



DOE Systems Biology Knowledgebase

KBase and Globus Online Nexus

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Knowledgebase enabling predictive systems biology.

- Powerful modeling framework.
- **Community-driven**, extensible and scalable open-source software and application system.
- Infrastructure for integration and reconciliation of algorithms and data sources.
- Framework for standardization, search, and association of data.
- Resource to enable experimental design and interpretation of results.

Who are KBase?

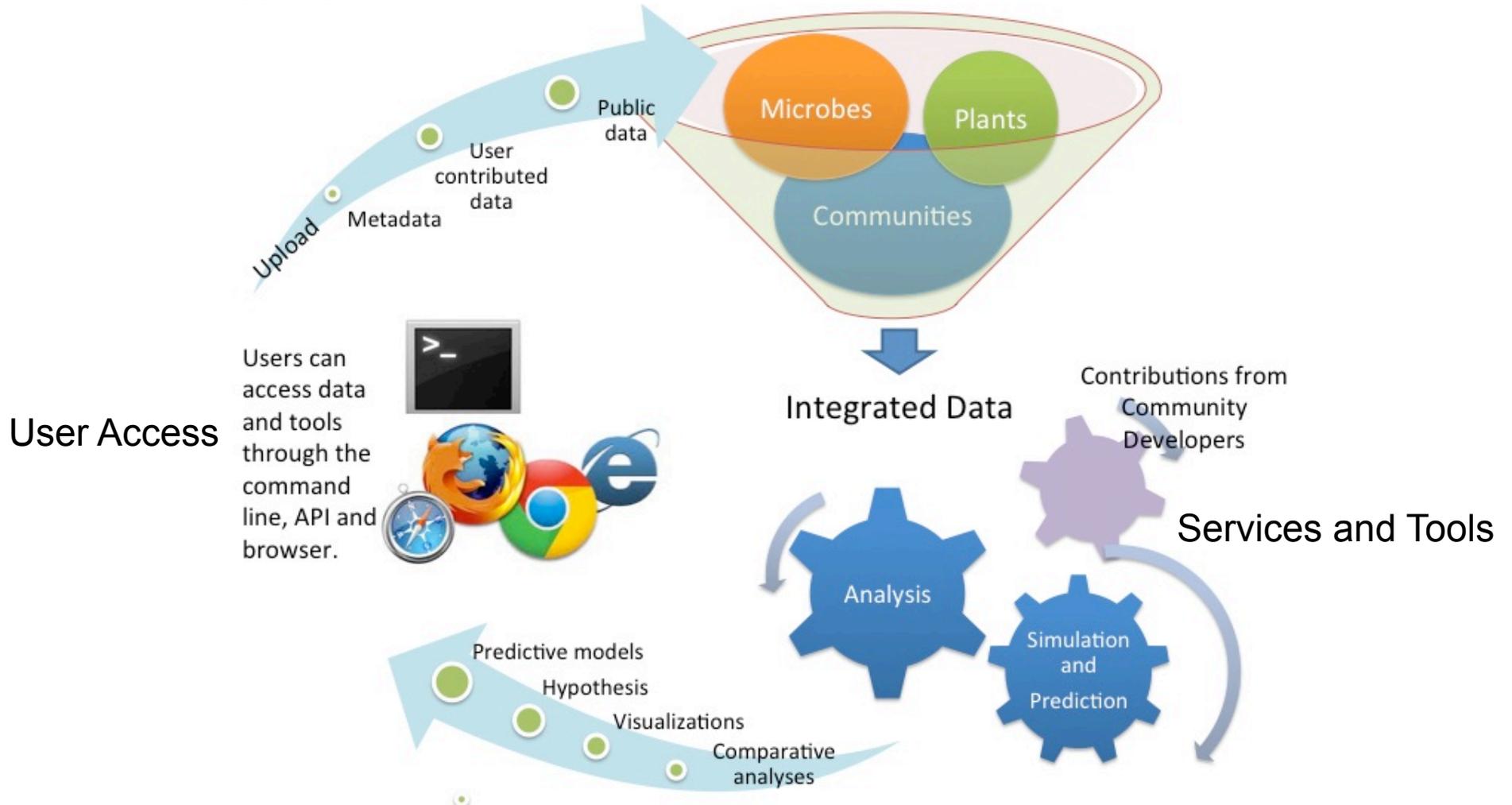
Collaborators

The KBase collaboration is led by Lawrence Berkeley, Argonne, Brookhaven, and Oak Ridge national laboratories.

Also involved in the multi-institutional program are Cold Spring Harbor Laboratory; the University of California, Davis; Hope College; the University of Illinois at Urbana-Champaign; Yale University; and the University of Tennessee.

Our key external partners are the Joint Genome Institute, EMSL, and the Bioenergy Centers. Several university projects are also important contributors.

The KBase Platform



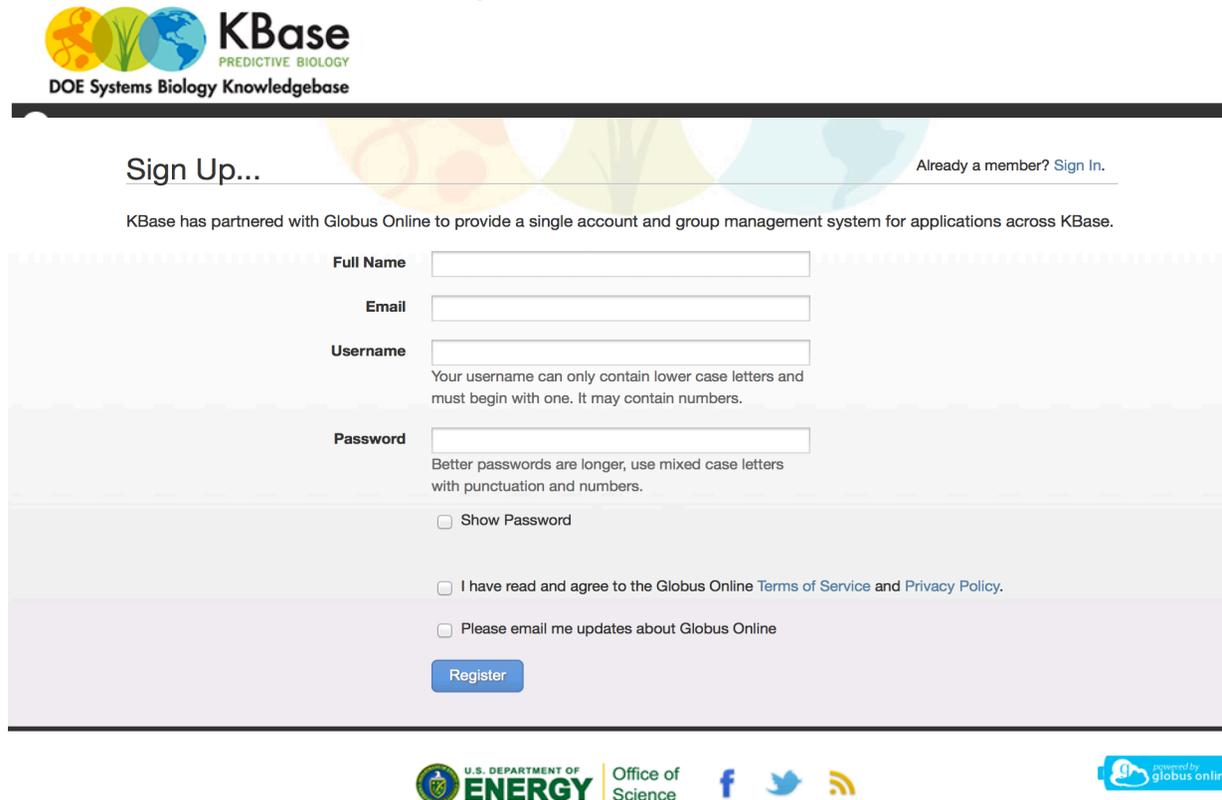
KBase Authentication/Authorization Use Cases

- User wants to sign up for a Kbase account
- From the commandline, user is prompted to authenticate for RPC service calls
- From the commandline, user uses cached credentials for RPC service calls
- From the web app, user is prompted to authenticate for browser based RPC service calls
- Web Application may request delegated access to user's protected resource
- Users who are not authorized KBase users have restricted access to KBase as a whole
- KBase users want share access to only certain other KBase users

KBase Authentication/Authorization Use Cases

- User wants to sign up for a Kbase account

Globus Online has created a hosted and branded site for new user account registration and profile management



The screenshot shows the KBase Sign Up page. At the top left is the KBase logo. The main heading is "Sign Up..." with a link "Already a member? Sign In." to the right. Below the heading is a paragraph: "KBase has partnered with Globus Online to provide a single account and group management system for applications across KBase." The form contains the following fields and options:

- Full Name**: Text input field.
- Email**: Text input field.
- Username**: Text input field with a note: "Your username can only contain lower case letters and must begin with one. It may contain numbers."
- Password**: Text input field with a note: "Better passwords are longer, use mixed case letters with punctuation and numbers."
- Show Password
- I have read and agree to the Globus Online [Terms of Service](#) and [Privacy Policy](#).
- Please email me updates about Globus Online
- Register**: Blue button.

At the bottom of the page, there are logos for the U.S. Department of Energy Office of Science, social media icons for Facebook, Twitter, and RSS, and a "powered by globus online" logo.

KBase Authentication/Authorization Use Cases

- From the commandline, user is prompted to authenticate for RPC service calls
- From the commandline, user uses cached credentials for RPC service calls

Solved with OAuth2 client credential flow (basic client server authentication) and bearer tokens. Both the client credential flow and bearer tokens were feature requests to GlobusOnline, resulting in new functionality.

Use the NEXUS REST API: Reference python-nexus-client reverse engineered to provide perl clients that support username/password and username/sshkey (RSA-SHA1) authentication.

Internal KBase client libraries also support caching of credentials in shell environment and in configuration files, as well as new support for SSH-Agent authentication. Convenience wrapper written for reference python library to support Kbase specific features.

Client Credential Flow: <http://tools.ietf.org/html/rfc6749#page-40>

OAuth2 bearer tokens: <http://tools.ietf.org/html/rfc6750>

Example of command line script usage. KBase Python API wrapper around python-nexus-globus libraries

```
In [ ]: In [1]: import biokbase.auth
In [2]: t=biokbase.Auth.Token()
In [3]: vars(t)
Out[3]:
{'client_secret': None,
 'keyfile': None,
 'keyfile_passphrase': None,
 'nclient': <biokbase.nexus.client.NexusClient at 0x10dcbd450>,
 'password': None,
 'sshagent_keyname': None,
 'sshagent_keys': {'/Users/sychan/.ssh/id_rsa': <paramiko.AgentKey at 0x10dcbd5d0>},
 'token': None,
 'user_id': None}
In [4]: # note that ssh agent keys found automatically, lets get a token!
In [5]: t=biokbase.Auth.Token( user_id='sychan', sshagent_keyname='/Users/sychan/.ssh/id_rsa')
In [6]: t.token
Out[6]: u'un=sychan|tokenid=3b72f472-a3a9-11e2-a0f5-12313809f035|expiry=1397331801|client_id=sy
```

KBase Authentication/Authorization Use Cases

- From the web app, user is prompted to authenticate for browser based RPC service calls without leaving current page

Initially problematic due to lack of CORS support in NEXUS REST API.

Solved by an internal KBase Django based authentication proxy service built using Python-nexus-client libraries and client credential flow. Kbase developers use JQuery based login widgets to acquire tokens from internal proxy service.

CORS support is pending review by Globus Online.

- Web Application may request delegated access to user's protected resource

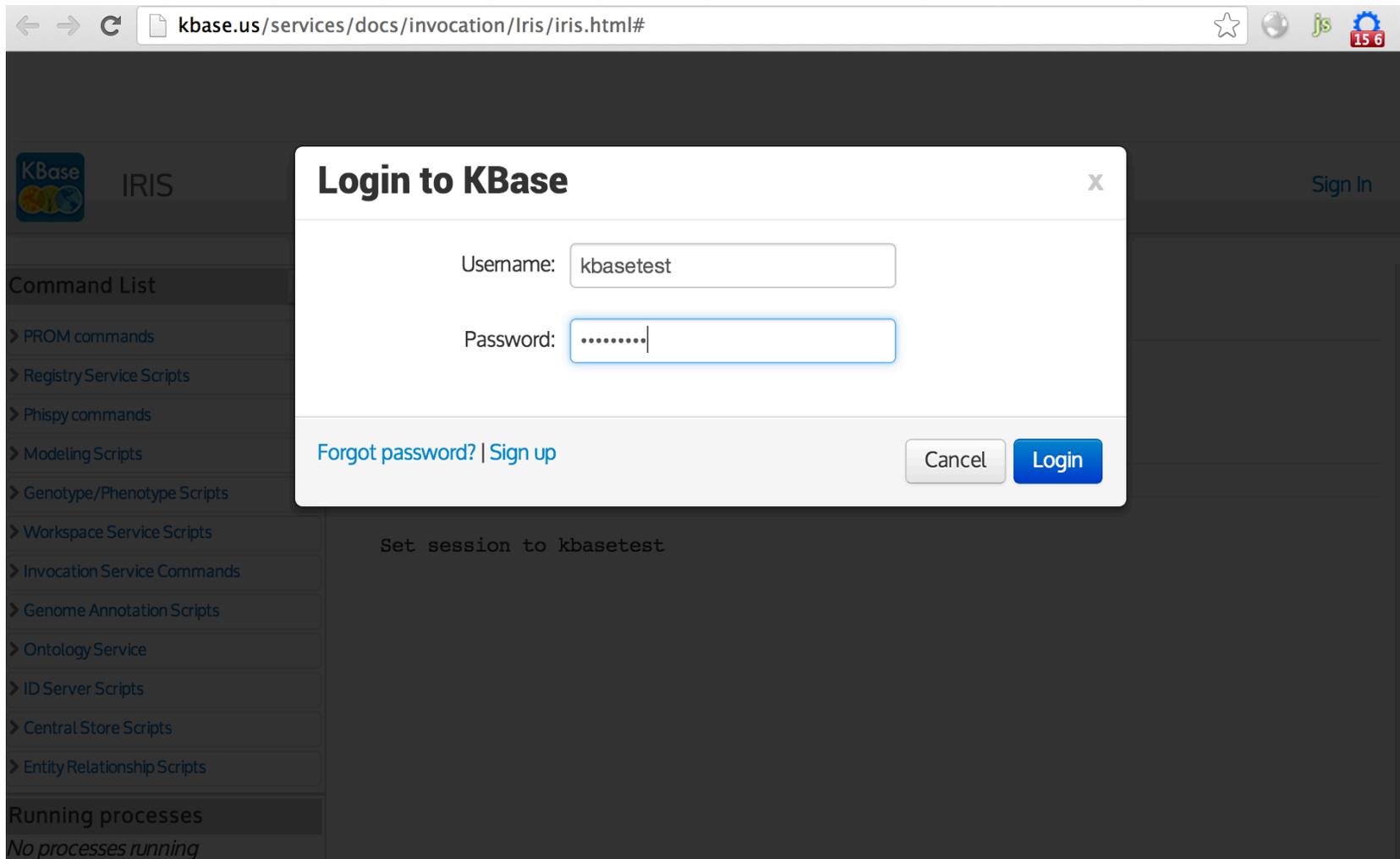
Ironically, this core feature of Oauth is not widely being used by KBase, except to authenticate user logins to static web site, www.kbase.us

We anticipate this use case to come up over time.

Also in discussions with Globus Online to support JSON Web Tokens (jwt) as a Standard for communicating delegated rights.

JSON Web Tokens: <http://tools.ietf.org/html/draft-jones-json-web-token-10>

Sample JQuery based login widget using Globus Nexus



← → ↻ kbase.us/services/docs/invoke/iris/iris.html#

KBase IRIS Sign In

Command List

- › PROM commands
- › Registry Service Scripts
- › Phispy commands
- › Modeling Scripts
- › Genotype/Phenotype Scripts
- › Workspace Service Scripts
- › Invocation Service Commands
- › Genome Annotation Scripts
- › Ontology Service
- › ID Server Scripts
- › Central Store Scripts
- › Entity Relationship Scripts

Running processes
No processes running

Login to KBase

Username:

Password:

[Forgot password?](#) | [Sign up](#) Cancel Login

Set session to kbasetest

Kbase branded Globus Nexus Login page

<https://gologin.kbase.us/>



KBase
PREDICTIVE BIOLOGY
DOE Systems Biology Knowledgebase

Sign In [Sign Up with Globus Online](#)

Use Your GlobusOnline login [alternate login](#)

Username

Password

[Forgot Password?](#)



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KBase Authentication/Authorization Use Cases

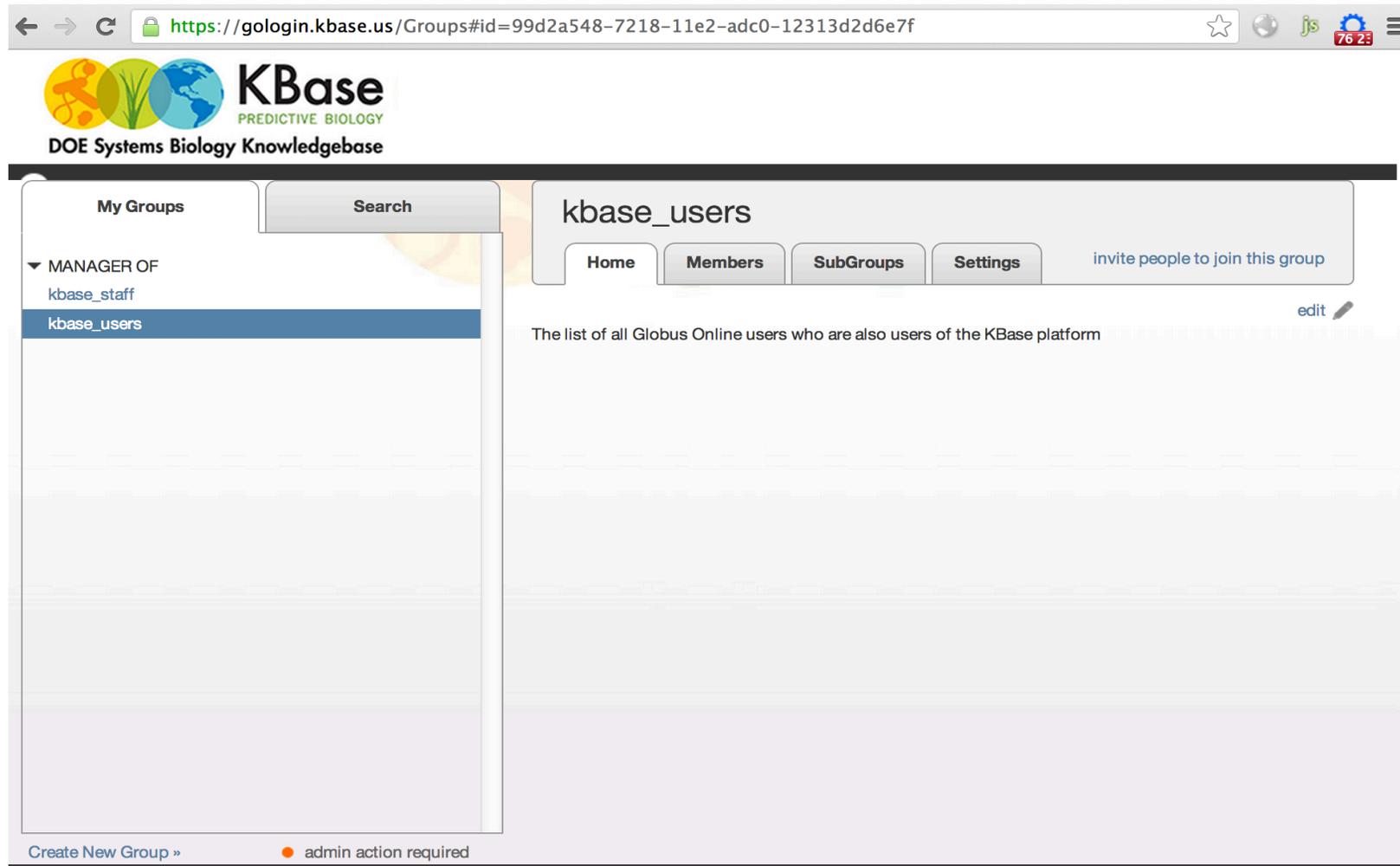
- Users who are not authorized KBase users have restricted access to KBase as a whole
- KBase users want share access to only certain other KBase users

Solved using a combination of NEXUS Groups service to manage groups of users and internal roles service that manages permissions associated with Groups.

The semantics of the group permissions are simply JSON documents, allowing easy integration with JSON Web Tokens for requesting delegated permissions.

KBase Branded Groups management interface

<https://gologin.kbase.us/Groups>



The screenshot shows a web browser window displaying the KBase Branded Groups management interface. The browser's address bar shows the URL: <https://gologin.kbase.us/Groups#id=99d2a548-7218-11e2-adc0-12313d2d6e7f>. The page header features the KBase Predictive Biology logo and the text "DOE Systems Biology Knowledgebase".

The main content area is divided into two sections. On the left, under the heading "My Groups", there is a search bar and a list of groups managed by the user. The groups listed are "kbase_staff" and "kbase_users", with "kbase_users" selected. Below this list is a "Create New Group »" link and a note "admin action required".

The right section displays the "kbase_users" group page. It has a navigation bar with tabs for "Home", "Members", "SubGroups", and "Settings", along with a link to "invite people to join this group" and an "edit" link. Below the navigation bar, there is a description: "The list of all Globus Online users who are also users of the KBase platform".

Ongoing Collaborative Work

- **Globus Online Groups callbacks and KBase internal permissions**
Globus Online has provided support for callbacks so that when there are changes to the members or creation of new groups within Globus Online, a callback can be used to notify KBase that updates need to be pulled. Feature exists in Globus, but needs to be integrated into KBase permissions service
- **CORS support in NEXUS REST Service**
CORS is the officially supported method for cross domain browser requests. Complex, modern browser applications pretty much require this to operate cleanly
- **Integration of Globus Online File transfer service with Kbase data stores**
Globus Online has a very useful service for transferring large files. Kbase hopes to integrate the file transfer services with its file storage service

- Use core GO transfer service on the backend as a the core data movement engine
 - Integration with SHOCK
<https://github.com/MG-RAST/Shock>
 - Use the GO REST API to enable seamless data movement

Acknowledgements

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To learn more about KBase, such as how to become a collaborator or attend upcoming training sessions, please visit www.kbase.us or email us at outreach@kbase.us.