Systems

Cost Recovery

Architecture

Matt Disney

LOPSA ETENN

November 30, 2015

Goals

- Charge rate/model for scientific computing clusters
- Needs to conform to the cluster expenses but meet accounting needs
- Keep it simple

WHY DO YOU CARE?

Constraints

- Cost recovery (sustainment) not profit
- Fully accountable to customers and tax-payers
- First year so no historical data
- Fiscal year boundaries
- No research funding augmentation
- Not driven by marketing but must be marketable

The Systems

- **Clusters from one blade to hundreds**
- Institutional/overhead investment:
  - Network
  - Core services (auth, OS mgmt, software licensing, config mgmt, etc)
  - Network
  - Storage (Infra and high-performance)

JUST COST RECOVERY?

SWEET, THIS WILL BE EASY

Factors

- Types of expenses
- One-time vs recurring expenses
- How the expense scales
- Who's paying (overhead, internal program, or external customer)

Cost Architecture and Systems Architecture

- Types of expenses
- One-time vs recurring expenses
- How the expense scales
- Who's paying (overhead, internal program, or external customer)

- Types of compute workload/data
- Single, recurring, or daemon
- How the workload/data scales
- Context/memory/namespace: kernel, user space, or remote

Types of Expense

- Time/labor
- Hardware (Materials)
- Software (Materials)
- Contract labor (Materials)
- MATERIALS

Expense Periodicity

- Upfront
- Annual
- Daily/weekly/monthly

Expense Periodicity

- Upfront: Hardware/software purchases (CAP EX)
- Annual: Annual support/maintenance or leases (OP EX)
- Daily/weekly/monthly: Ongoing support (OP EX)

Expense scaling

- Flat
- Linear
- Power law
- Step
- Geometric
- Exponential
- Logarithmic
- Horseshoe

Ways to Pay

- Time and materials
- Fixed rate
- Mix

Funding Source

- Overhead: Services for everyone internal
- Internal research programs:
  - Benefits from overhead services
- External funding:
  - Cannot benefit from overhead services

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Alpaca One

- Goal: Keep costs low and consistent across several years
- Lease hardware
- Combine labor and hardware into a single rate
- Define monthly rate for labor based on one FTE spread across all clusters
- Divide labor cost across all cluster owners by percentage

Alpaca Two

- Goal: Respect fiscal year boundaries and have all labor costs captured in rates
- Buy hardware with year-end funds
- Separate labor rate containing both initial deployment and ongoing mgmt

Alpaca Three

- Goal: Respect fiscal year boundaries, acknowledge upfront labor costs, and have ongoing labor costs captured in rates
- Buy hardware with year-end funds
- T&M for installation labor
- Fixed rate for ongoing labor costs
- Base per-node mgmt rate: recovery for one FTE spread proportionally across all customers
- Additional customers pay proportional base-rate (icing to be reinvested)

Alpaca Four

- Goal: Accommodate for both internal and external customers
- Keep Alpaca Three
- Add full cost recovery for institutional investment divided by estimated percentage usage

Discussion

Thanks!

Matt Disney

mdisney@lopsa.org