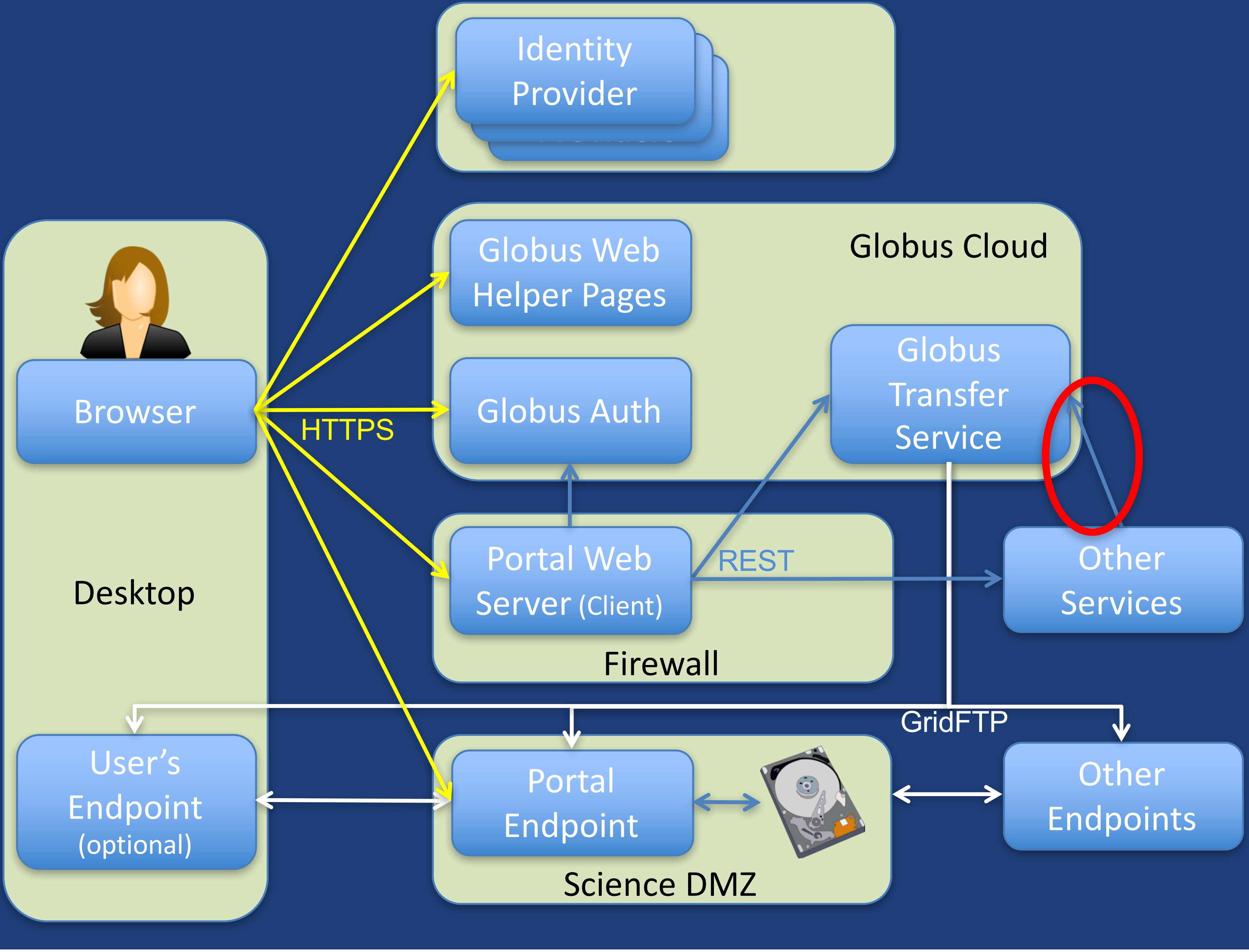
Share With * ● user ○ group ○ all users ○ public

Identity/E-mail * enter username or search for user   Search   Add

Permissions ☑ read ☐ write

Add Permission

Prototypical research data portal



Dependent tokens

- **Your service can act as client to other services (scopes)**
  - Globus Transfer and Auth
  - XSEDE (e.g., Jetstream, XUP)
  - Other community services
  - Future: Commercial services (e.g., Google Drive)
- **Entire service call tree consented by user and service owners**
  - Rescinding consent revokes all dependent tokens
- **Dependent tokens are restricted to a particular client, calling a particular scope, on behalf of a particular resource owner (e.g., user)**
  - Restricted delegation!

Refresh tokens

- **For “offline services”**
  - E.g., Globus transfer service working on your behalf even when you are offline
- **Refresh tokens issued to a particular client for use with a particular scope**
- **Client uses refresh token to get access token**
  - Client_id and client_secret required
- **Refresh token good for 6 months after last use**
- **Consent rescindment revokes resource token**

Token caching

- **Service should cache tokens and related information**
  - Improves performance of service
  - Reduces load on Globus Auth
- **Access token -> introspect response**
  - Cache timeout: 1-30 seconds recommended
    - To improve performance and load related to bursty use of REST API
  - Validity: Timeout duration determines responsiveness to token revocation and rescinding consent
  - client, scope, effective_identity: These will never change for an access token
  - identities_set: This may change at any time, due to identity (un)linking. May affect authorization. Timeout duration affect responsiveness to linking changes.
  - Future: add group membership to this, which is dependent on identities_set
- **Access token -> dependent access tokens**
  - Cache timeout: lifetime of access token
    - To avoid costly dependent token re-issuance
  - Rescinding consent will invalidate everything
- **Refresh tokens**
  - For however long they are needed for specific operations.

Sample Research Data Portal Service Walk-through

Building the Modern Research Data Portal

Exercises: Backend service for sample research data portal

Install sample data portal

- **Either locally or on EC2 instance**

https://github.com/globus/globus-sample-data-portal.git

- **EC2 instance login:**
  - Username:
    Password:

Service exercises

1. **Find and print to console:**
    1. Expiration time of each of dependent tokens
    2. The complete ACL rule added to the folder for the user
    3. The full response from token introspection
2. **Modify cleanup to wait for files to be deleted before returning**