

# Data Center Observatory: A Living Lab for Data Center Study

## A Utility and a Research Vehicle

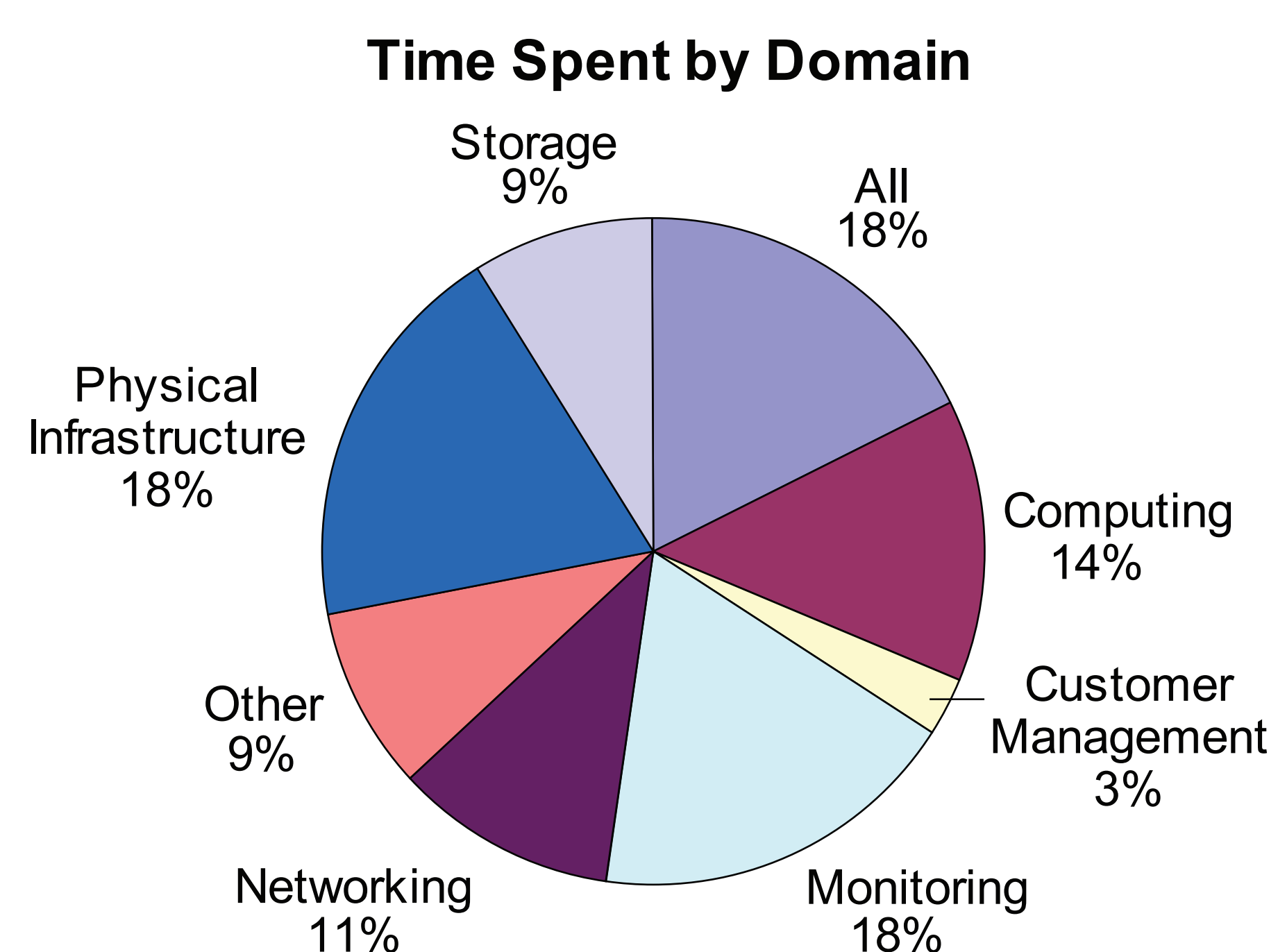
- A computing and storage utility
  - for CMU researchers and services
- A source of measurement data
  - on operational costs
  - on administrator time
- A testbed for cost-saving technologies
  - automation of administrative functions
  - reducing energy usage

## Physical Design Parameters

- ~2000 sq.ft. machine room space
  - plus adjacent administrator space
- Very visible showcase
  - main hallway, main floor of CIC building
  - windowed wall plus monitor with live stats
- Accommodates 40 compute/storage/networking racks
  - each rack at up to 2000 pounds and 25 kW
  - ~775 kW total
- Cooling via APC high density enclosures
  - contains hot air for greater cooling efficiency
  - simplifies staged deployment

## Progress to Date

- DCO became operational in April, 2006
- As of May 2008, all racks are populated:
  - 325 computers including blade servers, computing nodes, storage servers
  - Gigabit Ethernet infrastructure
  - One rack deploys 4x Infiniband
  - Network switches, file servers and monitoring gear
- Current power draw is 80 kW
- Administration monitoring underway
- Infrastructure monitoring operative



## Deeply Instrumented

- Physical sensors
  - per-machine and aggregate power usage
  - air temperature and chilled water flow
  - fan speeds, humidity, leaks, etc.
- Operational records
  - administrator tasks and times
  - component, system, application failures
  - per-customer resource utilization
- Activity tracing
  - I/O, network, etc.

## Deployment Schedule

- Staged deployment plan as follows:
  - Engineering plans complete
  - Construction began November, 2005
  - Room construction completed March, 2006
  - Zone 1 came online April, 2006
  - Zone 2 came online October, 2008
  - Zone 3 to come online in 2009
  - Zone 4 to come online in 2010

