

2015 Unidata Community Equipment Award  
Final Report

*Proposal Title:*

**A Standalone EDEX Server and Enhanced Local IDD/LDM Infrastructure  
at the University of Nebraska-Lincoln**

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## A. PROJECT OBJECTIVES

The University of Nebraska-Lincoln Department of Earth and Atmospheric Sciences received a 2015 Unidata Community Equipment award in the amount of \$11,050 to assist in upgrading its existing (9 year old) IDD/LDM system. The new system will enhance local research and education as well as overall Unidata community capabilities. It will function as a standalone EDEX server that can be accessed by local CAVE clients on the workstations of the new Meteorology-Climatology Computer Lab and possibly from remote CAVE clients within the Unidata Community.

## B. EQUIPMENT PURCHASED

Supplemented by \$4,450 from the Department of Earth and Atmospheric Sciences and \$2,644 from the College of Arts and Sciences, we were able to purchase a HPC Mercury RM436 rack mounted server. The server (squall.unl.edu) contains two Intel Xeon E5-2650 processors, 128GB DDR4 RAM, twenty two 6TB NL SAS hard drives, four 512GB solid state drives, two 160GB solid state drives, and four GbE NICs (full specifications appear in Table 1). The system was installed in a data center managed by IT:Enterprise, an information technology department central to the University of Nebraska. The data center is climate controlled, uses redundant generator-backed power, and is staffed 24 hours, 7 days a week.

<i>Table 1. System specifications</i>	
<b>Chassis</b>	
HDD bays	36 – 3.5 Inch Hot-Swap SAS3 (24 Front + 12 Rear); 2 – 2.5 inch (Rear)
Power supply	1280W Redundant Power
<b>System Configuration</b>	
CPU	2 – Intel Xeon E5-2650v3 2.3GHz Ten Core
RAM	8 – 16GB DDR4-2133 Reg ECC (128GB)
SAS HBA	Internal: LSI/Avago 9300-8i 12Gb External: LSI/Avago 9300-8e 12Gb
SSD	2 – 160GB Intel DC S3500 Series 4 – 512GB Samsung 850 Pro Series
HDD	22 – 6TB NL SAS Enterprise Class
<b>Motherboard</b>	
DIMM sockets	24 – Up to 1.5TB Reg. ECC DDR4 2133MHz
PCI	2 – PCI-E 3.0 x16 3 – PCI-E 3.0 x8 1 – PCI-E 2.0 x4
SATA3 (6 Gbps)	10 – RAID 0, 1, 5, 10
NIC	4 – Intel® i350 GbE

Centos 6.8 was installed and ZFS was used to create storage volumes which were in turn presented to virtual machines (Figure 1). The hard drives were added to one ZPOOL in a RAIDZ2 (~RAID6) format (ZPOOL0) and one ZPOOL reserved for future use (ZPOOL1). The four 512GB solid-state drives were added to two separate ZPOOLS for performance. The two 160GB solid-state drives were mirrored and used for the operating system. Several KVM based virtual machines were installed to provide discrete services. These services include: an EDEX/LDM server (on the SSD ZPOOLS), an NFS server providing home and shared networked filesystems, an LDAP server, and an HTTP server. The NICs were configured to provide separate network channels for virtual machines demanding higher bandwidth.

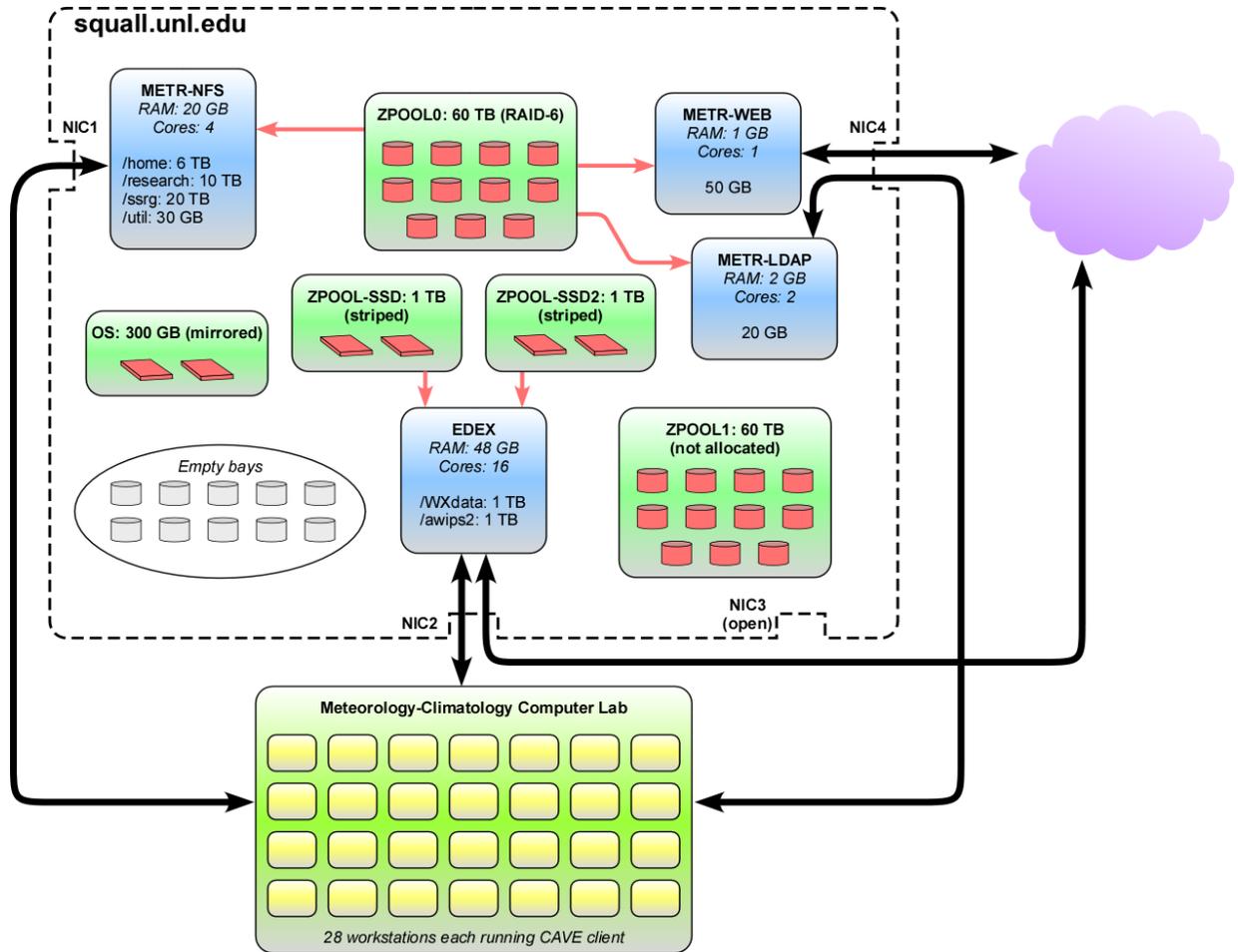


Figure 1. Illustration of system layout. Virtual machines are indicated with blue objects.

Directories on the METR-NFS and EDEX virtual machines are mounted on each of the workstations composing the Meteorology-Climatology Computer Lab (Figure 2). The METR-LDAP virtual machine manages authentication across the server and lab.

Work is underway to install CAVE clients on all Lab workstations. Work is also underway to enable access to the EDEX database by the broader Unidata community. The currently unallocated ZPOOL1 will likely be configured as an archive of EDEX and/or LDM data. Ten empty HDD bays provide sufficient room to expand the system in the coming years.

Development of a web-based public interface to weather data and charts derived from LDM-supplied datastreams is ongoing.



*Figure 2. Newly-renovated Meteorology-Climatology Computer Lab.*