Unidata Community Equipment Awards Cover Sheet

Proposal Title:

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

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

B. PROJECT SUMMARY

The University of Nebraska-Lincoln Department of Earth and Atmospheric Sciences is requesting an upgrade to 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. The system upgrade will include the development of a browser-based interface to LDM data that will enable cloud-based data and analysis that will expand the reach of the value-added products delivered via the EAS web page.

C. PROJECT DESCRIPTION

The University of Nebraska-Lincoln (UNL) Department of Earth and Atmospheric Sciences (EAS) has been involved with Unidata since its inception and has been an active participant in the Internet Data Distribution, serving as a relay node. Data ingest, processing, and relay are currently handled by a 9 year old system (purchased with a 2006 Unidata Community Equipment award) that is also tasked as a web/file server for EAS and a repository for research data sets, many of which are generated from NSF-supported projects. The LDM data and Unidata-supported analysis and visualization tools are used extensively within the EAS Meteorology-Climatology undergraduate program. Value-added products generated from the LDM data are exhibited on the EAS web page (http://weather.unl.edu/cws/) and on the new interactive weather wall (Figure 1). The system serves the research needs of the 30 faculty and 67 grad students in the Department of Earth and Atmospheric Sciences, the teaching needs of atmospheric science faculty and grad students, and the education of the ~60 undergraduate majors in Meteorology-Climatology and the ~300 undergraduates enrolled in EAS introductory meteorology courses. It also serves downstream Unidata community members. To not only maintain but enhance the contributions made by the UNL system to **research**, **education**, and **Unidata community capabilities**, we are requesting support for its replacement.



Figure 1. Interactive weather wall located in the newly-renovated Meteorology-Climatology Computer Lab (Figure 2).

Through significant contributions from the UNL College of Arts and Sciences, the Department of Earth and Atmospheric Sciences, and the UNL Office of Academic Affairs, the Meteorology-Climatology Computer Lab was recently renovated (Figure 2). Along with the new interactive weather wall (Figure 1), the new lab contains 28 Linux workstations configured to meet the recommended specifications for the CAVE environment. However, the current data server is not

capable of hosting an EDEX server for running AWIPS-II. Therefore, we are also requesting support for a **standalone EDEX server that can be accessed by local CAVE clients** on the workstations of the new Meteorology-Climatology Computer Lab.



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

We propose to work with Unidata to investigate the possibility of opening our EDEX server to remote CAVE clients within the Unidata Community in order to further **broaden the Unidata community scope and capabilities.** Uncertainties in the system load required to process EDEX data and topologies for remote access to the server preclude a formal commitment to enabling remote EDEX server access, but we aim to make a concerted effort to implement this functionality.

We also propose to expand the reach of the value-added products delivered via the EAS web page through the development of a browser-based interface to LDM data. This interface will resemble the prototype web-based system (Figure 3) developed by co-PI Rowe to allow simple analysis and visualization of regional climate model output for users in developing countries in Mesoamerica and the Caribbean. The model output is stored on, and analysis and visualization is performed by, UNL servers (http://weather.unl.edu/RCM/IDB_AR5/maps/ and http://weather.unl.edu/RCM/verify/MesoAm.html). From the perspective of our colleagues in this region, we are providing both **cloud-based storage** and **cloud-based analysis**. These prototype services make use of the NCAR Command Language (NCL) to perform the analysis and visualization. The proposed interface would serve as a portal to IDD (and other) data sets, using Gempak scripts (such as used for our real-time weather map server, http://weather.unl.edu/cws/) to provide customizable remote data access, data analysis, and visualization capability to users both within and outside the traditional Unidata community.

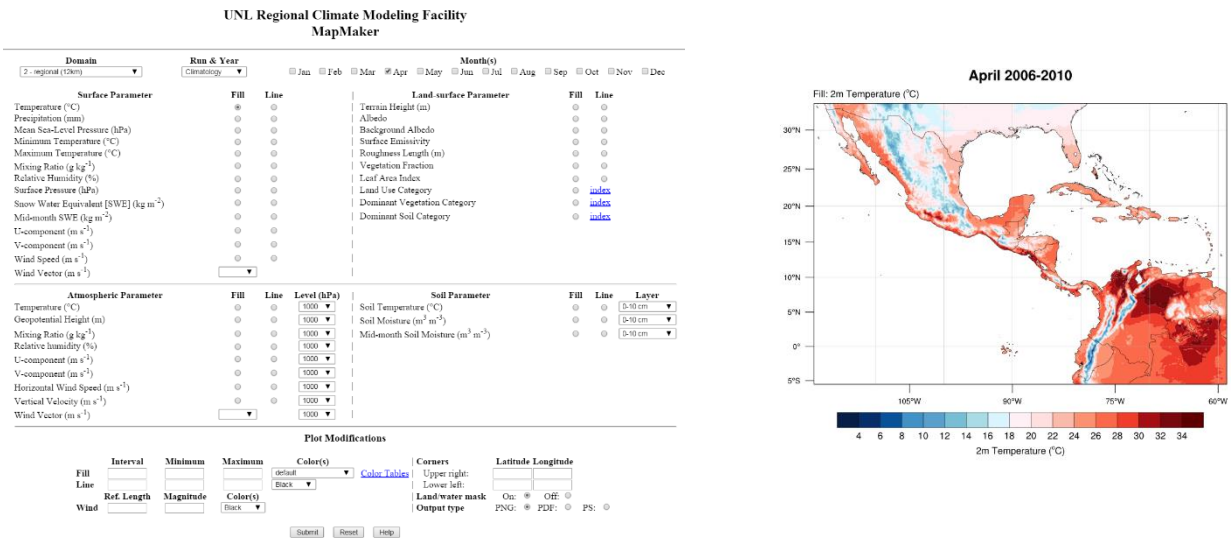


Figure 3. (left) Menu for prototype web-based analysis and visualization system for viewing regional climate model output for Mesoamerican and the Caribbean; (right) example map produced.

The new system (Figure 4) has been designed based on prior experience of the PIs configuring LDM/IDD systems and based on recent consultation with Unidata staff. The system has a modular design to ensure a distribution of system resources, particularly for the tasks that are expected to impose the largest demand. Key components of this system are as follows:

- **LDM relay** [existing infrastructure; not included in this request]
  - Distribute data to the downstream LDMs
  - Distribute data to the local EDEX and LDM servers
- **EDEX server with 8 HDD bays**
  - Ingest, process, and serve data for AWIPS-II
  - Store real-time data and 14-day "short" archive
- **Network attached storage (NAS) for research data and "long" archive**
  - 24-bay JBOD enclosure
  - 8 bays reserved for the "long" archive (30+ days) of either EDEX or LDM data
  - 16 bays reserved for data sets of EAS research groups [disks for these bays are not included in this request]
- **LDM and web/file server with 8 HDD bays**
  - Ingest, process, and serve GEMPAK data
  - Store real-time data and 14-day "short" archive
  - Store case study data
  - Host EAS web/file server
  - Store "home" directories of EAS personnel (faculty, staff, and students)
- **Network attached storage (NAS) for dedicated backup**
  - 16-bay JBOD enclosure
  - Store backup of case study data (primary storage of case study data is on the LDM server)

    - Store backup of the "home" directories of EAS personnel (primary storage of "home" is on the LDM server)
    - Store backup of research data (primary storage is the research/archive NAS) [disks for these bays not included in this request]
- **Meteorology-Climatology Computer Lab** [existing infrastructure; not included in this request]
    - 28-workstation computer lab
    - CAVE clients

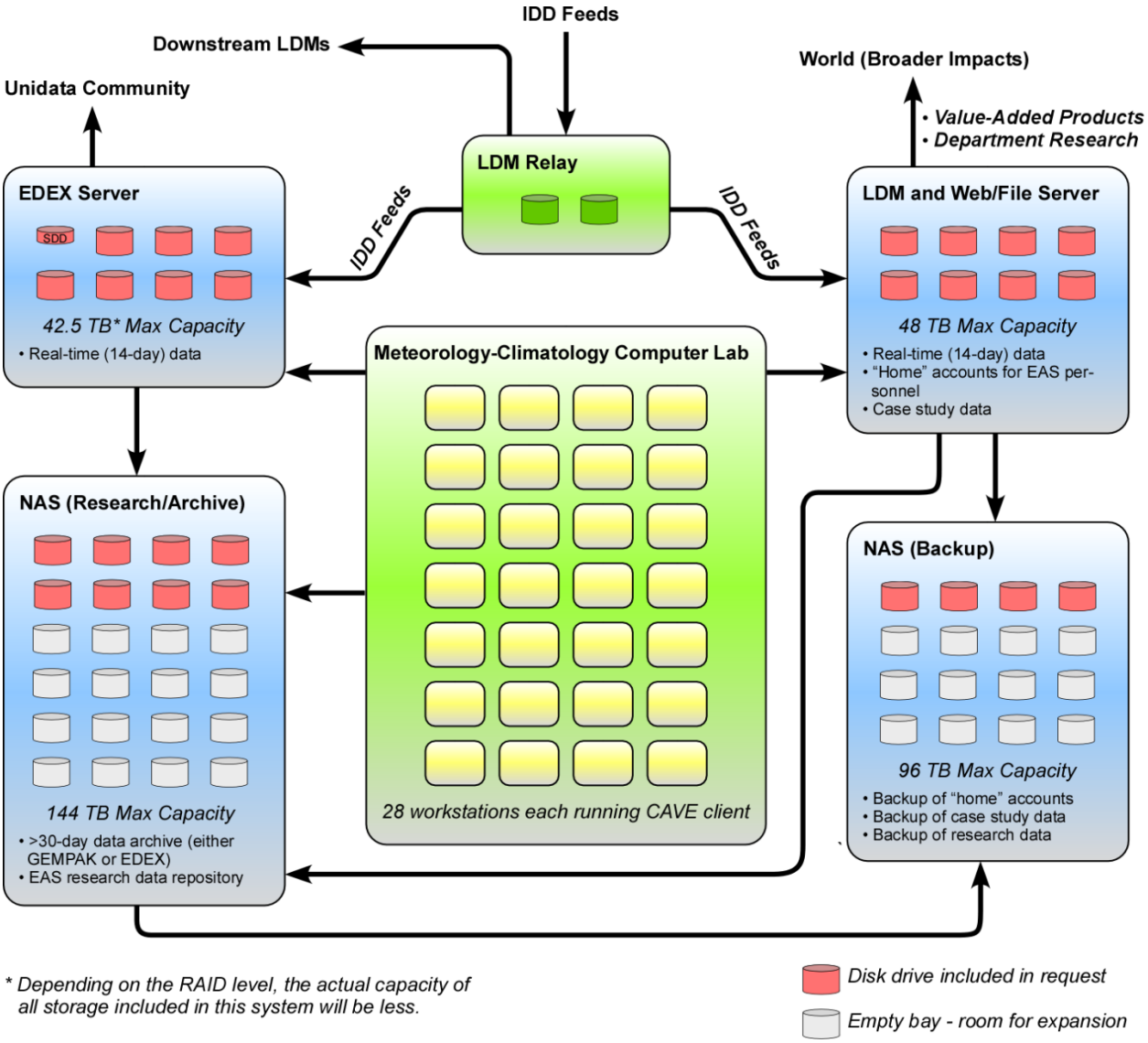


Figure 3. Schematic of the proposed system. Blue boxes indicate components included in this request while green boxes represent existing infrastructure. Cylinders denote disk bays; pink disk bays are included in this request.

D. BUDGET

Funds are requested for two Dell PowerEdge R630 servers, a 24-bay Promise Technology JBOD enclosure, and 16-bay Promise Technology JBOD enclosure. A total of 27, 6 TB HDD are requested to fully populate the servers and partially populate the JBOD enclosures.

Qty.	Description	Price	Cost
1	Dell PowerEdge R630, w/ 400 GB read-intensive SDD	$3,500	$3,500
1	Dell PowerEdge R630	$2,500	$2,500
1	Promise 24-bay	$6,000	$6,000
1	Promise 16-bay	$3,000	$3,000
27	6 TB HDD	$350	$9,450
		TOTAL	$24,450
		Department of Earth and Atmospheric Sciences	$4,450
		REQUESTED	**$20,000**

EDEX Server Configuration *(Dell PowerEdge R630)*

- Processor: Intel Xeon 4-core processor at 1.6GHz, 15M Cache
- Memory: 32 GB (4) RDIMM
- OS: CentOS-6
- Included hard drive: 480 GB Solid State Drive SATA Read Intensive
- HDD (budgeted separately): 7, 6-TB drives

LDM Server Configuration *(Dell PowerEdge R630)*

- Processor: Intel Xeon 4-core processor at 1.6GHz, 15M Cache
- Memory: 32 GB (4) RDIMM
- OS: CentOS-6
- HDD (budgeted separately): 8, 6-TB drives

Cost Sharing

EAS will cover project costs in excess of the $20K requested from Unidata. In addition to the above cash cost-share specified in the proposed budget, in-kind cost-sharing will include UNL/EAS existing support for a dedicated graduate assistant responsible for software development and server administration, existing support for on-call systems support from the University of Nebraska Holland Computer Center, as well as PI and co-PI time. Per a "common-good service" to all UNL Departments (http://its.unl.edu/service-catalog/data-center-hosting), UNL Information Technology Services will house these systems in the main campus machine

room which contains an integrated rack system, UPS, GigE, and system monitoring at no cost to the project. Technical oversight for the proposed project will be provided by the PI and co-PIs, supported by UNL/EAS student systems administrator and on-call support from the University of Nebraska Holland Computer Center staff.

E. PROJECT MILESTONES

Vendor quotes will be requested in late April so that purchase orders can be placed upon notification of an award. This will allow project personnel to install equipment as early as possible during the summer break so that all systems are operational well before the beginning of the 2015-2016 academic year. As the requested equipment will occupy rack space already allocated to the existing servers they will replace, there are no dependencies that will alter project goals or deadlines.