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Fermilab's data driven approach with Affiliations to drive Science and business processes

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Abstract

Fermilab supports scores of experiments, collaborations, and projects with approximately 5,000 affiliates and users participating throughout the world requiring access to our resources. We started on the journey to associate experiments and collaborations to compute resources using a concept called virtual organization allowing us to automate scientific services provisioning. About four years ago, the science and business areas requested a centralized database for experiments and collaborations. We have expanded the scope to include many other types of affiliation to the laboratory and it now drives data about our affiliates, users, sub-contractors, and other visitors for site access, account and scientific resource access, facility contracts and more. Learn how Fermilab has outlined their roadmap to drive scientific and business processes using configuration data in the Affiliations database. Find out more about what it means and what we have planned next.

Agenda

- Where we started
- Business Needs
- Affiliations Database
- How its used
- Data Driven Approach

Virtual Organizations (VO)

Concept borrowed from Open Science Grid (OSG)

Used it for Fermilab scientific experiment/projects:

- Auto-provisioning of scientific accounts based on VO data
- Manage and provision scientific services automatically based on VO information
- Account authorizations
- Tracking of services provided

The screenshot shows a web interface for managing a Virtual Organization (VO). The header bar includes a back arrow, a menu icon, the text "Virtual Organization E-1071 DUNE (Deep Underground Neutrino Experiment)", and a "Dashboard" link with a key icon. The main form contains the following fields:

- Name:** E-1071 DUNE (Deep Underground Neutrino Experiment)
- Title:** Experiments - Approved
- Map to Lab Affiliation:** DUNE - DEEP UNDERGROUND NEUTRINO EXPERIMENT (with a dropdown arrow icon)
- Virtual Organization Managed By:** Eileen Berman, Thomas Junk, Andrew Norman
- Include in service request menus:** ☒
- Include in access request menus:** ☒
- email:** (empty text field)
- Family:** DUNE (with a dropdown arrow icon)
- Frontier:** Intensity
- Affiliation group:** dune (with a dropdown arrow icon)
- User:** E-1071 DUNE (Deep Underground Neutrino Experiment) (with a dropdown arrow icon)
- Contractor Approvers:** (empty text field)

At the bottom left of the form are "Update" and "Save" buttons. Below the form is a "Related Links" section with links for "Subscribe", "Clone Relationships of", and "Remove Relationships". At the very bottom, a navigation bar shows "Service Commitments", "Users (421)", and "Subscribes to Service (115)".

Business Needs

Provide consistent data for following activities

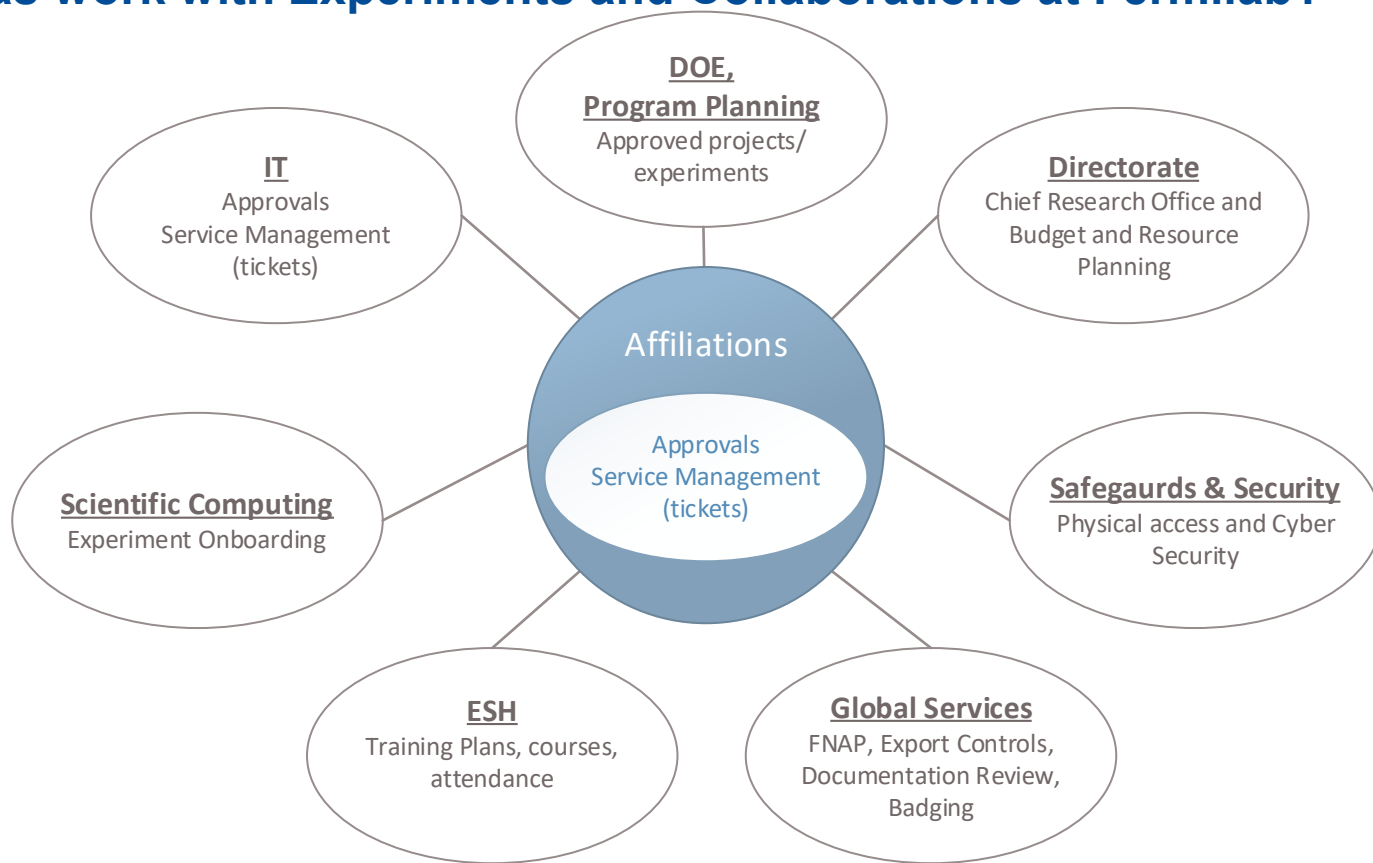
- Data reporting to DOE (experimenters database)
- Point of Contact Approvals
- Organizational, Project, Experiment Approvals
- Foreign National Access Program (FNAP), Foreign National Security Plans (FNSP)
- Host information
- Physical site access

We saw value in the approach that the VOs had taken and decided to repurpose / reengineer the idea of VOs providing a broader concept.

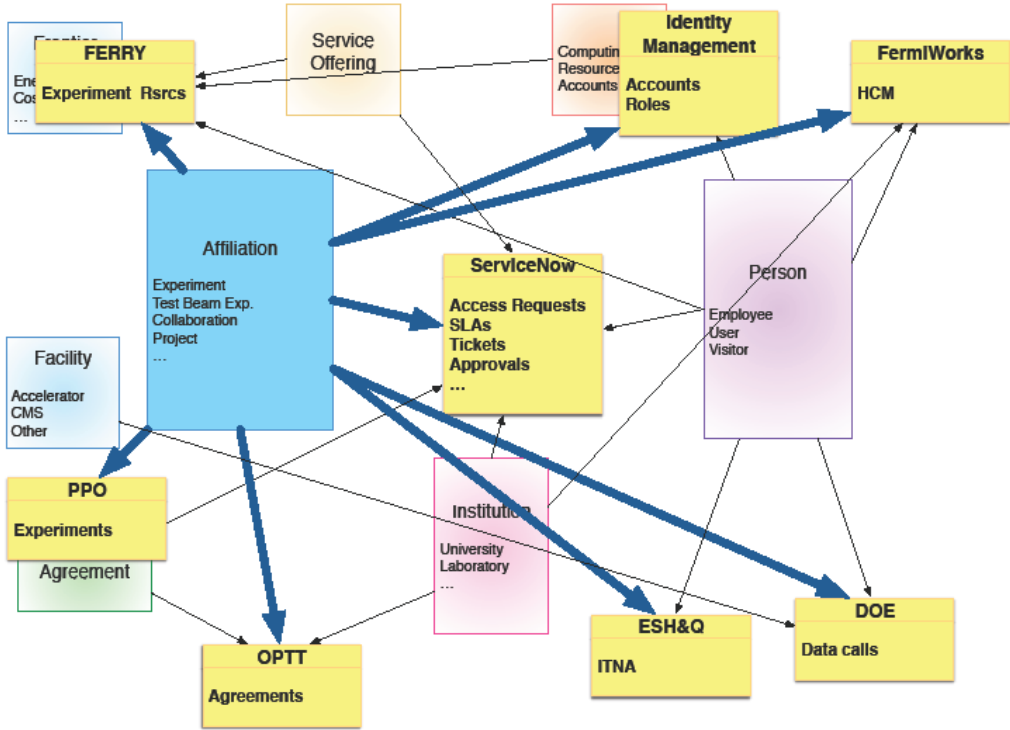
VOs grew into what we call the Affiliations Database

Affiliations Database –

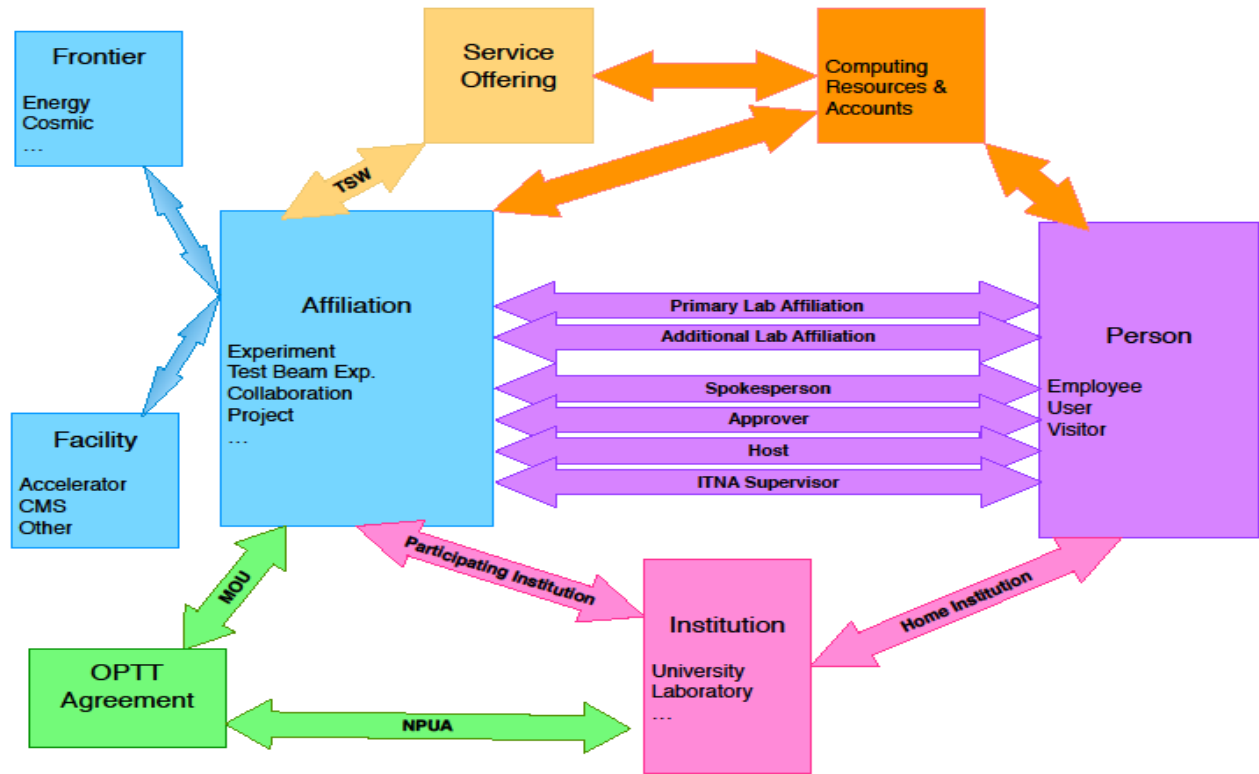
What areas work with Experiments and Collaborations at Fermilab?



Systems that Need Affiliation Data



Relationships Between Affiliations and Other Data



What is the Affiliation Database?

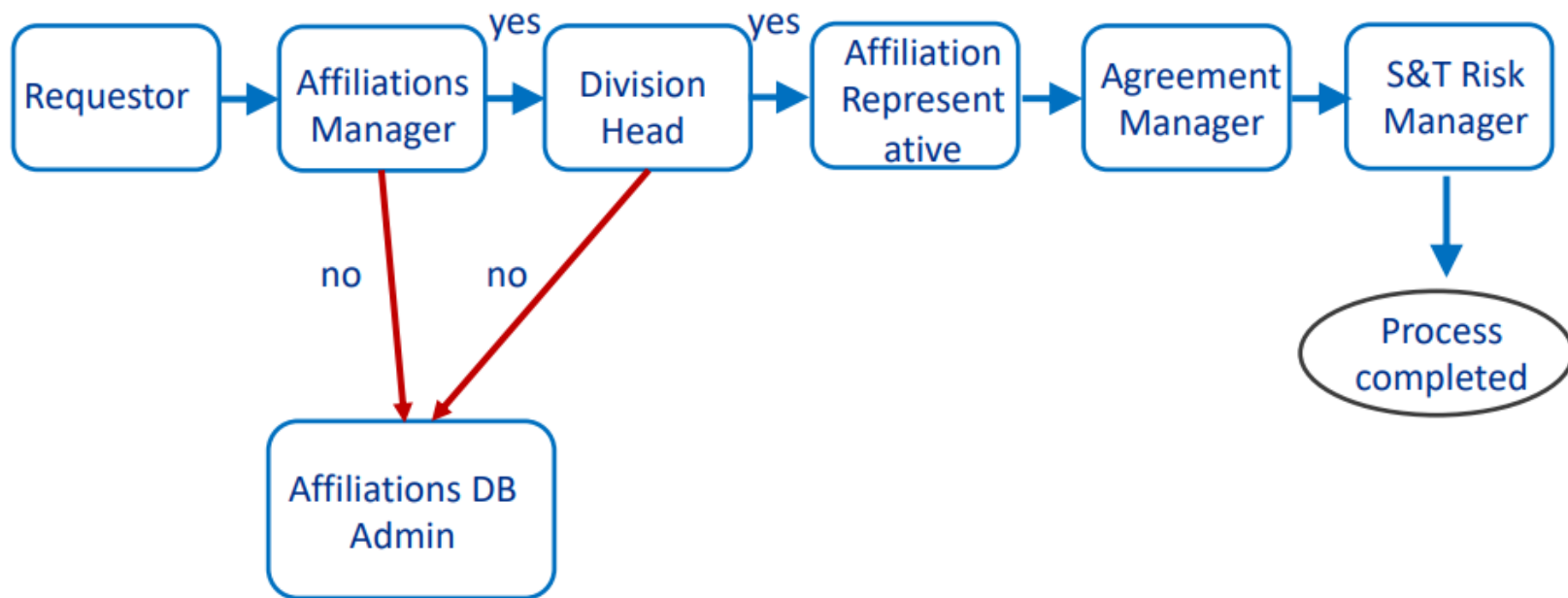
- A centralized location where you can find key information
- Data management is decentralized with IT oversight.
 - Roles: Affiliations Manager, Division Head, Affiliation Representative, Agreement Manager, S&T Risk Manager

- Affiliation Data:

Affiliation Name	Experiment Number	Spokespersons
TRAIN supervisors	Hosts	Offline and On-line run coordinators
Agreement types	S&T Assignment	Computing approvers

- Replace the various disconnected spreadsheets, emails and phone calls that are currently being used to track this information

Process overview for creating a new Affiliation



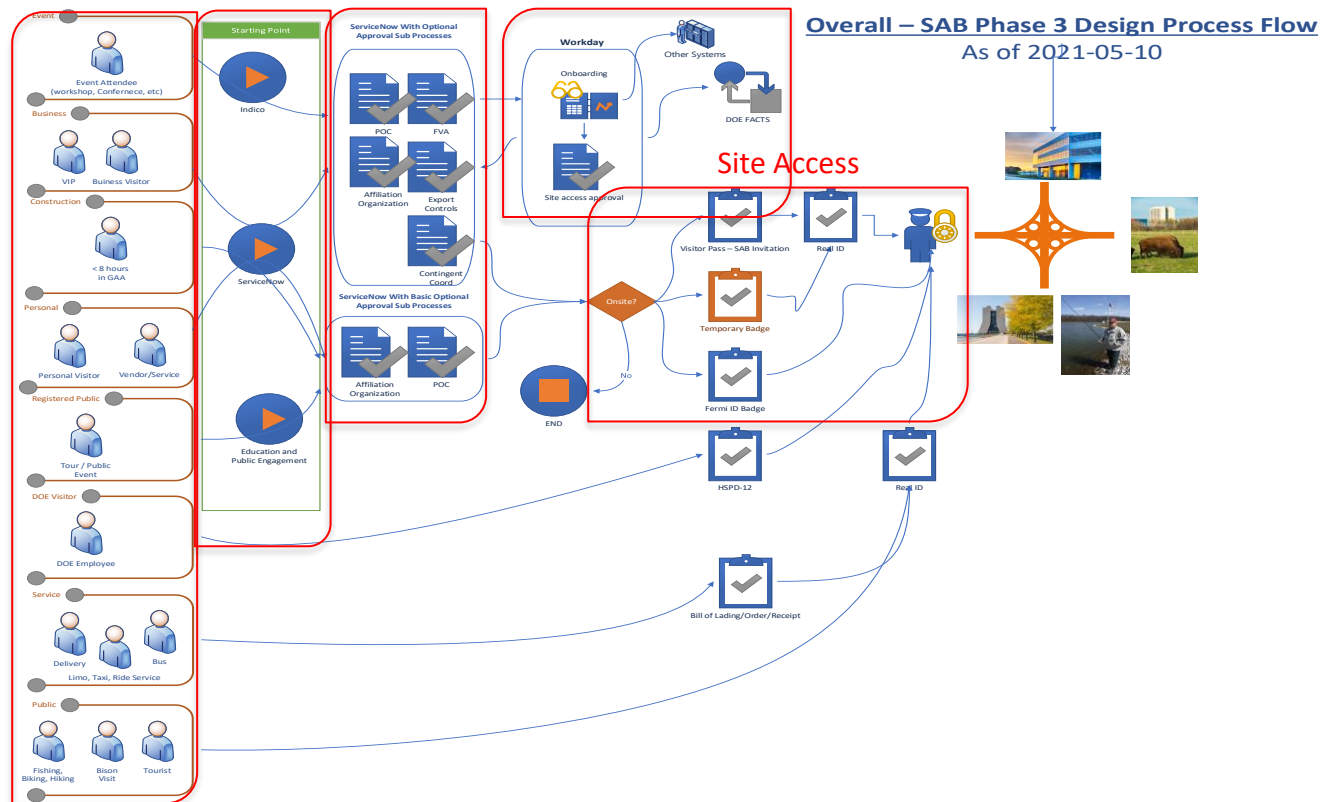
Fermilab's Site Access Program

How Affiliations support the business:

- Original SAB Charge: Who's here and why are they here?
- Goals
 - Common way to request access (single point of entry) -
 - Standard set of rules / workflow “easily” adjustable
 - Implement necessary repositories to support site access rules
 - Do all of this in a secure way

Original Site Access Charge & Goals

Visit Types Entry Points Workflow Conditional Data Flow



Data Driven Process

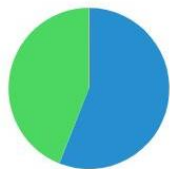
The process and workflow is a rules-based engine that takes into consideration several factors. Most significantly:

- **Who they are:** Person Data (citizenship, country of birth, etc....)
- **What organization are they representing** while at Fermilab: Home Institution, Supplier Company, other
- **What are they coming for:** Affiliation* – Fermilab Project, Experiment, Organization, Event
- **Is there an Agreement in place:** Some circumstances require formal Agreements between the Home Institution and Fermilab and/or the Affiliation
- **When is access requested:** Specifically, the duration of access
- **Where will access be needed:** Locations and Applications

Affiliation Data

Group by:

Category	Count	Percentage
Onsite	16,254	56.07%
Offsite	12,710	43.93%
Pending	19	0.07%
Empty	4	0.01%

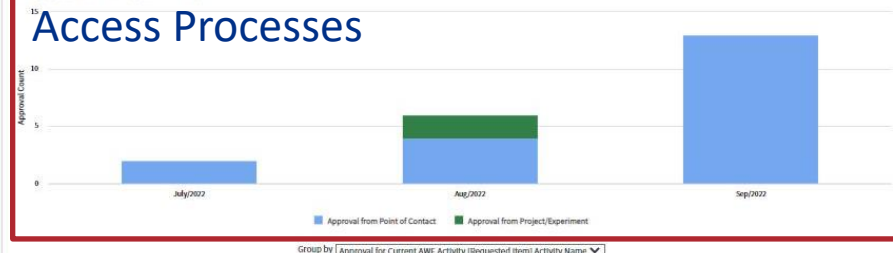


■ Onsite = 16,254 (56.07%) ■ Offsite = 12,710 (43.85%) ■ Pending = 19 (0.07%) ■ (empty) = 4 (0.01%)

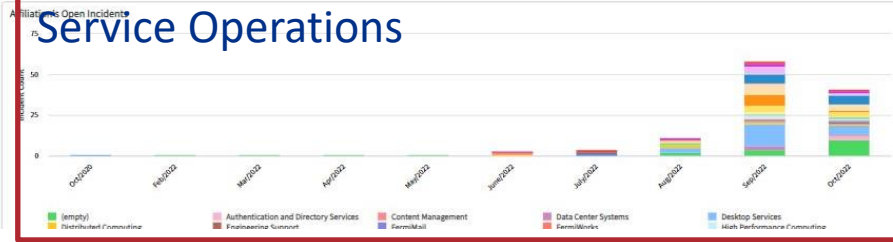
Group by Person Primary position Access type ▼

Access Processes

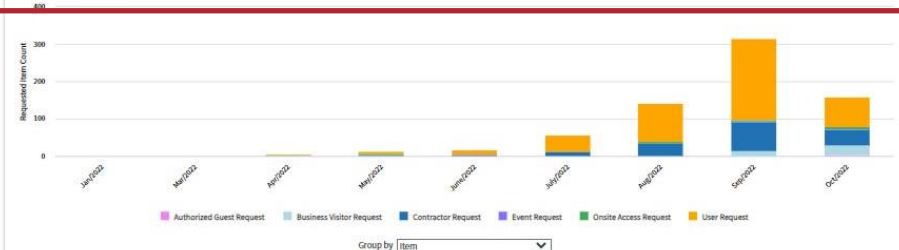
Month	Approval from Point of Contact	Approval from Project/Experiment	Total
July 2022	2	0	2
Aug 2022	4	2	6
Sep 2022	14	0	14



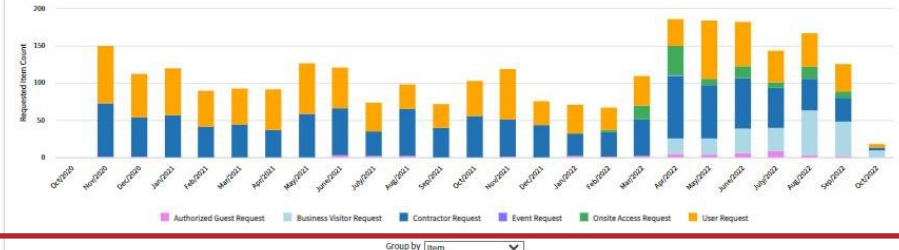
Service Operations



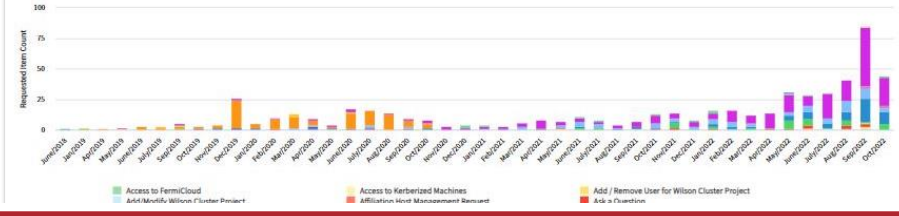
400



200



100

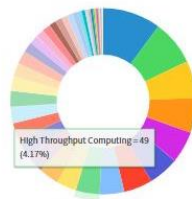


VO Data Reporting

Affiliation

All

Services Subscribed by Affiliation



Scientific Collaboration Tools = 119 (10.34%)
High Throughput Computing = 49 (4.17%)
Central Web Hosting = 29 (2.47%)

Scientific Linux Systems Engineering = 92 (7.84%)
DAQ and Engineering = 41 (3.49%)
High Performance Computing = 28 (2.39%)

Scientific Server Infrastructure = 76 (6.47%)
Scientific Database Applications = 41 (3.49%)
Identity = 27 (2.3%)

Content Management = 71 (6.09%)
Physics and Detector Simulation = 38 (3.24%)
Scientific Production Processing = 21 (1.79%)

Scientific Data Storage and Access = 65 (5.54%)
Scientific Software Infrastructure = 38 (3.24%)
FermiMail = 18 (1.53%)

Distributed Computing = 62 (5.28%)
Authentication and Directory Services = 35 (2.98%)
Database Hosting = 17 (1.45%)

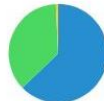
Scientific Data Management = 59 (5.03%)
Service Desk = 34 (2.9%)
Desktop Services = 17 (1.45%)

Network = 50 (4.26%)
RETIRED Service Offerings = 32 (2.73%)
Account Management = 14 (1.19%)

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Group by Business Service Service Area

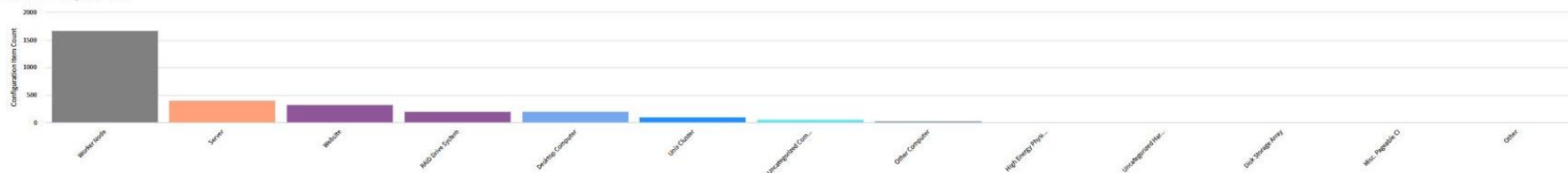
Grants



Web Site Owner = 88 (62.80%)
Content Review = 51 (36.43%)
Miscellaneous Web Grant = 1 (0.71%)

Group by Grant

Affiliations's Configuration Items



Summary

Having the affiliation database is a customization that is very powerful and is serving us well. Better analytics, automation, reporting, etc. And it's consistent and easy (ish) to use by services owners and management types : both lab employees and experiment coordinators.

Data driven application

- Risk management in a centrally managed system
- Allows for data driven versus human decisions
- Roll up location risks, applications, etc.
- S&T matrix to identify affiliations for Export controls and FNAP

Affiliations Database centralized configurations

- Automated Data flow
- Eliminated paper and Improved data quality
- Reduced redundant data entry
- Reporting improvements – DOE Data calls, DOE User Report, Collaboration Service

Reporting / Dashboards

About the Authors

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BIO: Tammy leads the Enterprise Architecture team at Fermilab. She strives to enable Fermilab's IT organization to meet their strategic initiatives and continuously improve the business of IT. She has been essential in developing the strategic partnerships between IT and the laboratory. Tammy has worked in information technology for more than 25 years and has experience in several industries and has managed all aspects of IT organizations including Technology, Applications, IT business process management, quality management, business continuity, information security and risk management processes.

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BIO: Craig is a member of the Enterprise Architecture team at Fermilab. He enjoys working with the business and IT to identify solutions that meet each other's needs. Craig's recent work includes leading Fermilab's HCM platform, providing technical leadership for the Site Access and Badging Program, and performing architectural planning work for smaller projects. Craig has been with Fermilab for over 21 years filling various roles including developer, system, business and functional analyst, group lead for collaboration, reporting, and messaging applications, Workday platform lead, project management, and now enterprise and solution architecture