Introduction to SciTokens

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On behalf of the SciTokens Team

https://www.scitokens.org

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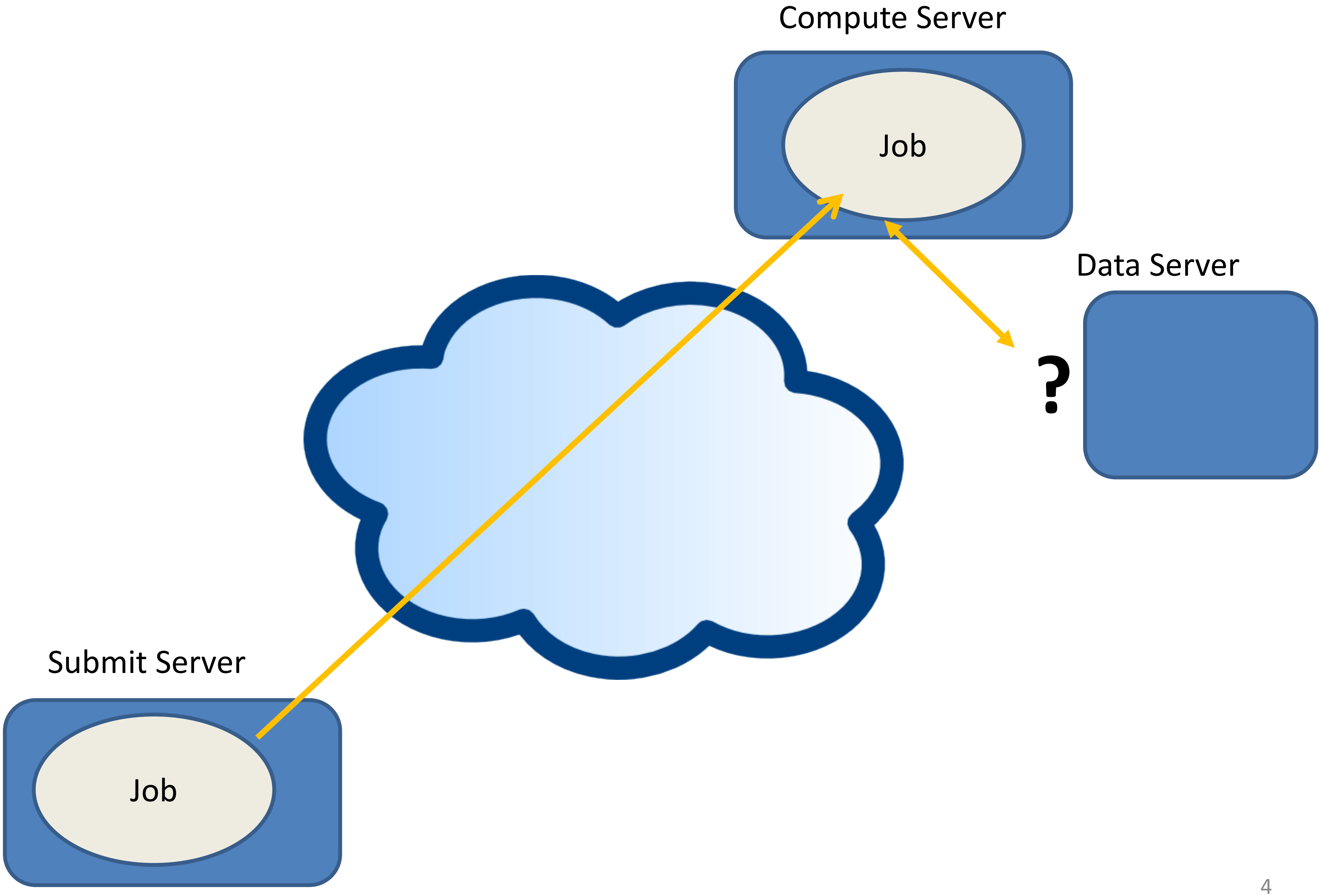
SciTokens: Federated Authorization Ecosystem for Distributed Scientific Computing

- The SciTokens project, started July 2017, aims to:
  - Introduce a ***capabilities-based* authorization infrastructure** for distributed scientific computing,
  - provide a **reference platform**, combining a token library with CILogon, HTCondor, CVMFS, and Xrootd, AND
  - **Deploy this service** to help our science stakeholders (LIGO and LSST) better achieve their scientific aims.
- In this presentation, I’d like to unpack what this means

A common grid computing scenario

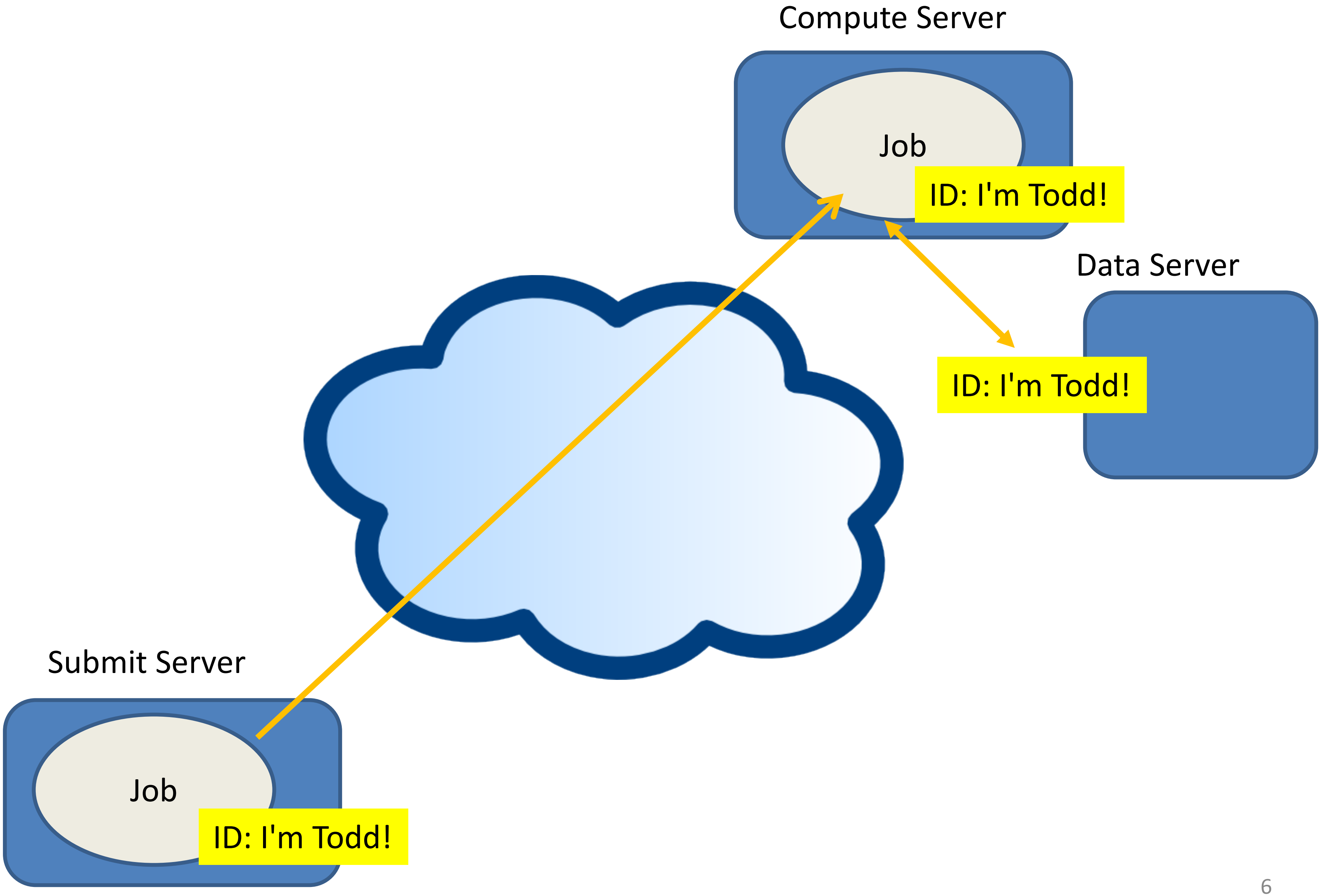
- Scientist submits a compute job
- This compute job is scheduled and ultimately starts running on some server out in the grid (or cloud, or HPC center)
- The job requests to read (and/or write) data from some remote data storage service

How should the storage service validate the job's request to access the data?


Compute Server
Job
Data Server
?
Submit Server
Job

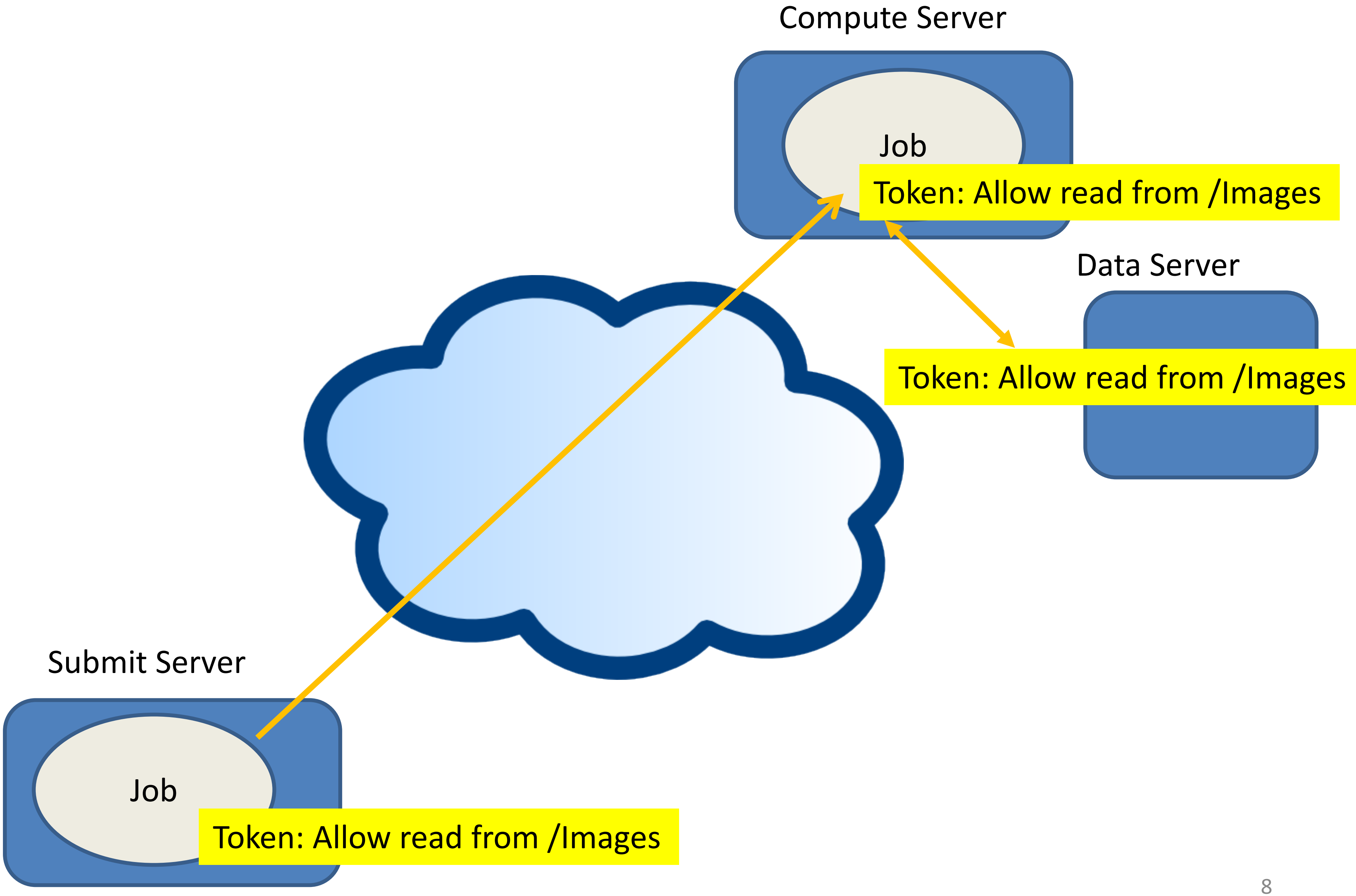
Identity & Impersonation-based Authorization Infrastructure w/ Certs

- Common grid solution used today: *identity* and *impersonation* via X.509 certificates.
  - Each user is assigned a grid certificate providing you with a globally-recognized identification.
  - The grid proxy, shipped with the job, allows a third party to impersonate you, (ideally) on your behalf.
  - The remote service maps your identity to some set of locally defined authorizations.
- Not ideal for a few reasons: Not least privilege (what if identity is stolen?), global identity complicates life…


Compute Server
Job
ID: I'm Todd!
Data Server
ID: I'm Todd!
Submit Server
Job
ID: I'm Todd!

Capabilities-based Authorization Infrastructure w/ tokens

- We want to change the infrastructure to focus on *capabilities*!
  - The tokens passed to the remote service describe what authorizations the bearer has.
  - For traceability purposes, there may be an identifier that allows tracing of the token bearer back to an identity.
  - Identifier != identity. It may be privacy-preserving, requiring the issuer (VO) to provide help in mapping.
- Example: "The bearer of this piece of paper is entitled to read image files from /LSST/datasets/DecemberImages".



Compute Server

Job

Token: Allow read from /Images

Data Server

Token: Allow read from /Images

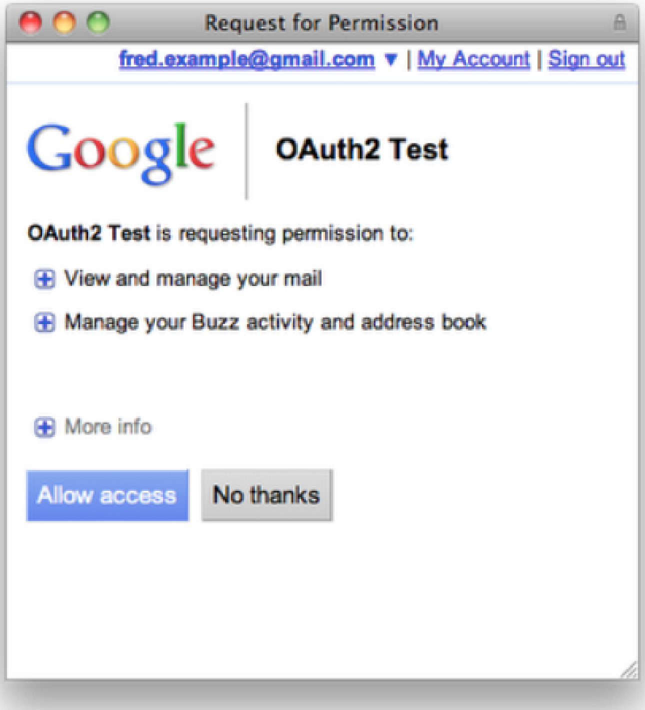
Submit Server

Job

Token: Allow read from /Images

The rest of the world uses capabilities!

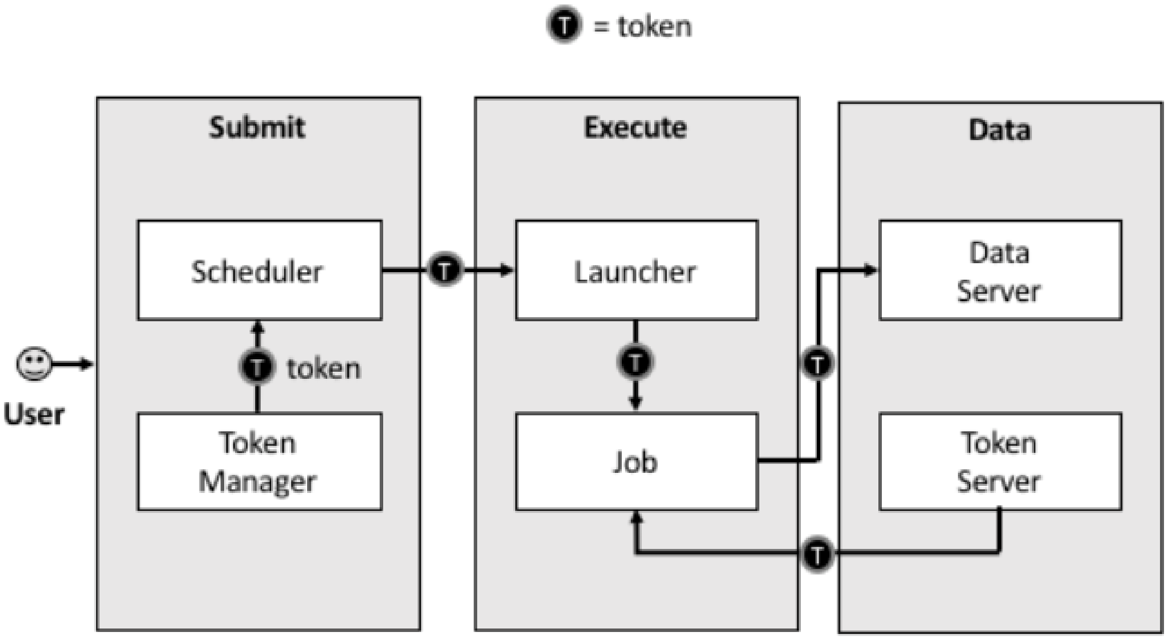
- The rest of the world uses capabilities for distributed services.
  - The authorization service creates a token that describes a certain capability or authorization.
  - Any bearer of that token may present it to a resource service and utilize the authorization.
- The primary way this is implemented is through OAuth2.
- When you click “allow access” on the right, the **client** at “OAuth2 Test” will receive a token. This token will permit it to access the listed subset of Google services for your account.
- OAuth2 is used by Microsoft, Facebook, Google, Dropbox, Box, Twitter, Amazon, GitHub, Salesforce (and more) to allow distributed access to their identity services.



OAuth2 Test is requesting permission to:

- ⊞ View and manage your mail
- ⊞ Manage your Buzz activity and address book

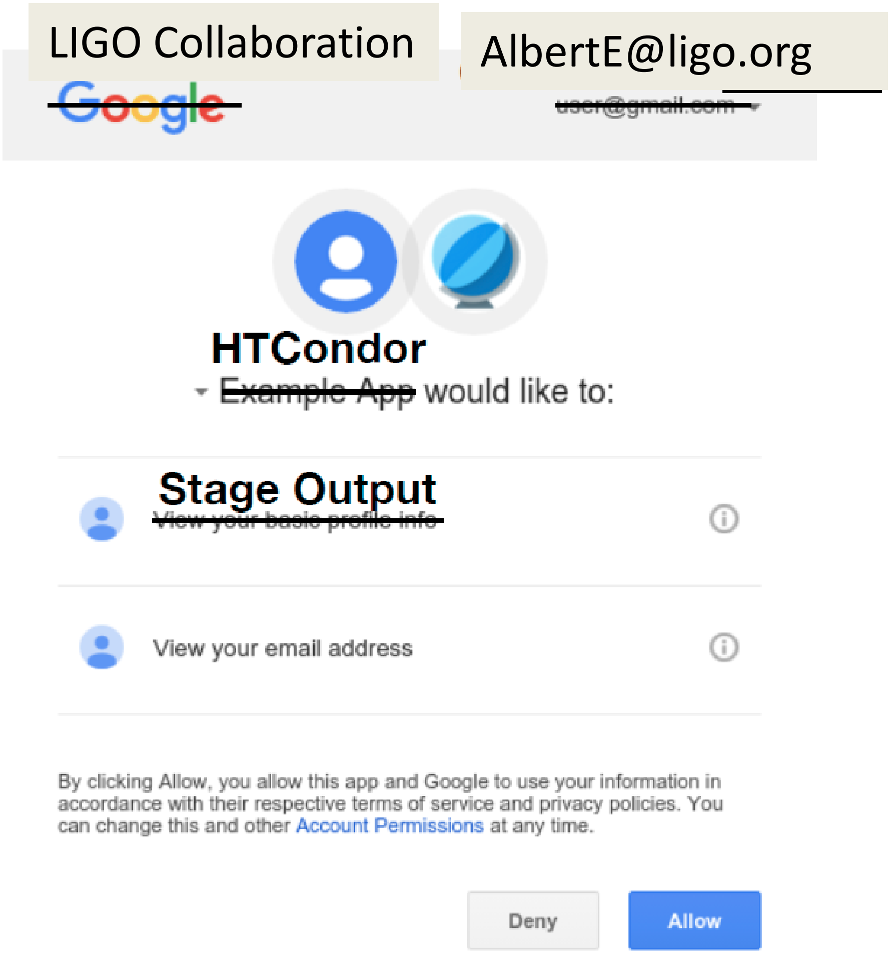
SciTokens Project Reference Platform



- SciTokens team working to integrate an OAuth2 client into HTCondor submit host, and enhance OAuth2 at CILogon.
- HTCondor being enhanced to manage the token lifetime (refreshing as needed), possibly attenuating it, and delivering to the job.
- Data services (CVMFS, Xrootd) are being enhanced to allow read/writes utilizing tokens instead of grid proxy certificates.

End-Goal will look like this

- The first time you use HTCondor, you navigate to a web interface and setup your desired permissions.
  - On every subsequent job submission, HTCondor will transparently create the access token for you. *User sees nothing.*
- Replace LIGO, usernames, permissions as desired.
- Goal: our first use of OAuth will be to send job output to Box.com storage



LIGO Collaboration

~~Google~~

AlbertE@ligo.org

~~user@gmail.com~~

HTCondor

~~Example App~~ would like to:

Stage Output

~~View your basic profile info~~

View your email address

By clicking Allow, you allow this app and Google to use your information in accordance with their respective terms of service and privacy policies. You can change this and other Account Permissions at any time.

Leverage Relevant RFC Standards

- We don’t exist in a vacuum, we'd rather adopt existing industry standards than create new ones.
- Workflows for acquiring/using tokens: **OAuth 2.0**.
  - Think of OAuth2 as describing how the various parties should interact
- Access Tokens: **JWT bearer tokens.**
  - The contents (*claims*) of JWT tokens are not standardized, so we will provide a SciTokens Claims specification and reference library implementation so tokens issued by an organization are understood by a wide variety of resources. SciTokens Library also supports
    - Distributed verification
    - Privacy preservation

TL;DR

- The SciTokens project aims to:
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- Note: SciTokens does not do everything… e.g. SciTokens does not manage your identity (still need an identity management solution), nor does SciTokens provide an authorization service. But it will enable taking existing solutions and scale them out of distributed grid infrastructure.

We are working with a lot of people

- Stakeholders: LIGO, LSST
- Technologies: HTCondor, CILogin, CVMFS, XRootD, FTS
- Discussions and Interest from Open Science Grid (OSG), LHC WLCG (Worldwide LHC Computing Grid), CMS, CERN IT
- You?

Feel free to contact us

- Web Site (includes email lists): https://scitokens.org
- PI/co-PI contact info appears below
- Questions and Thank You!

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