



connect

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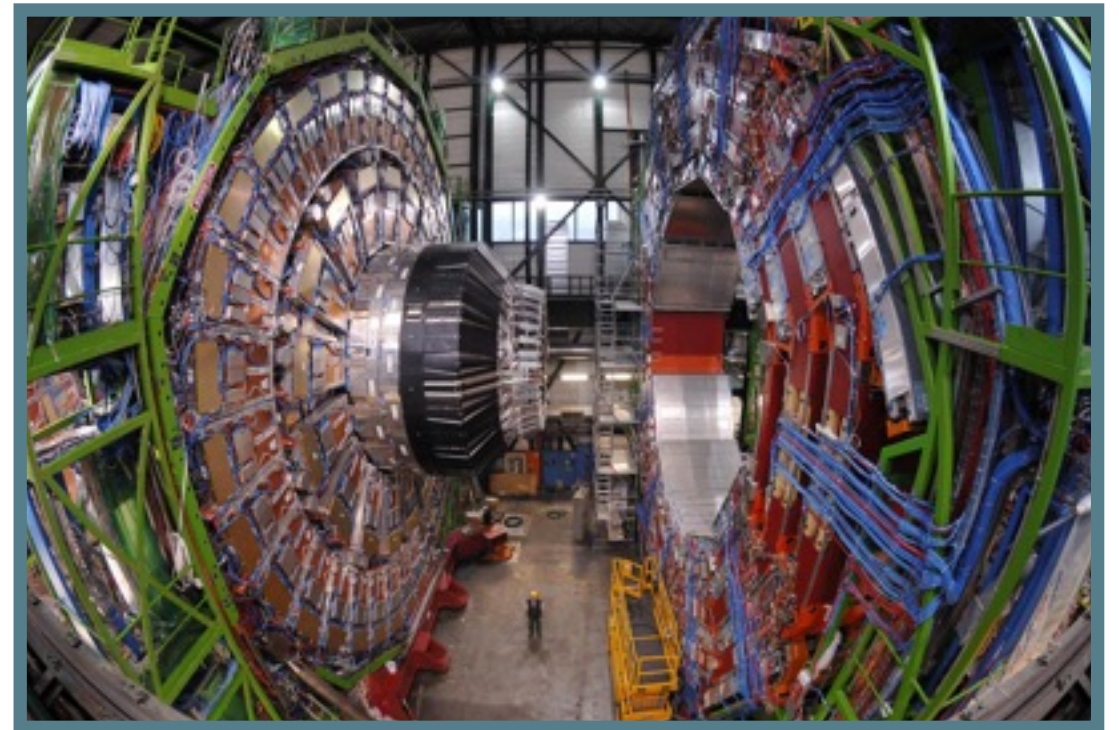
OSG All-Hands Meeting 2016

March 15, 2016

khurtado@nd.edu

Motivation

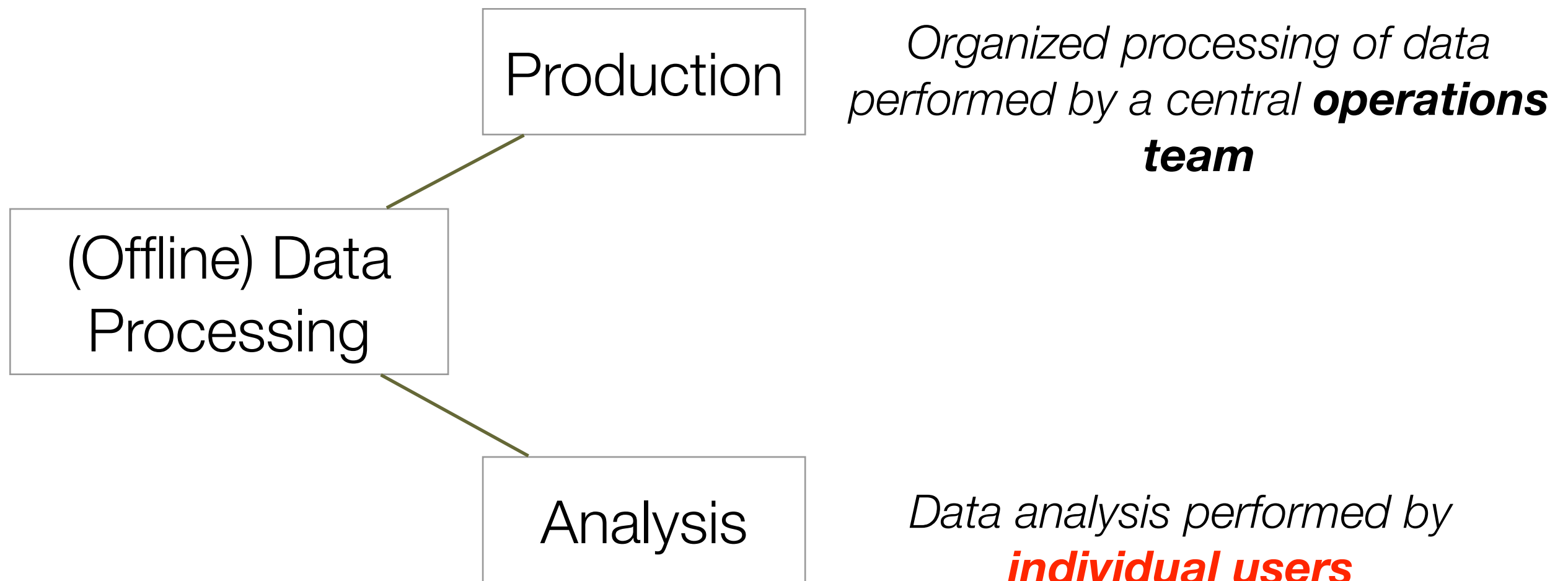
- The Compact Muon Solenoid (CMS) is a multipurpose experiment collecting and analyzing data from proton-proton and heavy ion collisions at the Large Hadron Collider (LHC).
- **From the computing point of view, this translates into tons of data and simulation processes that need to be handled.**



CMS Detector

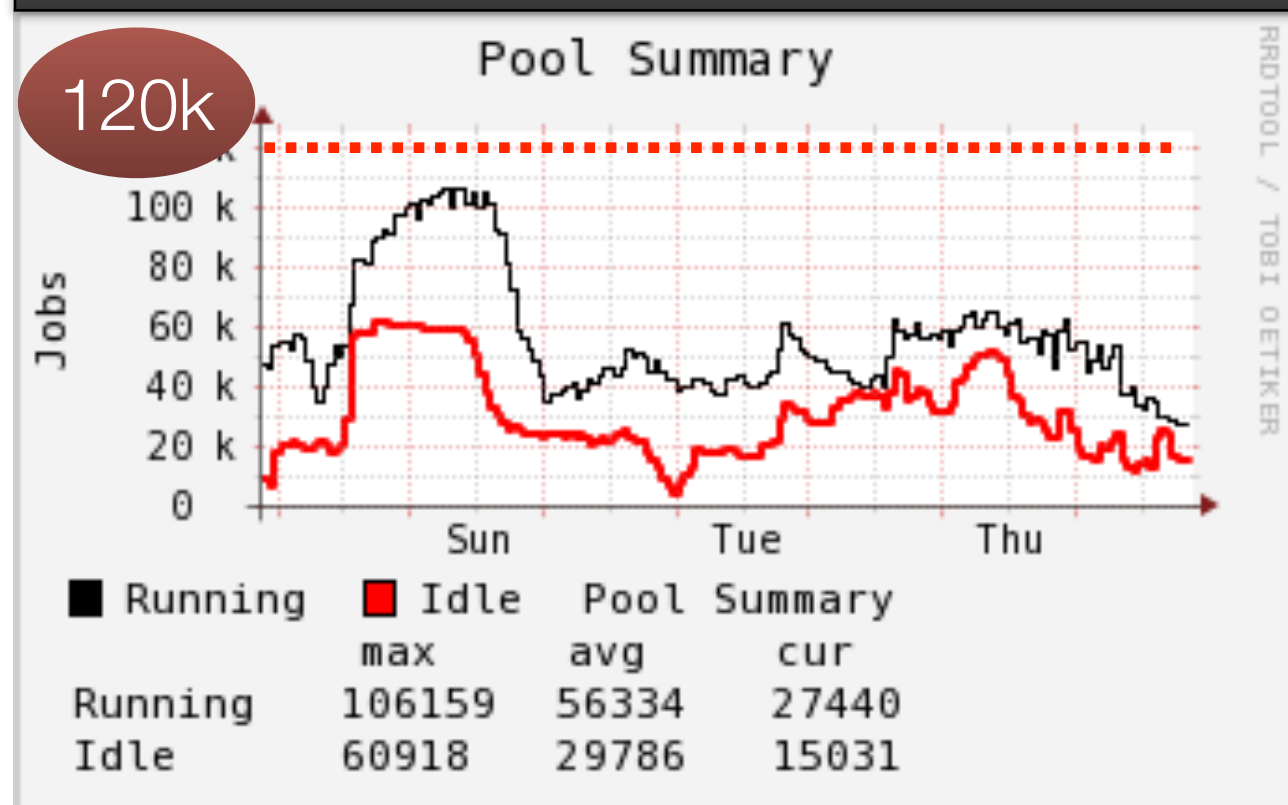
Motivation

Offline Data processing (frequently high throughput and batch-oriented) can in principle be divided in two categories:

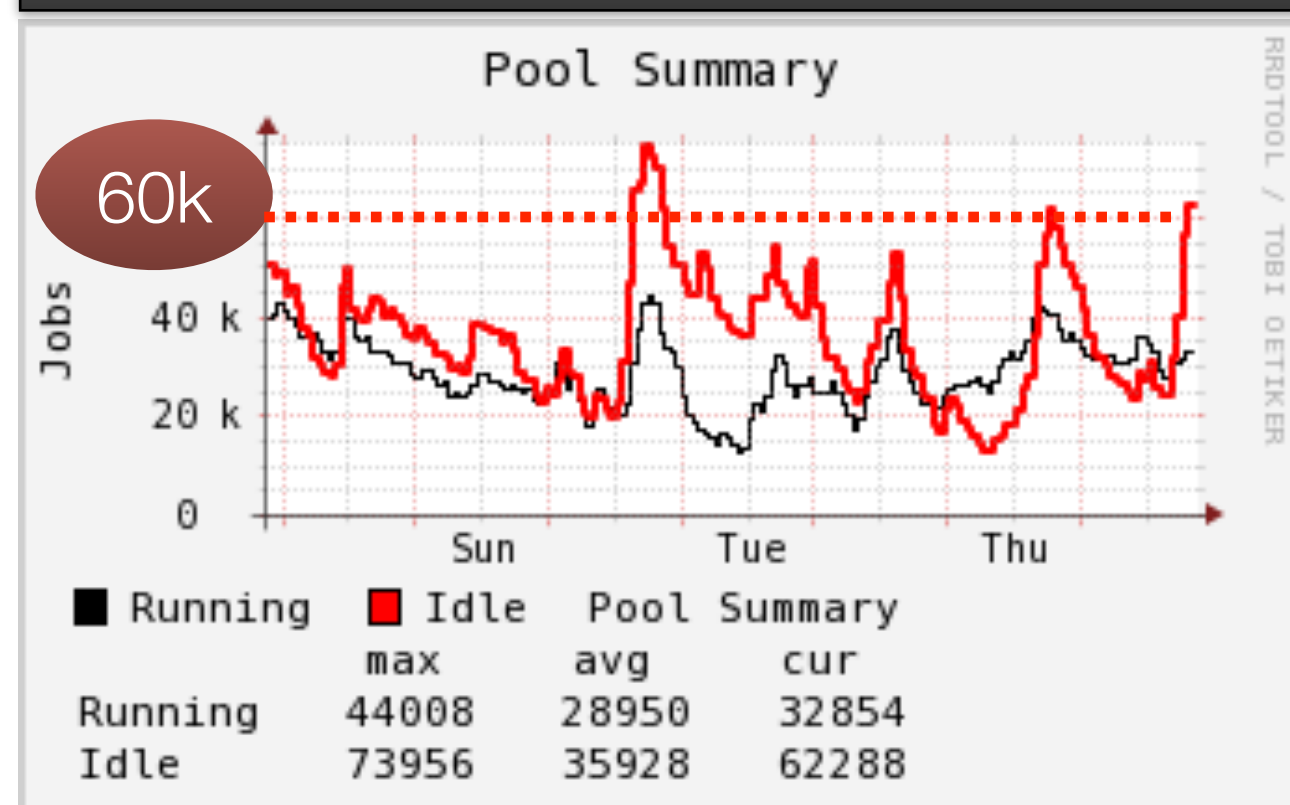


Motivation

Production Summary



Analysis Summary



Over 100K cores globally distributed available for these two categories.

Motivation

Analysis jobs could also be divided in two different workflow sub-categories

Workflows using **cmsRun**: the CMSSW executable for e.g *event processing*

Analysis

*Data analysis performed
by **individual users***

Late-stage analysis workflows: Regular condor-like jobs for e.g making histograms, plots, analyzing trees, etc.

Motivation

Analysis jobs could also be submitted to the CMS batch system

CRAB 3 handles this (CMS Remote Analysis Builder)

Workflows using **cmsRun**: the CMSSW executable for e.g *event processing*

Analysis

Data analysis performed
by **individual users**

CMS-Connect focuses on this category

Late-stage analysis workflows: Regular condor-like jobs for e.g making histograms, plots, analyzing trees, etc.

CMS Connect

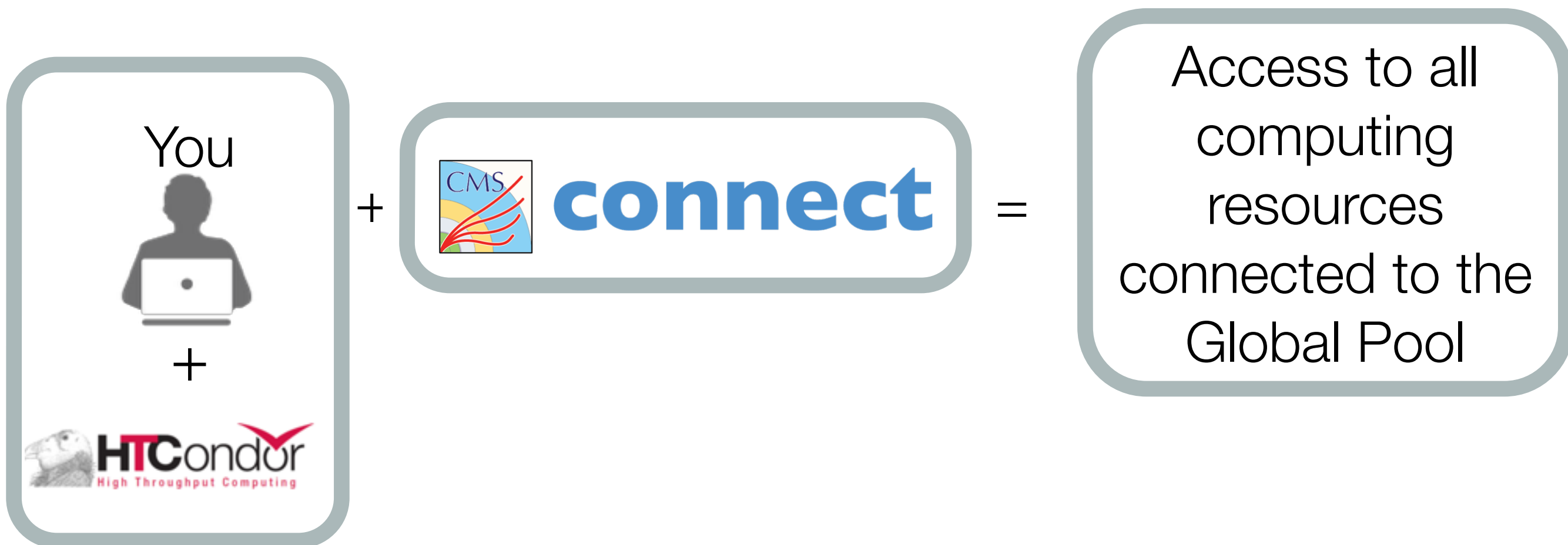
CMS Connect in a nutshell:

A service to provide local-like CMS analysis cluster capability to Institutions for **non-CRAB** workflow jobs.

Status:

- We are in "alpha" stage
 - Can submit HTCondor-like jobs to all CMS resources, including International Sites.
 - **Looking for users familiarized with HTCondor to be the first wave of testers for this service.**

CMS Connect



This is a complement to the existing tools in CMS with access to the same CMS Global resources for condor-like workflows that are frequently submitted to local clusters like e.g the LPC CAF at Fermilab or local University CMS analysis clusters.

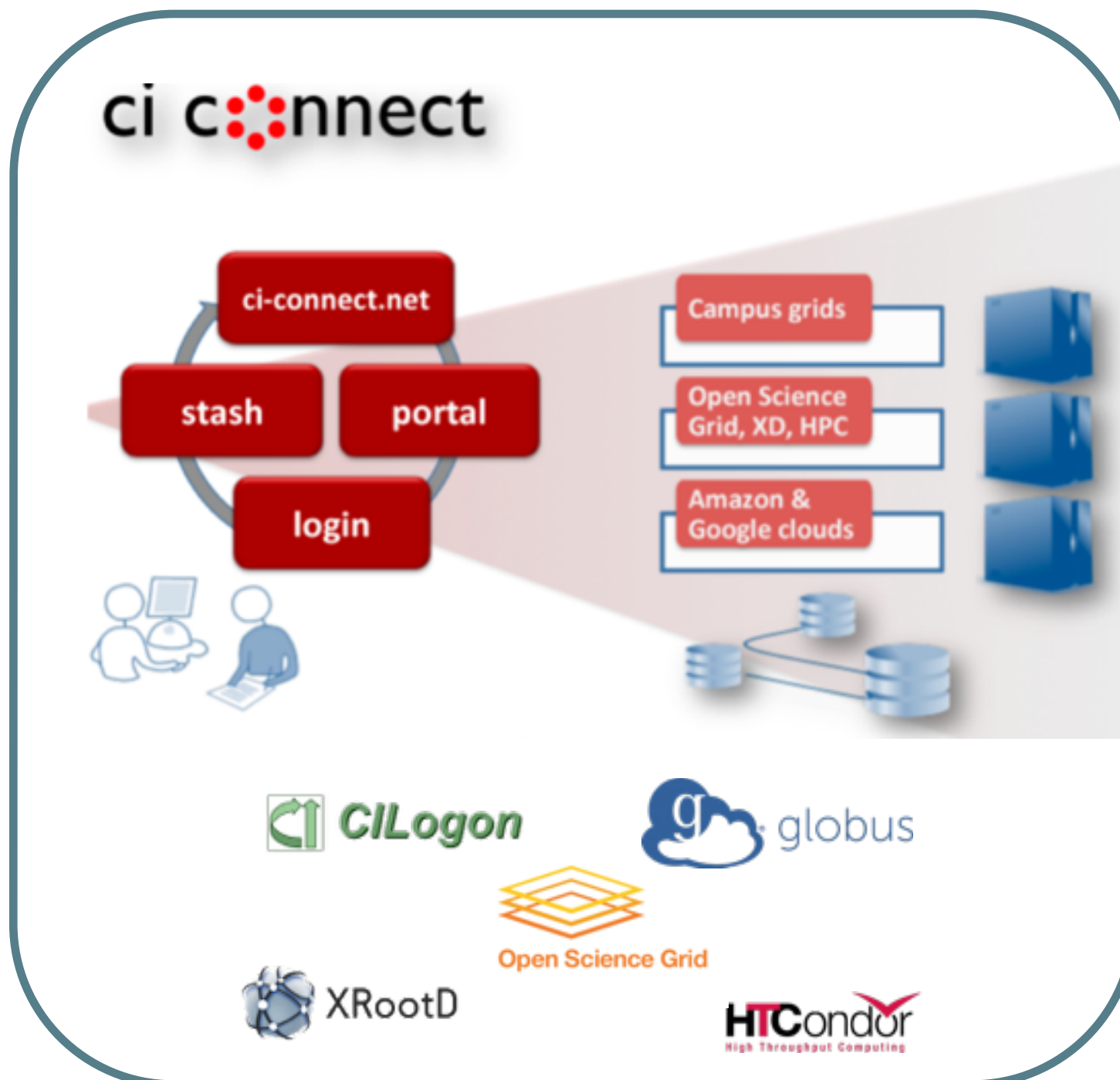
CI Connect

- Based on CI Connect Platform
 - Developed by OSG Area Coordinator of Campus Infrastructures Rob Gardner from U. Chicago.
- Computing services focused on batch-like analysis processing
- Minimal development
 - Use well supported technologies: HTCondor, Globus Online, XRootD, etc.

<http://stash.osgconnect.net/@staff/ci-connect-brief.pdf>

Technology behind CMS-Connect

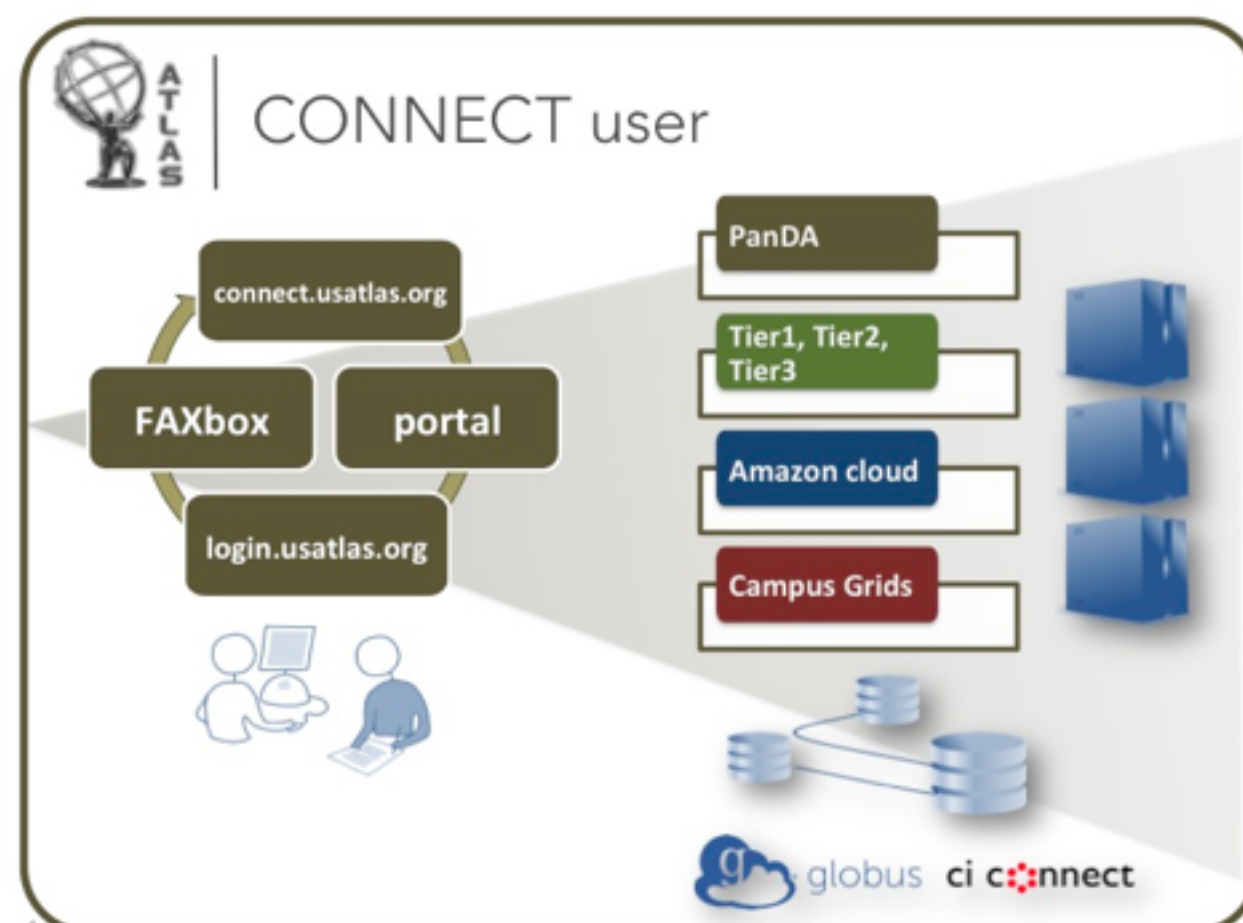
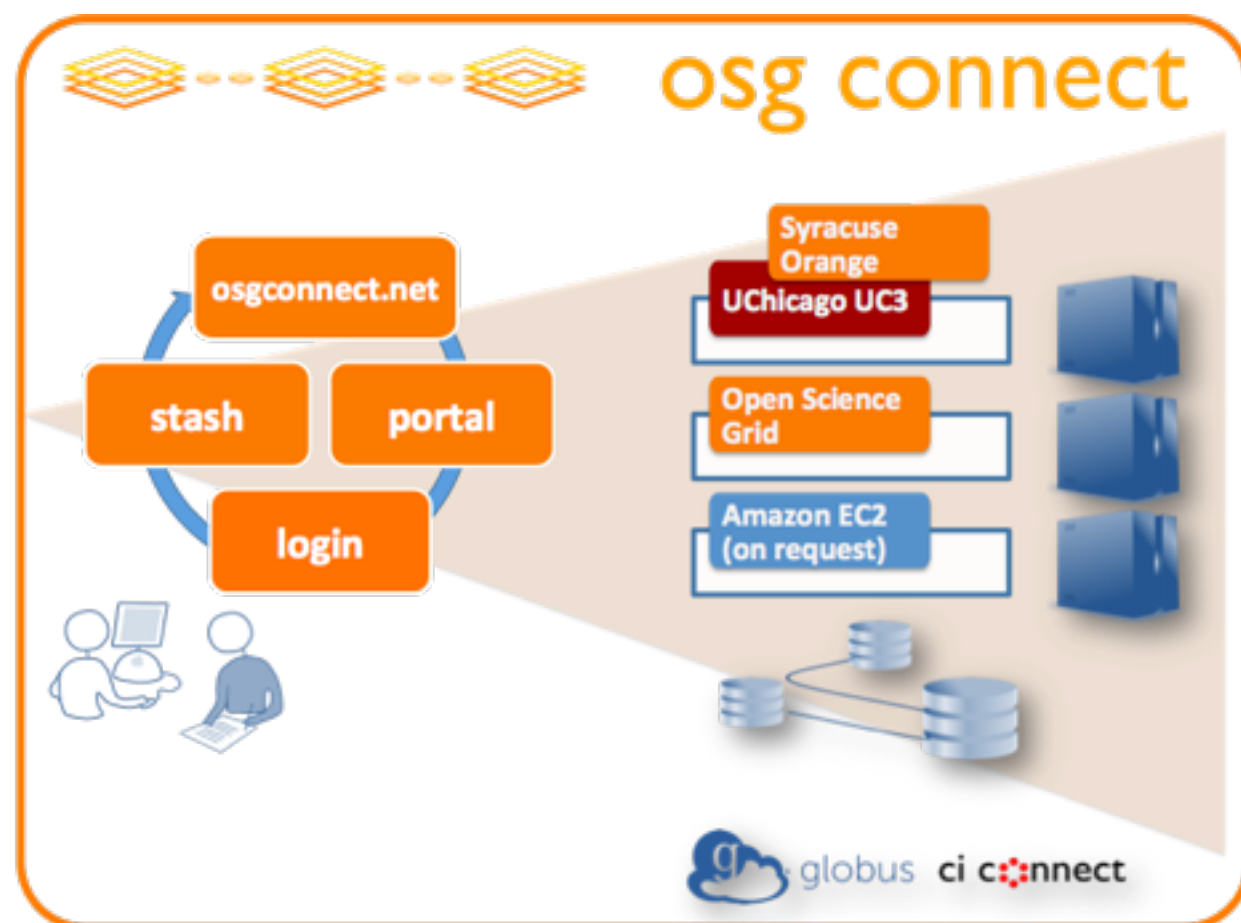
- Based on CI Connect Platform



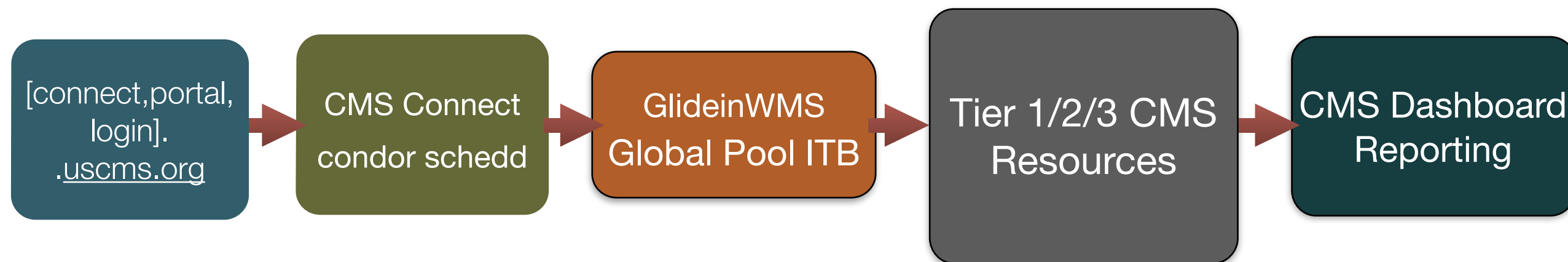
- Globus Platform
 - [CILogon + InCommon + X509]
 - Identity Management.
 - Groups, Projects.
- Login Host
 - Auto provisioning of user accounts.
- Connecting CPU resources
 - HTCondor.
- Distributed Data Access
 - XRRootD, Globus access, http.
- Distributed Software
 - cvmfs

Background

- OSG Connect: The Open Science Grid Connect service.
- ATLAS Connect user: Analysis service for the US ATLAS collaboration.
 - Similar to OSG Connect.
- CMS Connect is a clone of these.



Overview



- **Features:**

- User interacts using regular HTCondor commands
 - *It actually uses a wrapper around regular HTCondor to customize.*
- Jobs are reported to standard CMS monitoring services.

Service Details: Signing up

- Portal: <http://connect.uscms.org/signup>



The image shows a screenshot of the CMS Connect sign-up page. The browser address bar shows connect.uscms.org/signup. The page title is "Sign up for CMS Connect". The main text states: "To join CMS Connect, you will need to possess a Globus ID. the process of creating a Globus ID or using your existing Globus ID". A list of steps is provided:

- **Step 1.** Visit [CMS Connect sign up page](#) (opens a new page) and click on the **Continue** button. This takes you to the Globus sign up page which will let you create a Globus ID or log in if you already have an existing ID.

Below the text, there is a form with a dropdown menu and a "Continue" button. A speech bubble points to the "Continue" button with the text "Click Globus ID". Below the form, there is a note: "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)".

Annotations include:

- A red box around the URL in the top left.
- A brown oval around the "Sign In/Sign Up" link in the top right navigation bar, with an arrow pointing to the "Continue" button in the main content area.
- A red box around the text "Uses Globus ID for registration: An identity provider operated by Globus" on the right side.
- The Globus ID logo at the bottom right.

Service Details: Signing up

- Portal: <http://connect.uscms.org/signup>

Create a Globus ID

The client **Globus Auth** is requesting access to your **globusid.org** account for accessing a third-party website or application located at **auth.globusid.org** account to continue.

Username

username

Not available, but these are: [username1](#) [username2](#)

Names may contain both letters and numbers

NOTE: this is an ID you are creating — not a work email

Password

••••••••

E-mail

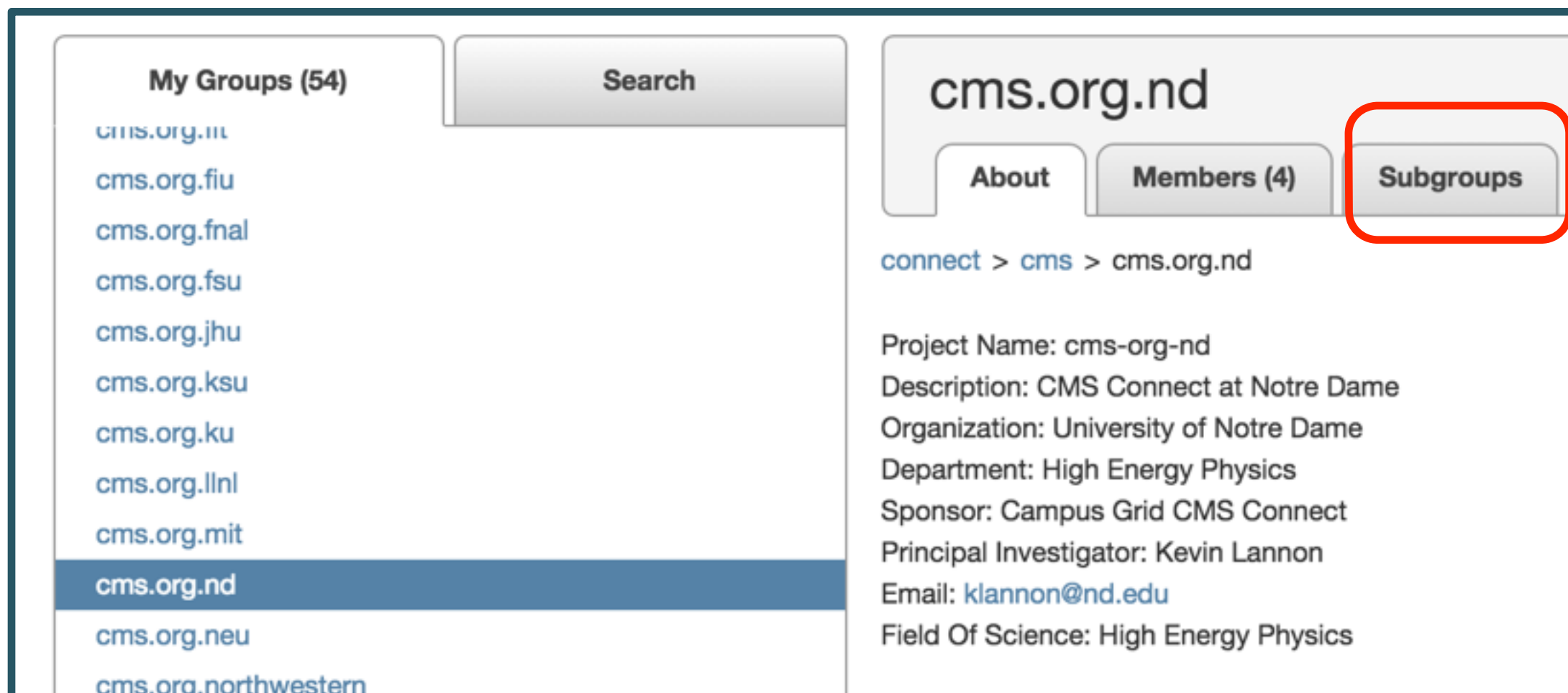
user@myInstitution.edu

- Provide your CMS affiliated University/Institution email.
- After a user is approved, the login account for the submission machine is created within a few hours.

Uses Globus ID for registration:
An identity provider operated by Globus

globus  ID

Service Details: Groups



The screenshot shows a web interface for CMS Connect groups. On the left, a sidebar titled "My Groups (54)" lists various institutions, with "cms.org.nd" highlighted. A "Search" button is located to the right of the sidebar. The main content area displays the details for "cms.org.nd". It features three tabs: "About", "Members (4)", and "Subgroups", with the "Subgroups" tab highlighted by a red rectangle. Below the tabs, a breadcrumb trail reads "connect > cms > cms.org.nd". The group details include: Project Name: cms-org-nd, Description: CMS Connect at Notre Dame, Organization: University of Notre Dame, Department: High Energy Physics, Sponsor: Campus Grid CMS Connect, Principal Investigator: Kevin Lannon, Email: klannon@nd.edu, and Field Of Science: High Energy Physics.

My Groups (54)

- [cms.org.mt](#)
- [cms.org.fiu](#)
- [cms.org.fnal](#)
- [cms.org.fsu](#)
- [cms.org.jhu](#)
- [cms.org.ksu](#)
- [cms.org.ku](#)
- [cms.org.llnl](#)
- [cms.org.mit](#)
- [cms.org.nd](#)**
- [cms.org.neu](#)
- [cms.org.northwestern](#)

Search

cms.org.nd

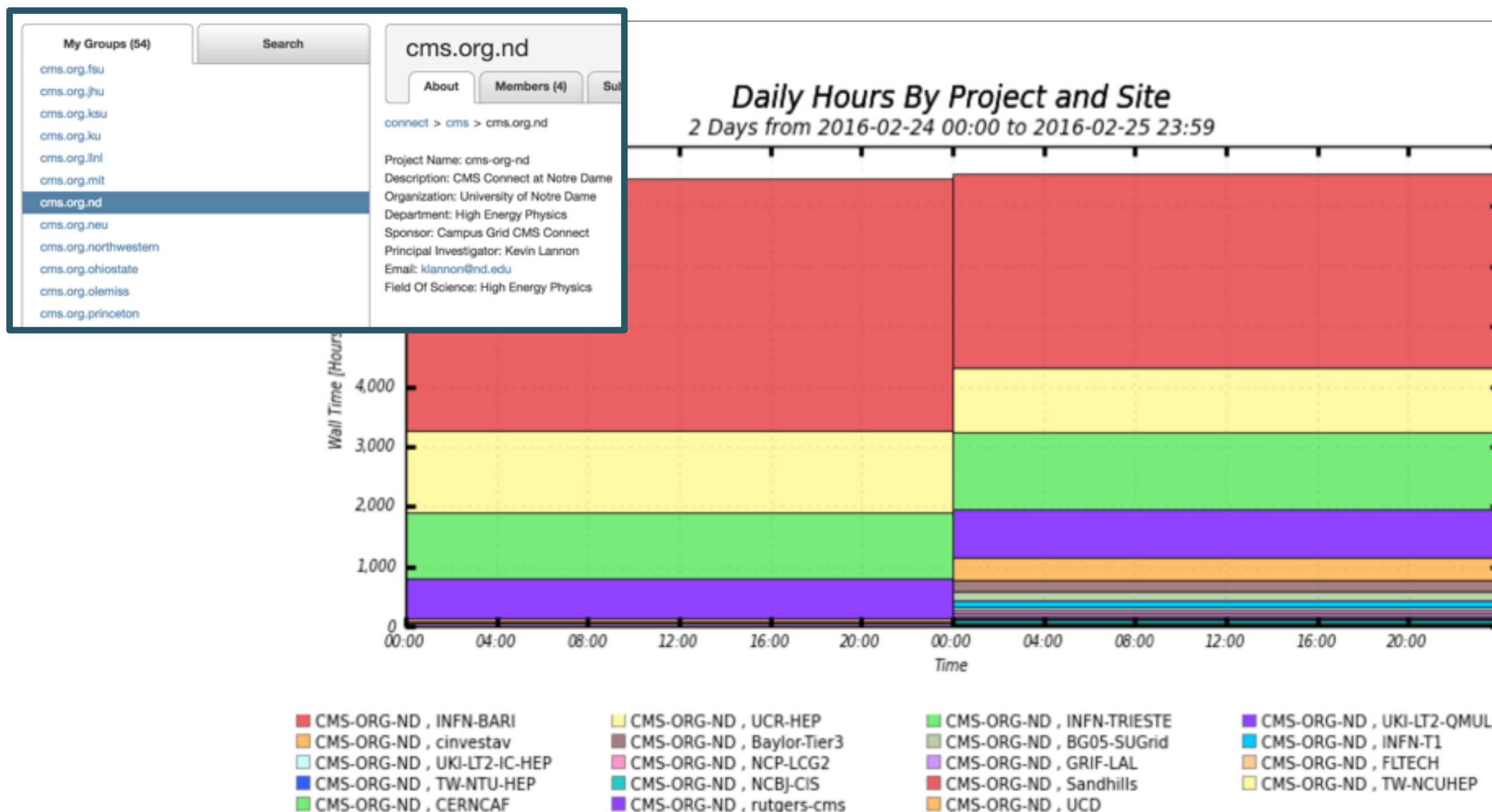
[About](#) [Members \(4\)](#) **[Subgroups](#)**

[connect](#) > [cms](#) > cms.org.nd

Project Name: cms-org-nd
Description: CMS Connect at Notre Dame
Organization: University of Notre Dame
Department: High Energy Physics
Sponsor: Campus Grid CMS Connect
Principal Investigator: Kevin Lannon
Email: klannon@nd.edu
Field Of Science: High Energy Physics

- Institution groups can create their own e.g analysis groups for organization.
- You can see each group activity and resources reached, etc₁₅

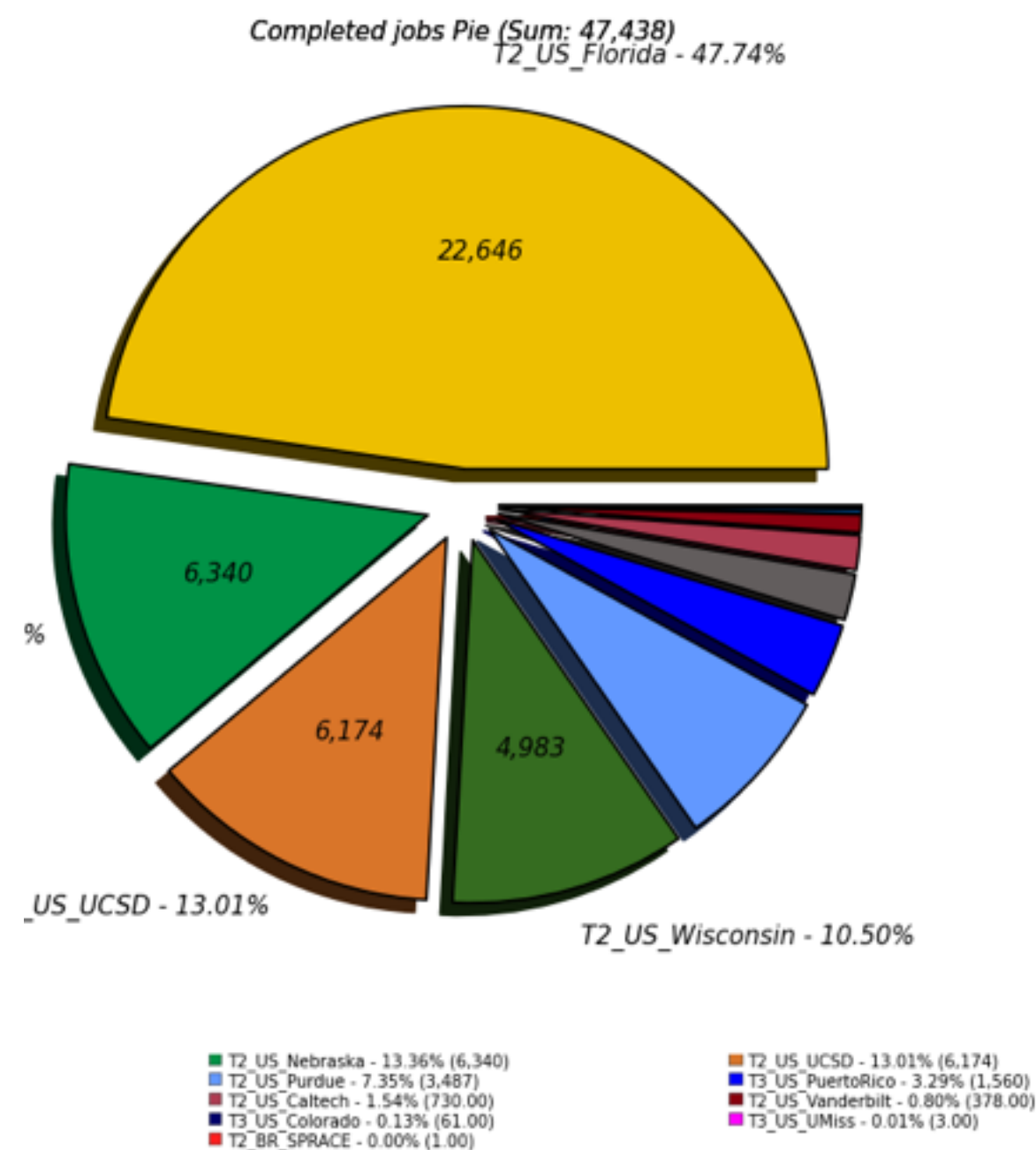
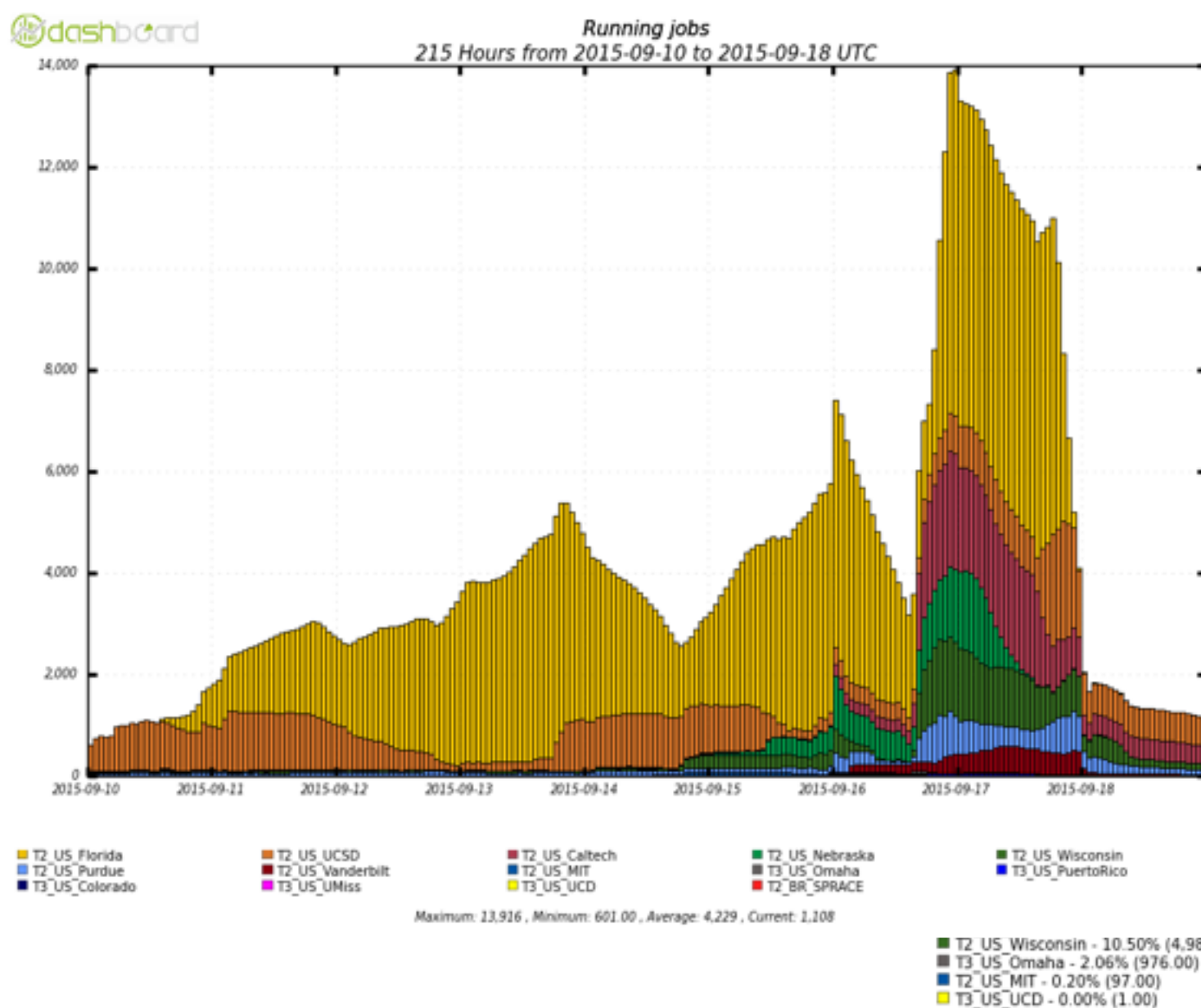
Service Details: Groups



This is an example of CMS-ORG-ND using 19 different Site resources

CMS Dashboard Reporting

T2 US Sites historical view example



Integrated CMS Dashboard monitoring with condor job submission

A Submit Service

- It is “just Condor”.
- Usual ClassAds and HTCondor submit scripts.
- **Users are responsible in terms of workflow tools.**
- Actually uses wrappers around HTCondor to customize.

A Virtual CMS analysis Cluster

- Users should not expect to run jobs with data or software stored in their home directories.
- Instead, use CVMFS, XRootD, HTCondor transfer mechanisms, etc to ensure the worker nodes can read them.

Summary and Future Plans

- At present:
 - CMS Connect provides users with a uniform virtual cluster for CMS analysis with access to global CMS resources.
 - The service is open for testing.
 - **Accepting alpha tester volunteers**

If you are interested in becoming an alpha tester,
contact me: khurtado@nd.edu

Summary and Future Plans

- Future Plans:
 - Add resource targets
 - Institution CMS analysis clusters: T3 sites
 - Currently, we only have the ability to make resources available to anyone on CMS.
 - A mechanism to add a T3 with priority (or exclusive) access to their own users is under development. See this [Twiki](#).
 - OSG Opportunistic resources
 - This is technically straightforward.
 - Campus off-grid resources.

If you are interested in connecting your T3 or off-grid campus resources to CMS Connect, please contact me too:

khurtado@nd.edu

Acknowledgements

- UChicago OSG Team:
 - Rob Gardner
 - Lincoln Bryant
 - Suchandra Thapa
 - Balamurugan Desinghu
 - David Champion



connect



CILogon



globus

Thank you



Open Science Grid



XRootD

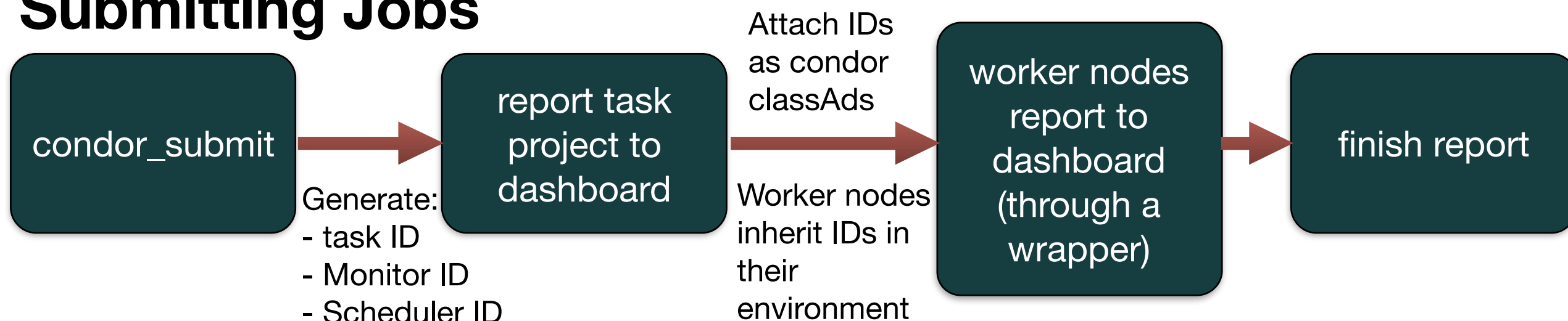
HTCondor
High Throughput Computing

Backup Slides

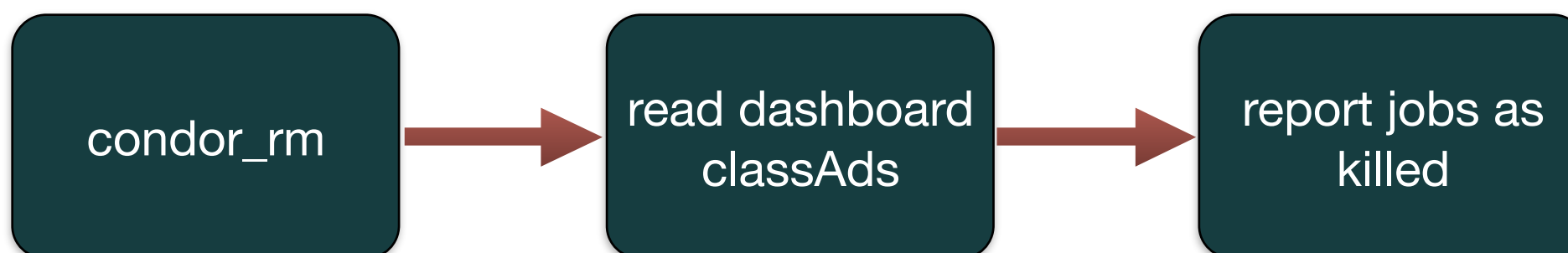
CMS Dashboard Reporting

- Current reporting model:

Submitting Jobs



Deleting Jobs



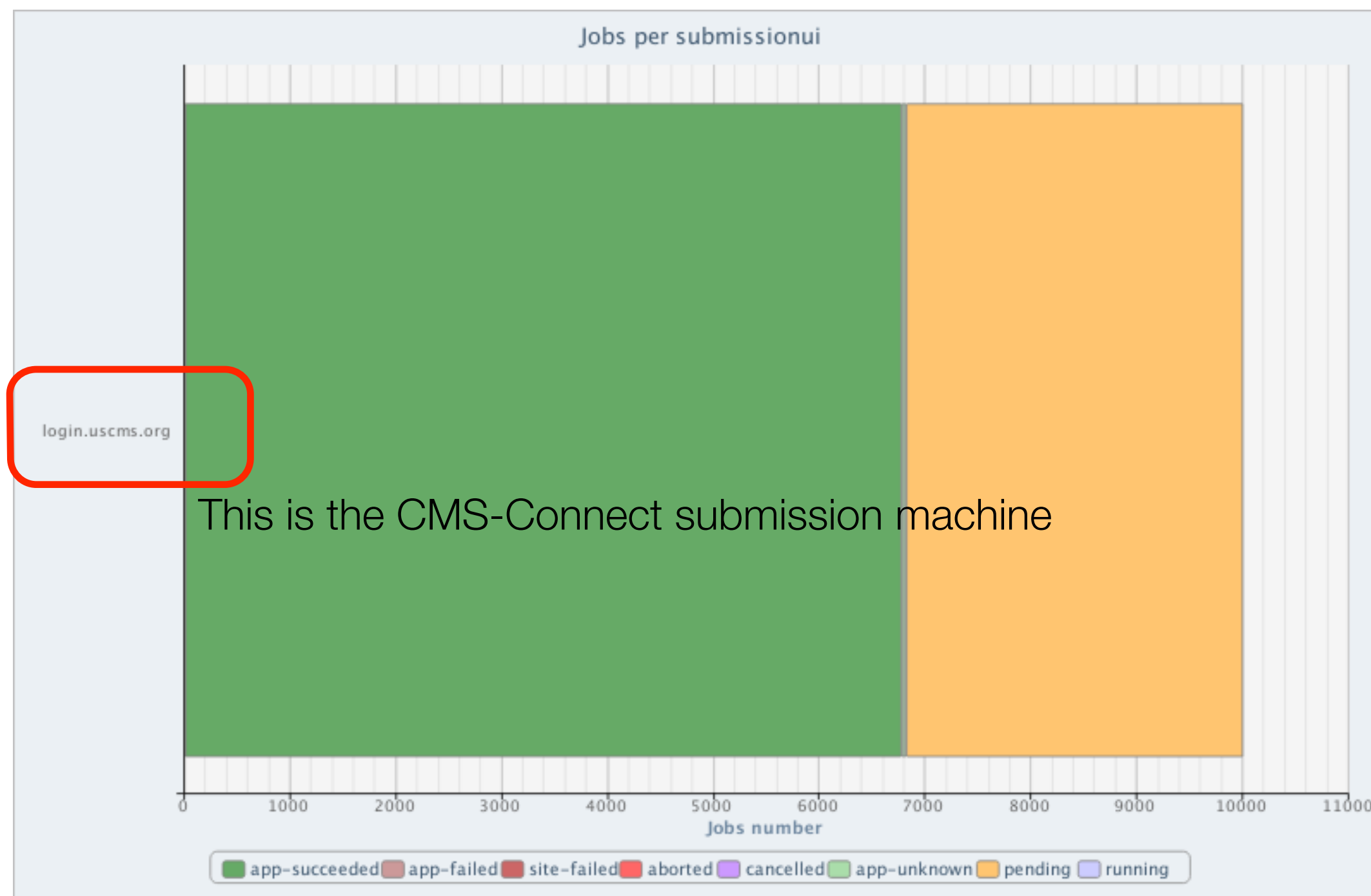
CMS Dashboard Reporting

- CRAB implements CMS dashboard reporting
- As mentioned before, CMS-Connect is oriented for non-CRAB job workflows though...
- But it is important to measure Site Activity coming from CMS-Connect to standard CMS monitoring services.

CMS Dashboard Reporting

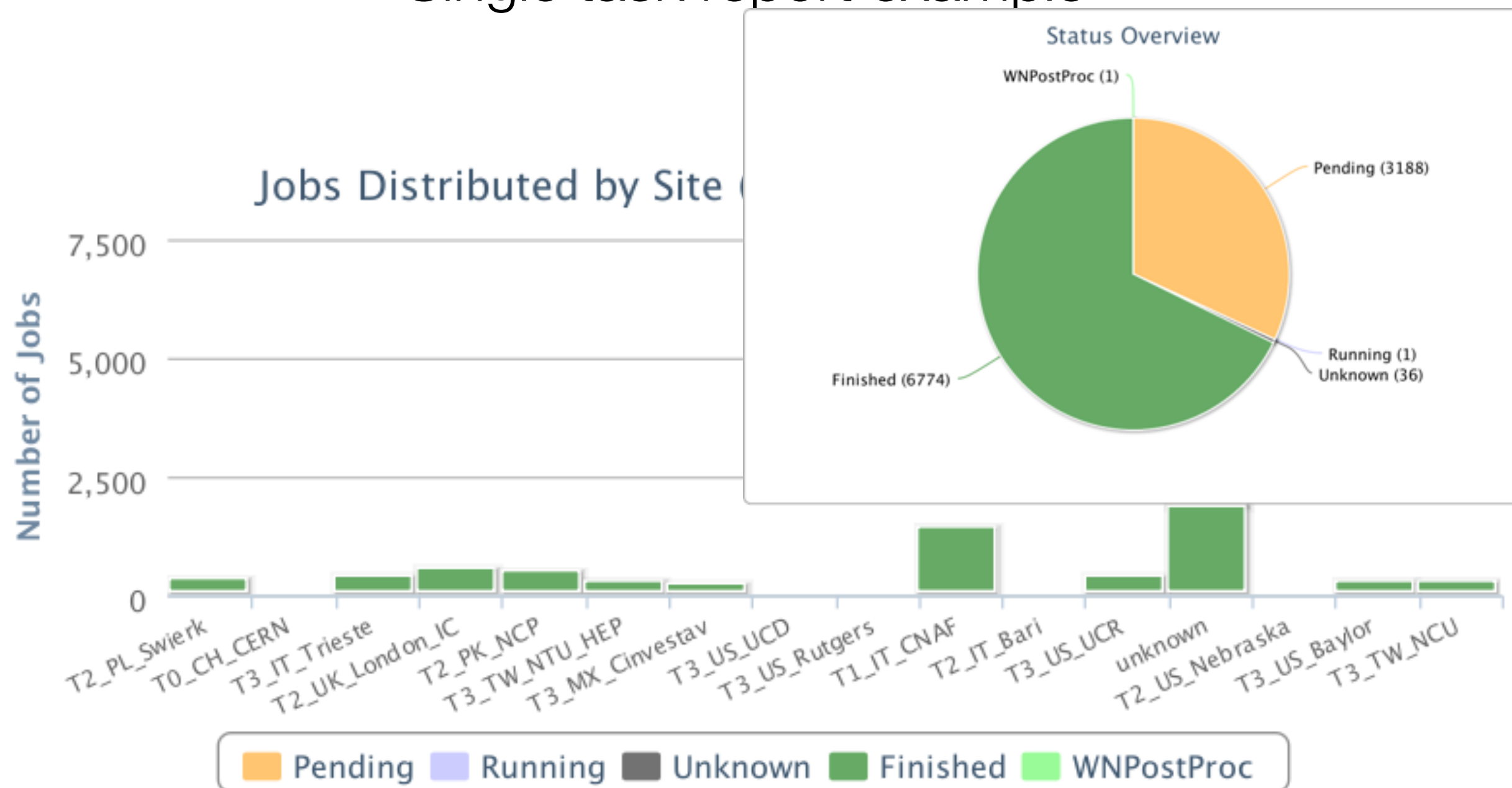
- **What can be reported?**
 - As opposed to regular CRAB workflows, users are responsible in terms of workflow tools, stage-out, error codes, etc.
 - To get the "full dashboard experience", the user can include extra bits in their scripts to inform e.g the number of events in the job, storage element name, stage-out time and exit code, etc.
 - However, even **if the user doesn't do anything, the basic level of details is still handled by the CMS-Connect wrappers**. E.g.- Application times and exit code, hostname, computing element name, etc.

CMS Dashboard Reporting



CMS Dashboard Reporting

Single task report example



CMS Dashboard Reporting

- Condor jobs are submitted with “cmsconnect” as the name of the submission tool.
- **Supporting other submission tools in CMS-Connect**
 - In principle, other submission tools could be used for the user’s convenience too (e.g. grid-control, farmout, lobster, etc).
 - The integrated dashboard would be disabled via the environment variable `CONDOR_CMS_DASHBOARD=False`
 - Such tools would report with their own tool names. A dashboard API would be created in order to see all jobs from all submission tools submitted from CMS-Connect in that case.

Service Details: Stash

- Stash: The OSG Connect storage service
 - Temporary data storage solution.
 - To assist with pre-stage job input data files, write output files for later use, etc
 - Currently no user quota. When space becomes tight, files are removed on a simple least-recently-used basis.

ci c:connect

Support ▾ Resources ▾ Connect ▾ Transfer ▾ khurtado ▾

Search:

Type ▲	Name	Kind	Changed	Size
	chart_pie_1730159.html	text/html	Sat, 03 Jan 2015 11:00	1956
	data_app.tar.gz	application/x-tar	Mon, 05 Jan 2015 13:13	250
	oasis_app.tar.gz	application/x-tar	Mon, 05 Jan 2015 14:51	511
	parrot.tar.gz	application/x-tar	Fri, 06 Mar 2015 18:46	4792.87 k
	pset_tutorial_MC_generation.py	text/x-python	Fri, 06 Mar 2015 18:44	5713
	pset_tutorial_analysis.py	text/x-python	Fri, 23 Jan 2015 17:08	756
	siteconfig.tar.gz	application/x-tar	Fri, 06 Mar 2015 18:49	887

Showing 1 to 7 of 7 entries

generated in 0.994s

Not like CRAB

- “Just condor” also means e.g stage in/out fallback methods depend on the user.
- **Example:**
Copied files via gfal-copy/srm to T2 Nebraska.
Submitted jobs to read files locally at T2_US_Nebraska.

T2_US_Nebraska has different gatekeepers:

-tusker-gw1.unl.edu:9619: Nodes with store local files inside /panfs/panasas (recognized as T3_US_Omaha by dashboard)

-red*.unl.edu:9619: Nodes with store local files in /mnt/hadoop

Not like CRAB

- **Example:**

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-red*.unl.edu:9619: Nodes with store local files in /mnt/hadoop

- Using hardcoded file paths to /mnt/hadoop will fail on tusker* worker nodes (in this case, could be avoided using DESIRED_Gatekeepers)

Jobs sent with DESIRED_Sites="T2_US_Nebraska"					
Id in Task	Appl Status	Appl Exit Code	Grid End Status	Retries	Site
1	Appl Succeeded	0	Done	1	T2_US_Nebraska
2	Appl Succeeded	0	Done	1	T2_US_Nebraska
3	Appl Succeeded	0	Done	1	T2_US_Nebraska
4	Failed	200	Done	1	T3_US_Omaha
5	Failed	200	Done	1	T3_US_Omaha