Unidata Community Equipment Awards Cover Sheet
Proposal Title: The Next Generation of NEXLAB – Server Upgrade for College of DuPage's Meteorology Lab

Date: March 5, 2021

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Project Summary

The College of DuPage (COD) Meteorology Program proposes to purchase, install, and operate a satellite processing server for the purposes of examining, disseminating, and displaying GOES-R satellite data on the program's laboratory website, also known as NEXLAB. The program's primary goal is to provide the most up-to-date observational datasets with a simple, yet powerful user experience for educational and research purposes. The dissemination of this data enables student, faculty, peer researcher, and public-at-large access to NEXLAB's widely acclaimed user interface of meteorology tools and visualizations (http://weather.cod.edu/satrad). This website sees between 20,000 and 40,000 users who download up to 1TB of data daily. The current server's capabilities will soon be outdated and will not be able to fully utilize the expected wealth of data available from current and next generation GOES-R satellites.

An upgraded physical server on COD's campus will allow the program to continue growing the online repository of satellite data and keep it publicly available to the hundreds of universities and thousands of people that utilize it. COD has been supportive of the Meteorology Program's operations and successes and will continue to provide the necessary infrastructure with the understanding that NEXLAB is a national leader in meteorological data distribution. Imagery captured by this new server will continue to be archived in partnership with Iowa State University (led by Mr. Daryl Herzmann) using Unidata's Local Data Manager software. NEXLAB also partnered with Texas Tech University (led by Dr. Eric Bruning) in 2018 to add Geostationary Lightning Mapper (GLM)-derived data alongside satellite imagery, and this server will help further expand the number of variables captured in datasets.

Project Description

College of DuPage Meteorology Program

College of DuPage is a community college located in Glen Ellyn, Illinois, a western suburb of Chicago. Serving approximately 24,000 students, COD is the second largest institution of higher education in the state. As a comprehensive public community college, COD provides academic and CTE programs for learners of all ages and abilities through 81 degree and 177 certificate programs. In the Fall 2020 semester, COD had a student enrollment comprised of 50% White, 25% Hispanic/Latino, 11% Asian, 7% Black, 3% two or more races, and 4% other. Approximately 55% of students are female, and 45% are male.

Housed within the STEM Division, the Meteorology Laboratory (known widely as the Next Generation Weather Lab, or NEXLAB) has received widespread interest and acclaim at local and national levels since its inception in 1989. The program has received a vast amount of media attention, and many local and national weather stations cite NEXLAB data in their own meteorological studies and weather predictions. On COD's campus, the program attracts students from various backgrounds and is known widely for its commitment to improving undergraduate meteorology education. College of DuPage provides both an affordable and high-quality educational experience, and students have access to a nationally recognized and state-of-the-art computer

network that delivers real-time global meteorological data, powered by Unidata software.

Project Goals

COD NEXLAB's primary project goals for the installation of an upgraded server are the following:

1. Establish a more robust server environment that will support current and future curriculum development (both remote and in-person learning) of COD's Meteorology Program based on availability of data provided by the server.
2. Continue providing accessible, state-of-the-art meteorological visualization services to the Unidata community and public-at-large, contributing local datasets to wide-reaching research and education efforts.
3. Work with external university partners and Unidata to continue archiving and expanding the capabilities of NEXLAB satellite imagery over the long term, including the addition of new visualizations such as GLM-derived products Minimum Flash Area (MFA) and Total Optical Energy (TOE).

These goals will be achieved through the purchase and configuration of server equipment described below. This is determined based on the consultation and collaboration between COD Meteorology and Information Technology staff.

Equipment Requested

NEXLAB's upgraded server needs are based on discussions and expectations set between COD's Meteorology Program and the in-house Information Technology staff. In addition, the processing power of the upgraded server must meet the demanding requirements of providing high-resolution GOES-16 and GOES-17 satellite imagery with existing and additional GLM overlays to thousands of daily users. The proposed server equipment would double the hard drive space compared to the existing hardware, allowing data to be processed faster and stored longer. Installing this new server will continue to ensure an isolated environment dedicated exclusively to satellite processing, allowing the other servers in the NEXLAB system to perform their processing without disruption or competition for limited processing power and memory. The new server will be an HPE ProLiant DL380 Gen10 server, and will consist of:

- 2x Intel Xeon-Gold 6240R Processors (2.5GHz/24-core/165W each)
- 8x 32GB (DDR4 2933 MHz) SDRAM
- 4x 1.2TB SAS HDD (10K RPM)
- 2x 800GB SAS SSD

The Meteorology Program has obtained quotes for the server from RTI that is included as an attachment. Installation, operation, and maintenance will be performed by both Meteorology Program staff and COD's in-house IT staff. Based on the quote, the team respectfully requests $20,000 for the hardware in order to achieve the stated project goals.

Relationship to Existing Facilities and Resources

The Meteorology Lab is housed at the main campus of College of DuPage and has all college resources available to support the program. The new server will be installed alongside all other existing NEXLAB server rack hardware in the Student Resource Center IT server room. This is a climate-controlled environment with capabilities for providing backup power, and COD manages all utilities and power to the server room. Implementation and maintenance will come from Paul Sirvatka, Professor of Meteorology, and Michael Zuranski, Meteorology Support Analyst, in addition to COD's IT team. The day-to-day operation and monitoring will be the responsibility of the Meteorology Program, with oversight by Mr. Zuranski.

The COD STEM Division fully endorses the NEXLAB program and will continue to provide operational and salary support to the Meteorology staff, including project leaders Professor Sirvatka and Mr. Zuranski. Both Professor Sirvatka and Mr. Zuranski oversee the program's servers and bring their wealth of knowledge to the program. Professor Sirvatka is the founder of NEXLAB and has developed the Meteorology Program at COD from the ground up. From the beginning, he has developed and refined the entire course curriculum and obtained many weather forecasting and storm chasing components for the program. Since connecting with Unidata, he has implemented McIDAS, GEMPAK, and LDM software. He has also given many professional presentations and attended training meetings at Unidata while actively participating in field research. Mr. Zuranski has been involved with the College of DuPage Meteorology Program since first taking classes in 2008. From full-time student to student worker, and now as a full-time Meteorology Support Analyst, Mr. Zuranski has worked closely with Unidata and the COD IT team to ensure the smooth operation of NEXLAB servers. He has competitively placed in weather forecasting challenges and was recently honored with the 2020 Russell L. DeSouza award from Unidata.

Serving Students and the Community

This proposal uniquely fits the needs of Unidata's 2021 call for proposals as the upgraded server will enable NEXLAB to continue providing both local and nation-wide value and benefits through the advanced visualization of meteorological data. Since the launch of NEXLAB's GOES-R webpage, the COD Meteorology team has partnered with multiple stakeholders in the meteorological community to bring both new data to the page as well as adding overall value to meteorology students at COD and Unidata community members.

Since 2007, a subset of NEXLAB's radar mosaic imagery has been archived by UCAR, which is viewable alongside a variety of other data, which can be found at https://www2.mmm.ucar.edu/imagearchive/. This archive has been widely used by the meteorological community, especially by members who give scientific presentations or who are working on research projects. To the broader public, the archived imagery is of high interest by those who are seeking to gain better understanding of past weather events. In recent years, NEXLAB has visualized improved high-res imagery from GOES-16 at 1600x900 pixels to take advantage of the advancements in satellite technology. The same has been done with the radar mosaics in order to match the satellite imagery more precisely. In April 2020, the larger and more detailed images have been saved in the UCAR archive.

In 2017, COD began a partnership with Iowa State University to archive NEXLAB's imagery for community access. As a result of that successful partnership, satellite imagery from each of the ABI bands and each of the RGB products are sent to ISU for archival as soon as they are created on the server. The imagery is subsequently made available to the public at-large on the web. The COD Meteorology Program regularly receives requests from NEXLAB site users for archived satellite imagery, and the partnership with ISU makes it possible to readily answer these requests.

Furthermore, the COD Meteorology team began working with Dr. Eric Bruning from Texas Tech University in 2019 to integrate their data to the NEXLAB satellite page. Dr. Bruning developed GLM-derived data which includes gridded datasets that convey more information on detected lightning activity. These include variables such as Flash Extent Density (FED), Minimum Flash Area (MFA), Total Optical Energy (TOE), among others. Mr. Zuranski at COD and Dr. Bruning have been collaborating with Tom Yoksas at Unidata to ensure the GLM-derived data would be compatible with McIDAS-X. By 2020, NEXLAB added the FED product to the satellite visualization page as an overlay (see Figure 1). This allows users to view this gridded lightning activity on top of the satellite imagery, all with matching temporal output. FED is the only GLM-derived product currently offered, and the upgraded server will allow NEXLAB to eventually include MFA, TOE, and other variables to the system.

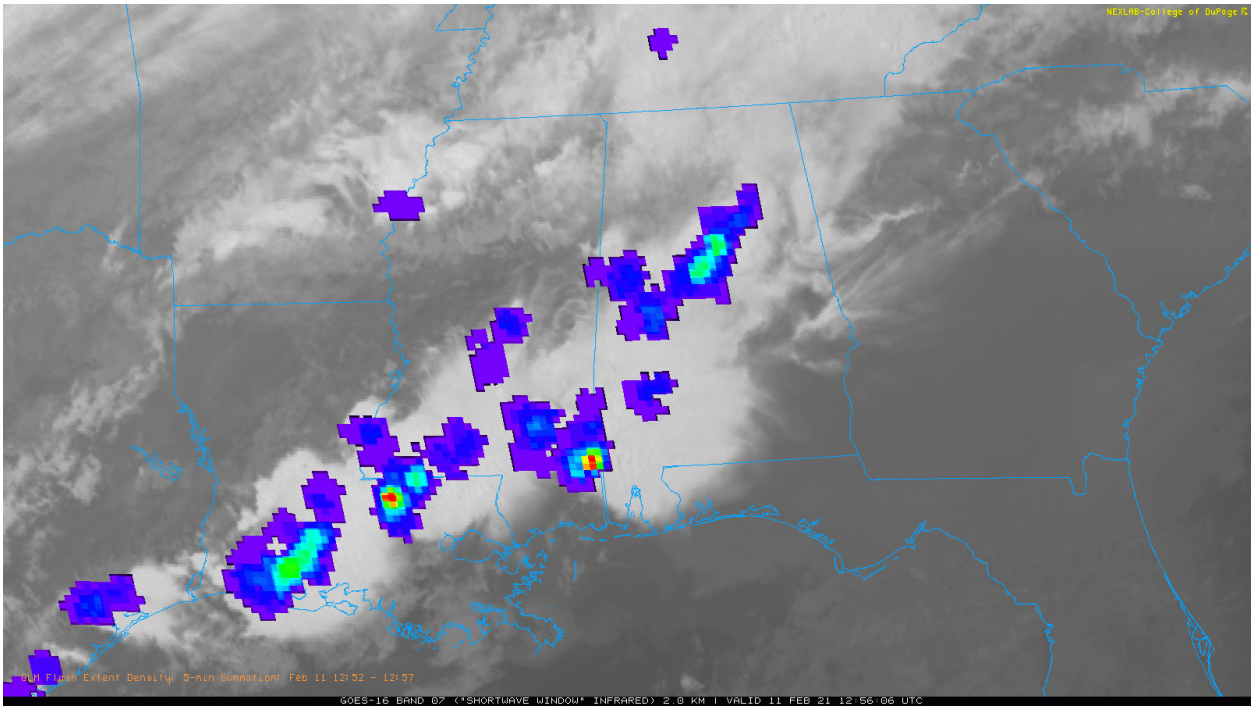


Figure 1: Satellite data visualization featuring the Flash Extent Density (FED) overlay on COD's NEXLAB webpage, February 11th, 2021. (https://weather.cod.edu/satrad/)

The COD Meteorology curriculum uses a variety of Unidata software packages which help students and other researchers obtain a greater understanding of meteorological processes through data visualization. Forecasting classes at COD use satellite imagery from the NEXLAB webpage as a foundation to beginning weather discussions. Curriculum objectives include learning and understanding the various imagery available on the webpage, methods of creating color "recipes" to denote various weather situations, and data interpretation to use all satellite imagery in forecasting and analyzing current weather. All other classes of the COD Meteorology Program use this satellite data as needed to illustrate a variety of concepts including Rayleigh scattering, forest fire detection, and mesoanalysis. This hands-on approach using real-time data gives future meteorologists, emergency managers, and those pursuing related careers a significant advantage with a top-quality experience. Despite the transition to remote learning due to the COVID-19 pandemic, the Meteorology Program continues to provide the best possible experience for students because NEXLAB uses a web-based display of imagery, which requires no specialized software on the user end. All major programming is completed server-side, making the final, professional meteorological images equitably accessible to everyone with an internet connection without the need for specialized software. Providing a beneficial service to home users that is easy to navigate and tailor to everyone's needs has been a constant goal of NEXLAB, and the server will continue providing this experience.

These software programs have been the cornerstone of NEXLAB's popular online internet presence (http://weather.cod.edu) and are essential in making these powerful datasets equitably accessible. In fact, COD's online presence has continued to be one of the most popular meteorological websites in the country. On a typical day, the NEXLAB website receives between 5 and 10 million hits, with 20,000 to 40,000 unique visitors. Furthermore, approximately 800GB to 1TB of outgoing data is downloaded daily. Most website hits occur during hurricane season, with NEXLAB's busiest day in 2020 being September 9th with multiple active Atlantic tropical storm systems (see Figure 2). The website saw over 38 million hits, 115,000 unique visitors, and 3.77TB of data being exported.

NEXLAB has a significant impact on both the local community as well as the national meteorological community by providing these visualizations and datasets to the public for educational and research purposes. Current webpage users include the National Weather Service (both regional and local offices), the US military, forestry services, Environment Canada, utility companies, and most universities needing weather information. Users have reported the site and all that it offers to be vital to their work and research, from developing educational curricula to publishing research. Upgrading NEXLAB's server will be a significant step in capturing high resolution images for wide dissemination, furthering education curricula and research, and ultimately archiving for posterity. Furthermore, this server will enhance COD's capability to utilize a greater number of datasets and overlays in its visualizations. Failure to upgrade the server within the near future will hamper efforts to provide more exciting and important information over the long term. The COD Meteorology team prides themselves in supporting and collaborating with other members of the meteorological community. The ability to renew the satellite processing server will ensure NEXLAB will continue providing these tremendous services to the larger community.

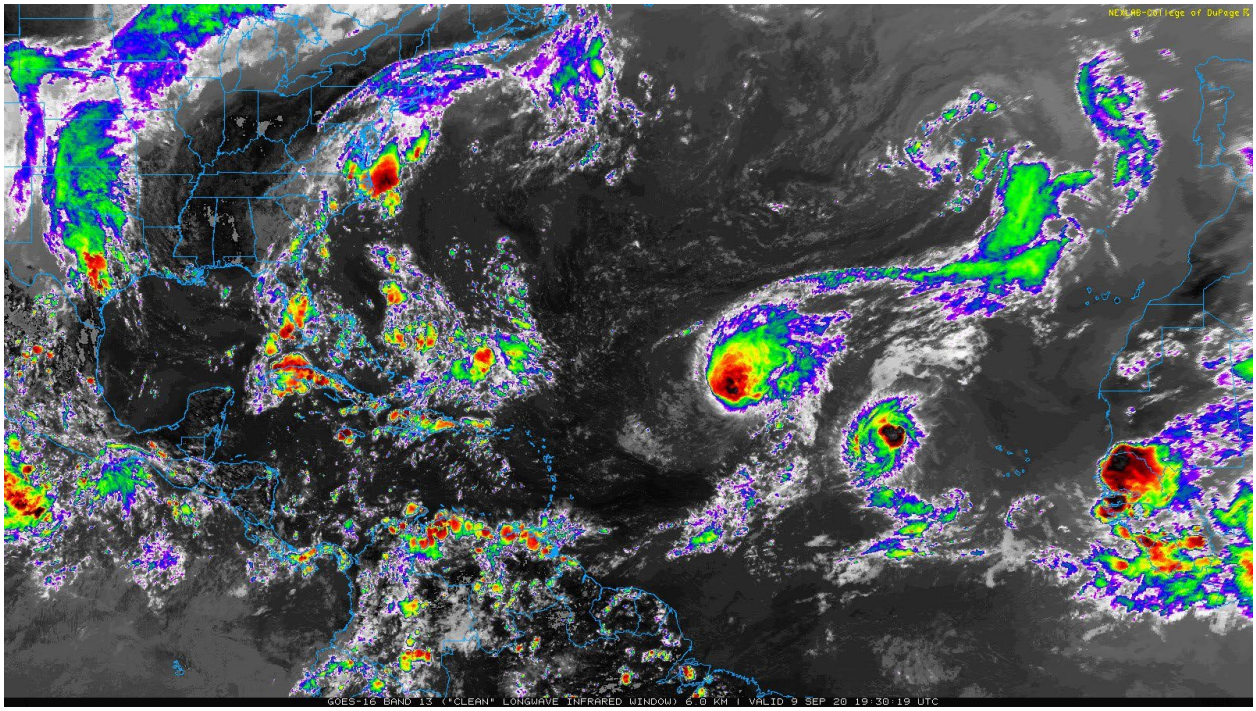


Figure 2: Multiple active tropical storm systems captured from COD's NEXLAB website server, September 9th, 2020. (https://weather.cod.edu/satrad/)

Budget

COD NEXLAB proposes to purchase a HPE ProLiant DL380 Gen10 server based on discussions with COD IT support staff and discovery of required data processing power. Meteorology Program staff are confident this server model is best suited for the unique current and future satellite imagery data processing needs. The total cost of the server system is $18,630.50 (see quote). Faculty and staff time, as well as system administration and computer time, is covered by College of DuPage. Indirect costs of 7.35% of the total cost is recovered and matched through the college.

Itemized Budget Request
HPE ProLiant DL380 Gen10 Server, including:

- 2x Intel Xeon-Gold 6240R Processors (2.5GHz/24-core/165W each)
- 8x 32GB (DDR4 2933 MHz) SDRAM
- 4x 1.2TB SAS HDD (10K RPM)
- 2x 800GB SAS SSD
- See attached quote for additional accessories not listed above

Total Estimated Cost of Server	$18,630.50
Indirect Cost @ 7.35%	$1,369.50
Total Amount Requested	**$20,000**

Project Milestones

Equipment quotes from vendors have been secured and approved by the COD IT Department, which would allow for expedient purchasing late Summer 2021. This will allow COD NEXLAB staff and IT personnel to deploy the equipment in Fall 2021, ready for data sharing by late fall if not the Spring 2022 semester. The below project milestone timeline is under the assumption that the proposal is funded June 1, 2021. No dependencies are anticipated that would significantly alter project goals and deadlines.

Date	Task
May 1, 2021	• Award announced
June 1, 2021	• Funds received by Unidata
July 1, 2021	• Purchase of the upgraded server
September – October, 2021	• Delivery and physical installation of the server
November 2021 – January 2022	• Server is optimized and configured to meet expectations • Once fully deployed, data will continue to be shared to students and the public at large

Attachments:
Vendor Quote
Statement from Primary IT Support Staff

RTI®
RIVERSIDE TECHNOLOGIES, INC.

PARTNER OF THE YEAR

DL380

Quote #058976 v2

Prepared For:

College of DuPage

Rich Kulig
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P: (630) 942-3984
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Contract:

Prepared by:

RTI

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PO Box 1547
North Sioux City, SD 57049

P: 866.804.4388
E: tbosley@1rti.com

Date Issued:

02.05.2021

Expires:

03.26.2021

Hardware		Price	Qty	Ext. Price
868703-B21	**HPE DL380 Gen10 8SFF CTO Server**	$1,018.68	1	$1,018.68
P24470-L21	**Intel Xeon-G 6240R FIO Kit for DL380 G10**	$2,128.85	1	$2,128.85
P24470-B21	**Intel Xeon-G 6240R Kit for DL380 Gen10**	$2,128.85	1	$2,128.85
P00924-B21	**HPE 32GB 2Rx4 PC4-2933Y-R Smart Kit**	$606.84	8	$4,854.72
826708-B21	**HPE DL38X Gen10 Universal Media Bay**	$73.84	1	$73.84
872479-B21	**HPE 1.2TB SAS 10K SFF SC DS HDD**	$384.80	4	$1,539.20
P21127-B21	**HPE 800GB SAS WI SFF SC SS540 SSD**	$1,538.16	2	$3,076.32
726536-B21	**HPE 9.5mm SATA DVD-ROM Optical Drive**	$56.68	1	$56.68
870548-B21	**HPE DL Gen10 x8 x16 x8 Rsr Kit**	$85.28	1	$85.28
P01366-B21	**HPE 96W Smart Storage Battery 145mm Cbl**	$72.80	1	$72.80
804338-B21	**HPE Smart Array P816i-a SR Gen10 Ctrlr**	$623.48	1	$623.48
867810-B21	**HPE DL38X Gen10 High Perf Fan**	$161.72	1	$161.72
830272-B21	**HPE 1600W FS Plat Ht Plg LH Pwr Sply Kit**	$257.40	2	$514.80
E5Y43A	**HPE OV for DL 3y 24x7 FIO Phys 1 Svr Lic**	$415.48	1	$415.48
733660-B21	**HPE 2U SFF Easy Install Rail Kit**	$57.20	1	$57.20
H7J32A5	**HPE 5Y Foundation Care NBD Service**	$0.00	1	$0.00
H7J32A5#SVN	**HPE One View w/Ilo Support**	$118.56	1	$118.56
H7J32A5#WAH	**HPE DL38x Gen10 Support**	$1,704.04	1	$1,704.04
			Subtotal:	**$18,630.50**

Quote Summary	Amount
Hardware	$18,630.50
Total:	**$18,630.50**

Taxes, shipping, handling and other fees may apply. We reserve the right to cancel orders arising from pricing or other errors.

M E M O R A N D U M

DATE: March 3, 2021

TO: Whom it may concern

FROM: Keith Zeitz, Manager, Office and Classroom Technology

RE: NEXLAB Server Upgrade – letter of support

I am pleased to offer my support for the proposal entitled "The Next Generation of NEXLAB – Server Upgrade for College of DuPage's Meteorology Lab". The Information Technology Services Department at the College of DuPage fully supports and endorses the efforts of Paul Sirvatka, Professor of Meteorology, and the COD Meteorology Program.

The IT Department will provide resources, infrastructure and support for this proposal. Michael Zuranski is an IT staff member who is dedicated to the Meteorology Program, and he will be the primary support personnel operating and maintaining the server.

Keith Zeitz Date: 2021.03.03 09:03:39 -06'00'