A Common Engineering Environment (CEE) Implementation

Sandia National Laboratories
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Sandia's Computing & Network Services Center has a relatively mature CEE project
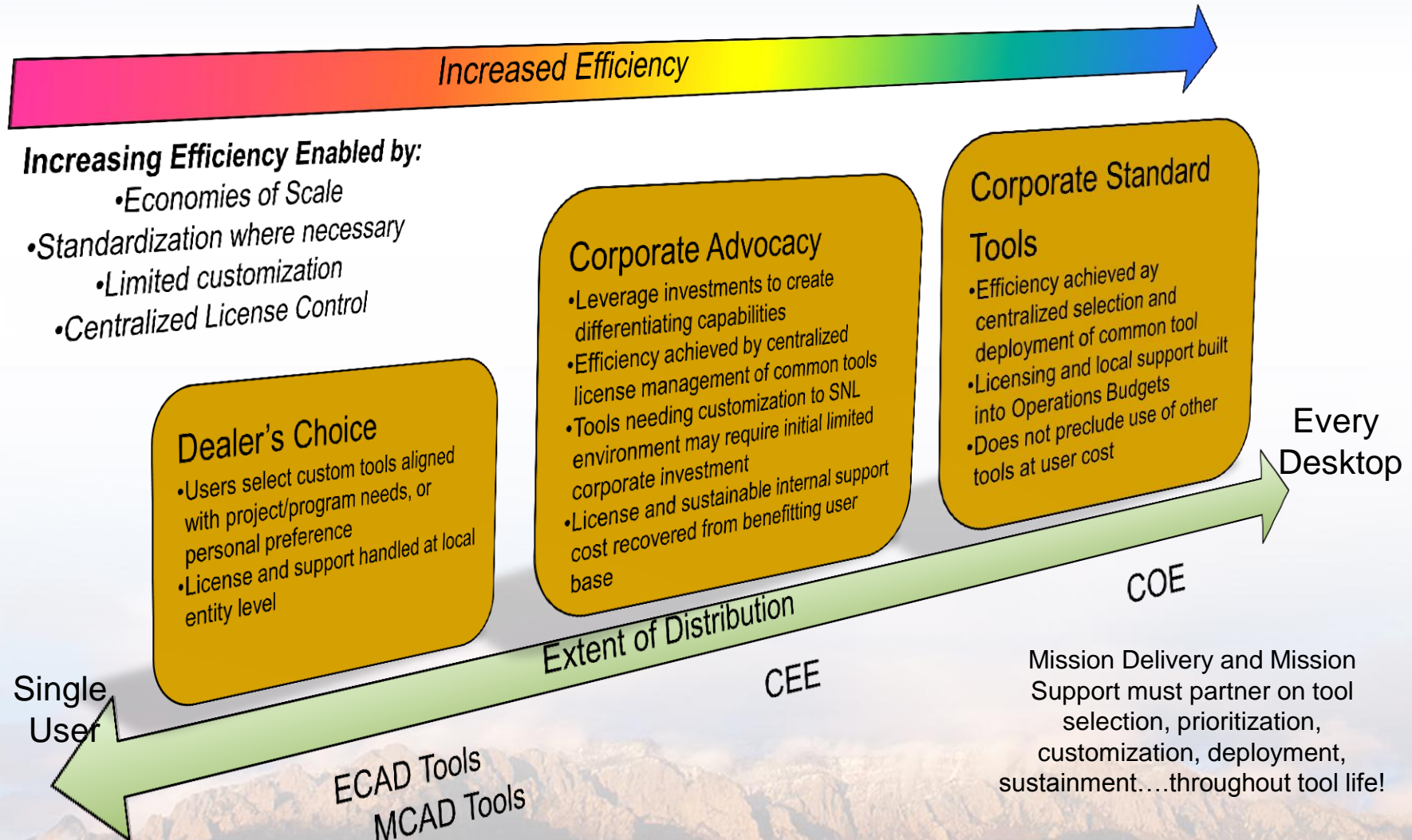
- **In existence as "CEE" for 2+ years**
- **Branded to promote and facilitate a Corporate CEE**
- **Boot-strapped from the ground up**

… that is well positioned to support Sandia's new top-down strategic thrusts

Sandia FY12-FY16 Strategic Plan

- **Includes Objective: Excel in the Practice of Engineering**
  - Goal: Implement a common engineering environment that enables technically creative work and promotes a disciplined approach to assure quality.

Use advocacy as a tactic for driving toward CEE tools

Increased Efficiency

Increasing Efficiency Enabled by:
- Economies of Scale
- Standardization where necessary
- Limited customization
- Centralized License Control

Dealer's Choice
- Users select custom tools aligned with project/program needs, or personal preference
- License and support handled at local entity level

Corporate Advocacy
- Leverage investments to create differentiating capabilities
- Efficiency achieved by centralized license management of common tools
- Tools needing customization to SNL environment may require initial limited corporate investment
- License and sustainable internal support cost recovered from benefitting user base

Corporate Standard Tools
- Efficiency achieved ay centralized selection and deployment of common tool
- Licensing and local support built into Operations Budgets
- Does not preclude use of other tools at user cost

Extent of Distribution

Single User

Every Desktop

ECAD Tools
MCAD Tools

CEE

COE

Mission Delivery and Mission Support must partner on tool selection, prioritization, customization, deployment, sustainment….throughout tool life!

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Center 9300's Common Engineering Environment

- **The Common Engineering Environment (CEE) is a set of Preferred Engineering Software, Infrastructure, and Support Services that enable a Highly Functional Engineering Environment with seamless and ubiquitous access to Computational Engineering Capabilities.**

- **CEE Goals:**

  - Facilitate the identification and use of a common, preferred set of tools and infrastructure for computational engineering.

  - Provide consistent and easy-to-use methods for customers to access, and use software tools.

  - Provide consistent support for engineering tools and infrastructure in the preferred set.

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The Common Engineering Environment

- **CEE is….**

  - … A complete scientific computational environment, comprised of carefully integrated and expertly managed services (i.e. Remote Graphics Workstations, High Performance Compute Resources, Storage, Scientific Tools—internally developed and COTS)
  - … Seamlessly integrated into the existing Sandia IT infrastructure in all three major environments (SRN, SCN, SIPRNET)
  - … Built upon synergistic partnerships with other corporate IT providers (Tool Support Teams, CCHD, OneStop, WebCARS, CSUs, etc)

CEE Resources

- **Remote/Re-connectable Compute Resources:**
  - Graphical Workstations for Optimal Graphics Performance
  - High Performance Shared Memory Compute Servers
  - Remote Session & Application Servers
  - HPC Cluster Access
- **Computational Engineering Applications & Tools:**
  - COTS (MatLab, Ansys, Mathematica, SolidWorks, TeamForge, etc)
  - Sandia codes (Sierra, Alegra, CUBIT, DART………)
- **"Ubiquitous" Storage**
  - Home Directories and Project Space "follow you" wherever you go within the CEE environment
- **Data Protection**
  - Hourly snapshots with self-serve restore capability
  - 3 year backup retention

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Remote Computing

Capture, compress and encrypt pixels
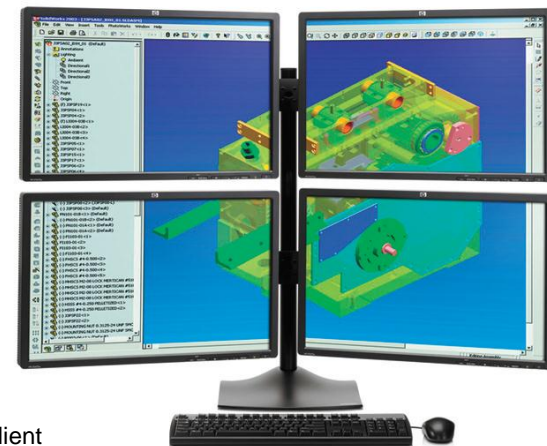
Decompress & display

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Network

Mouse and Keyboard inputs

Client

Workstation Blades

High Performance 3D Graphics via HP RGS protocol
User workstations assigned by connection broker

HP WS460c G6 blades
2 x 6 core, 3.06 GHz CPU's
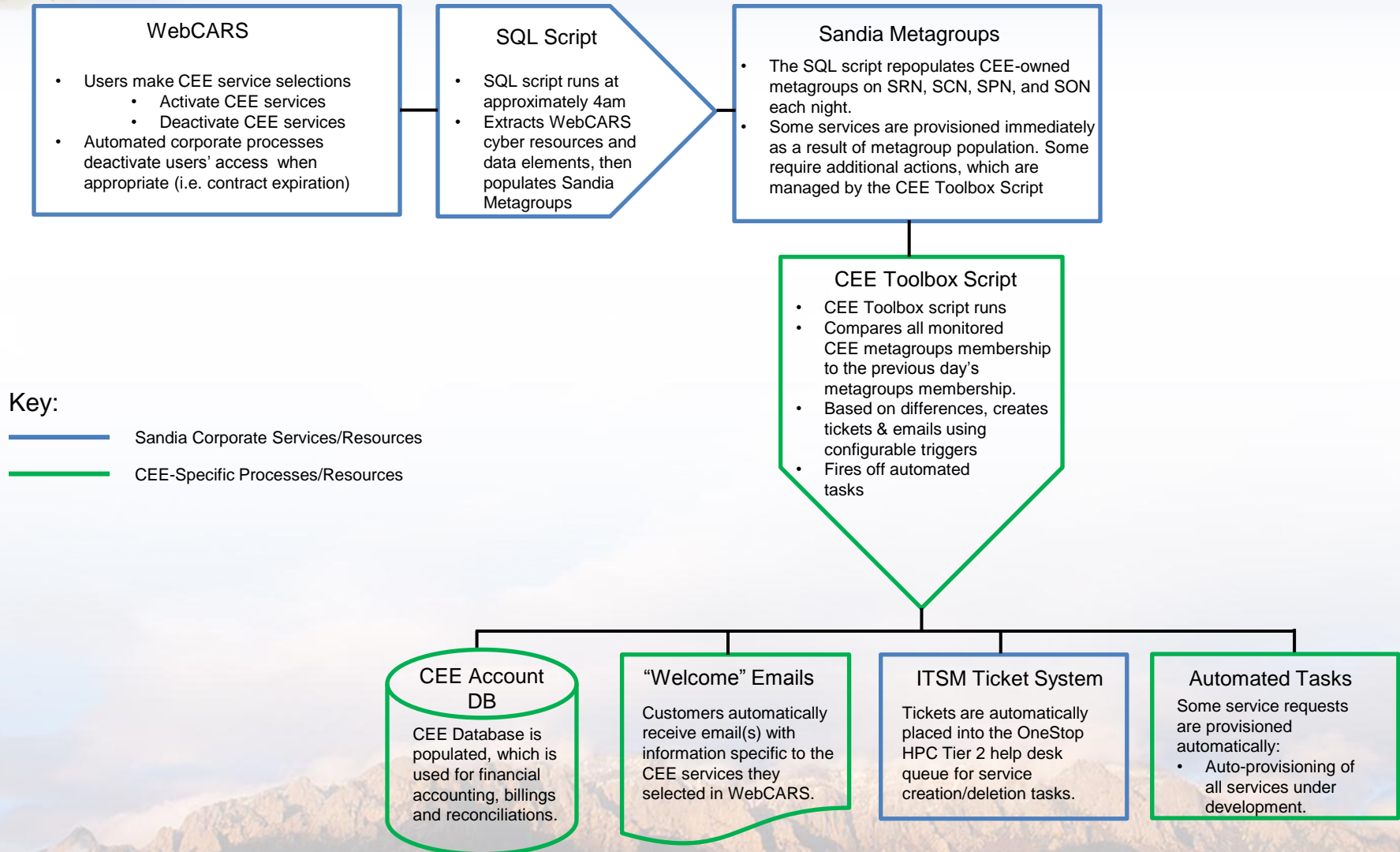48 GB RAM
Nvidia FX880M Gfx module
HP c7000 chassis

SRN offers 256 shared and dedicated workstations
SCN offers 44 shared workstations supporting 150 customers

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Accessing CEE Resources

- **All CEE Services are available for subscription via Sandia's WebCARS**

- **CEE Services are listed as a "menu" of accounts with optional add-on selections, as well as "a la carte" items.**

- **After subscribing to CEE Services via WebCARS, "Getting Started" emails are automatically sent to the subscriber, tailored to the services selected.**

- **User Thin Clients and Kiosks are provided for those without Sandia desktop access.**

- **Support requests for CEE Services are submitted via the CCHD (option 8), and serviced by CEE technical specialists.**

CEE Subscription/Provisioning Workflow

WebCARS

- Users make CEE service selections
  - Activate CEE services
  - Deactivate CEE services
- Automated corporate processes deactivate users' access when appropriate (i.e. contract expiration)

SQL Script

- SQL script runs at approximately 4am
- Extracts WebCARS cyber resources and data elements, then populates Sandia Metagroups

Sandia Metagroups

- The SQL script repopulates CEE-owned metagroups on SRN, SCN, SPN, and SON each night.
- Some services are provisioned immediately as a result of metagroup population. Some require additional actions, which are managed by the CEE Toolbox Script

CEE Toolbox Script

- CEE Toolbox script runs
- Compares all monitored CEE metagroups membership to the previous day's metagroups membership.
- Based on differences, creates tickets & emails using configurable triggers
- Fires off automated tasks

Key:

—— Sandia Corporate Services/Resources

—— CEE-Specific Processes/Resources

CEE Account DB

CEE Database is populated, which is used for financial accounting, billings and reconciliations.

"Welcome" Emails

Customers automatically receive email(s) with information specific to the CEE services they selected in WebCARS.

ITSM Ticket System

Tickets are automatically placed into the OneStop HPC Tier 2 help desk queue for service creation/deletion tasks.

Automated Tasks

Some service requests are provisioned automatically:
- Auto-provisioning of all services under development.

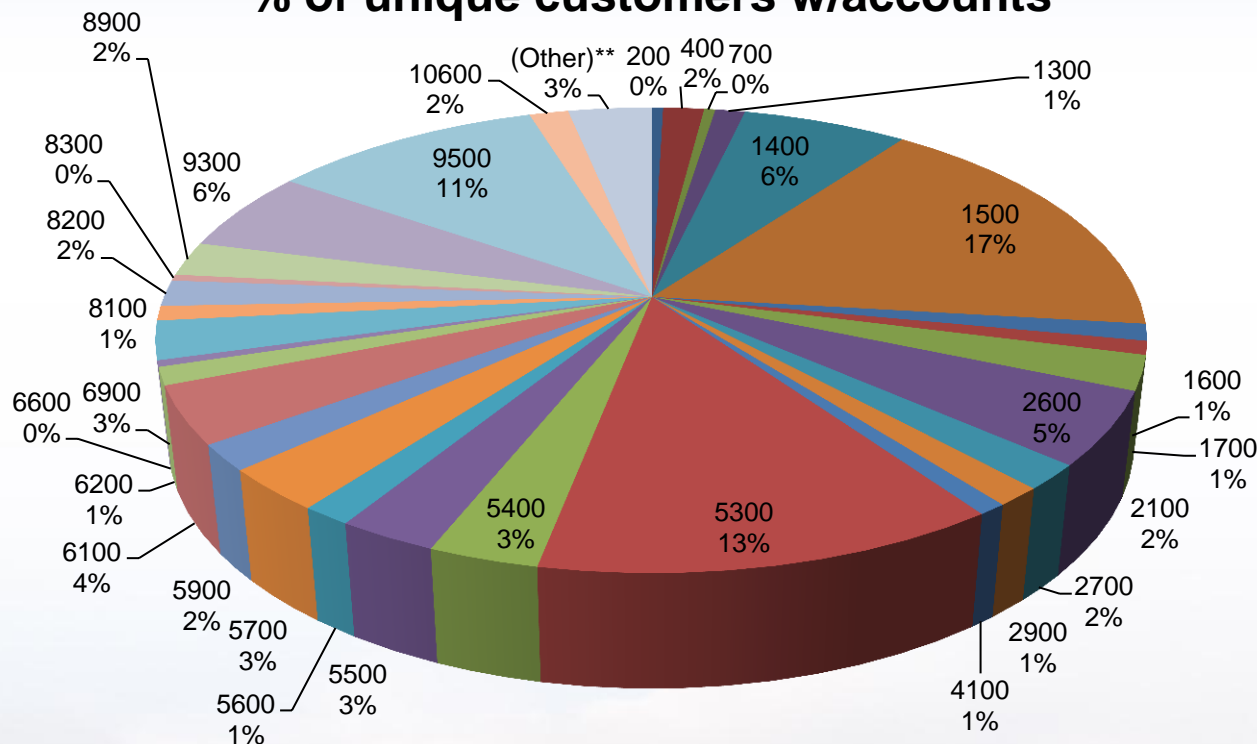Sandia National Laboratories

CEE Costs

- **CEE offers a flexible account structure, which results in the ability to control costs based on specific needs.**

- **Selective access to computational engineering tools in an integrated environment reduces software licensing costs through economies of scale and enables lab-wide efficiencies and collaboration.**

- **CEE services are billed in 11 monthly installments (Nov-Sept).**

- **CEE Services can be added and deleted at any time via WebCARS and the subscriber is only charged for the time used.**

CEE Unique Account Breakdown

% of unique customers w/accounts

- 8900 2%
- 10600 2%
- (Other)** 3%
- 200 0%
- 400 2%
- 700 0%
- 1300 1%
- 1400 6%
- 1500 17%
- 9500 11%
- 8300 0%
- 9300 6%
- 8200 2%
- 8100 1%
- 2600 5%
- 1600 1%
- 1700 1%
- 6900 3%
- 6600 0%
- 6200 1%
- 6100 4%
- 5900 2%
- 5700 3%
- 5600 1%
- 5500 3%
- 5400 3%
- 5300 13%
- 2100 2%
- 2700 2%
- 2900 1%
- 4100 1%

Total # of Unique Accounts = 1,381

Includes all accounts (Base, Entity, Scientific, SPN, ENDO, a la carte, and Team Forge)

Total # of Subscribed Services = 2,737

Includes all accounts (Base, Entity, and Scientific, a la carte, TeamForge, etc.)

Top 5 Centers (total unique accounts)
1. 1500 (232)
2. 5300 (177)
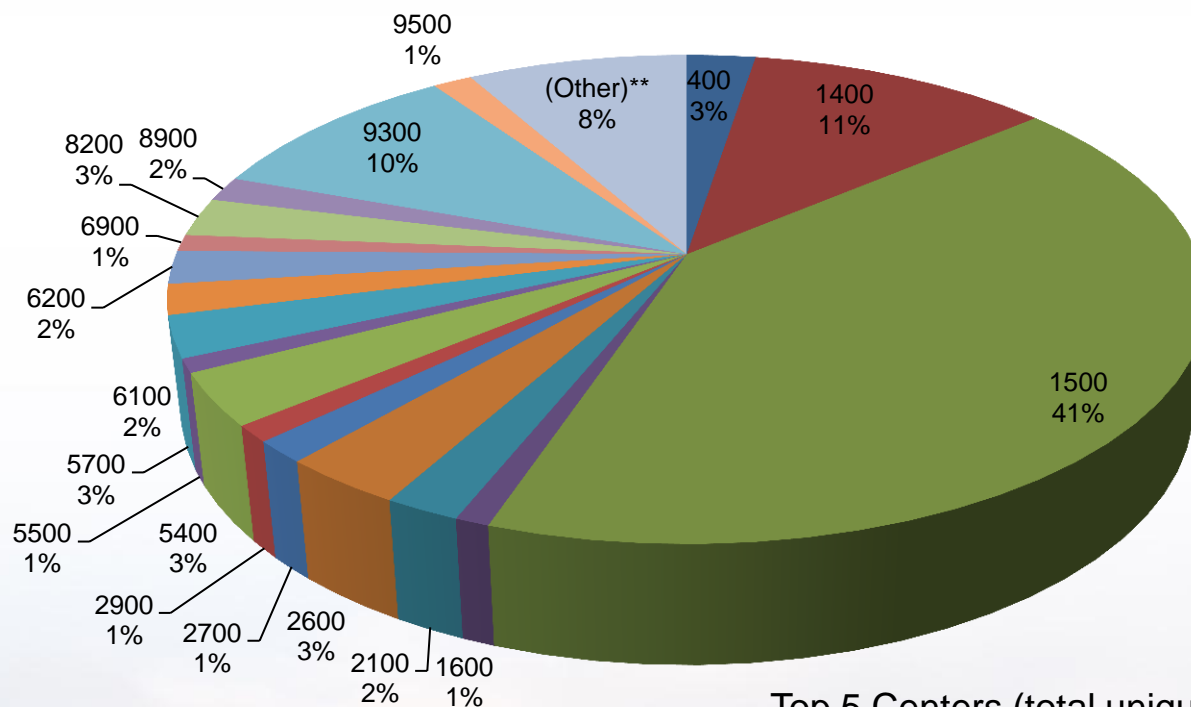3. 9500 (146)
4. 1400 (89)
5. 9300 (78)

**Other category is the total sum of all centers that had 4 or less unique accounts (30 total)

Serving >10% of Sandia's workforce

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CEE Account Breakdown w/o TeamForge

% of unique customers, excluding TeamForge accounts

Pie chart labels:

- 9500 — 1%
- 8900 — 2%
- 8200 — 3%
- 6900 — 1%
- 6200 — 2%
- 6100 — 2%
- 5700 — 3%
- 5500 — 1%
- 5400 — 3%
- 2900 — 1%
- 2700 — 1%
- 2600 — 3%
- 2100 — 2%
- 1600 — 1%
- 1500 — 41%
- 1400 — 11%
- 400 — 3%
- 9300 — 10%
- (Other)** — 8%

Total # of Unique Accounts = 549

Includes all accounts except TeamForge (Base, Entity, Scientific, SPN, ENDO, and a la carte items)

Top 5 Centers (total unique accounts)
1. 1500 (227)
2. 1400 (62)
3. 9300 (54)
4. 5400 (19)
5. 2600 (18)

**Other category is the total sum of all centers that had 4 or less unique accounts (50 total)

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CEE Future Plans

- **Continue to cater to a broader Sandia scientific and engineering community.**

- **Establishing a customer focus group to better communicate and understand the needs of the scientific and engineering communities.**

- **Identify and offer preferred bundles specific to discipline or job classification.**

- **Architect and deliver a cloud-like provisioning solution for the entire CEE environment.**

- **Stay abreast of the latest technology and continually adapt to meet demands of the scientific and engineering community.**

- **Identify and pursue opportunities for partnerships and collaborations across the laboratory to leverage existing capabilities and reduce costs.**

For more information …

- **https://computing.sandia.gov/cee**

- **https://computing.sandia.gov/movies**
  - Common Engineering Environment (CEE)