Fall 2024 Joint Committee Meeting

(Times are Mountain Standard Time)

Wednesday, September 25, 2024, 11:00am: New Committee Member Orientation

[Meet online and in UCAR FL4-1201 (Unidata conference room)]

11:00 – 12:00   New Committee Member Orientation

Wednesday, September 25, 2024, 1:00pm-5:00pm: Users Committee

[Meet online and in UCAR FL4-1201 (Unidata conference room)]

Meeting Commences After Lunch at 13:00

13:00 – 13:05   Administrative Items (Co-Chairs /Tanya)

13:05 – 13:25   Welcome/Introductions (Mohan Ramamurthy/Co-Chairs)

13:25 – 13:45   NOAA NCEP Agency Report (Margaret Curtis)

13:45 – 14:30   Learning Experiences, Design, Science Gateway Reimagined Educational Hub (Nicole Corbin)

14:30 – 14:45   Community Equipment Awards and Upcoming Virtual Session (Chairs)

14:45 – 15:00   BREAK

15:00 – 15:30   Big Data, Science Gateway, and Integrated Approaches (Sean Freeman)

15:30 – 16:30   Spring 2024 Mtg Brainstorming Session Report and Implementation Discussion (Tanya/Committee)

16:30 – 17:00   Administrative / Wrap Up (Review Day's Proceedings/Discussion, Actions, Spring Meeting Dates and Format, Community Assessment Subcommittee Solicitation, Committee Model Primer)

Thursday, September 26, 2024, 9:00am-4:30pm (Joint Committee)

[Meet online and in UCAR CG1-3131 (Center Green campus)]

09:00 – 09:30   Administrative Items and Welcome (Chairs/Tanya)

- Committee Members Thank You and Welcome
- Introductions - Member Highlights

09:15 – 09:30   Committee Chairs Update and Prior Action Items

09:30 – 10:30   Director's Report (Mohan Ramamurthy)

10:30 – 10:45   BREAK

10:45 – 11:45   NSF Unidata Lightning Portfolio Presentations (Staff)

- Community Services
- Data Access, Dissemination, and Management
- Data Visualization

11:45 – 12:00 Portfolio Clarification Questions (Staff/Committees)

12:00 – 13:15   LUNCH

13:15 – 13:45   NSF Unidata Portfolio Q&A (Staff/Committees)

13:45 – 14:45   Committee Model Discussion (Chairs)

14:45 – 15:00   BREAK

15:00 – 16:00   Hybrid DeSouza Award Presentation and Q&A (Jim Steenburgh)

16:00 – 16:30   Administrative Items and Wrap-up (Review Day's Proceedings/Discussion, Actions)

16:30   Adjourn

17:30   Dinner at BarTaco at 1048 Pearl Street, Suite 101, Boulder, CO 80302

Friday, September 27, 2024, 9:00am -1:00pm (Strategic Advisory Committee)

[Meet online and in UCAR FL4-1201 (Unidata conference room)]

09:00 – 09:15   Administrative Items and Welcome

09:15 – 09:35   NASA Agency Report (Justin Rice)

09:35 – 09:55   NOAA NWS Agency Report (Scott Jacobs)

09:55 – 10:15   NSF Report (Bernard Grant)

10:15 - 10: 30   BREAK

10:30 - 11:00   Budget Report (Sheri Ruscetta)

11:00 – 12:30 SAC and UPC Collaborative Processes and Frameworks

Collaborative Decision-making Framework for Community Priorities and the NSF Unidata Portfolio

Defining and Refining Internal SAC/UPC Recommendation Process

12:30 – 12:40   Administrative / Wrap Up (Review Day's Proceedings/Discussion, Actions, Spring Meeting Dates and Location)

12:40- 13:00 All Other Business/Lunch/Meeting Adjourned

Status Report: Strategic Advisory Committee Actions

April 2024- September 2024

Unidata Program Center Staff

Actions from the Previous Meeting (November 2023)

Action 1

Discuss Fall Joint Committee meeting dates with Usercom [UPC: TanyaV]

Result

Complete

Action 2

Send 2024 Unidata Strategic Plan Narrative and 1 page summary of NSF Unidata portfolio/high level projects and connections/relevant info to committee members by Friday May 10th. [UPC: TanyaV, DougD, UMT]

Result

Complete

Action 3

 Committee to provide advice to Mohan by May 22. [SAC]

Result

Complete

Action 4

Reach out to Patrick Quinn (Patrick.m.quinn@nasa.gov) regarding CF workshop and roadmap [EthanD]

Result

Complete - Emailed and talked at ESIP mtg in July. A team member will attend CF Workshop (remotely).

Action 5

Committees Model Discussion: incorporate input from Spring meeting and send back out over summer for asynchronous SAC member review and feedback, then iterate for a completed version to vote on during Joint Committee Meeting [AlexD, CaseyD, VictorG]

Result

Complete; topic included for Joint Meeting Day.

Prepared *September 2024*

Status Report: Users Committee Actions

April 2024- September 2024

Unidata Program Center Staff

Actions from the Previous Meeting (May 2024)

Action 1

Fall Meeting Topic Request around AI/ML [TanyaV, Chairs]

Result

In discussions with the Users Committee Chairs, it was decided this will be feasible for the Spring meeting as the CyberTraining Project will be wrapping up and there will be three more modules to report on.

Action 2

Institute committee member report-out at each meeting, use for blog post if appropriate. Sean Freeman will present at Fall meeting [SeanF, DougD]

Result

Complete

Action 3

Create a blog post guiding community members on acknowledging Unidata (incorporate new NSF Unidata branding) [DougD]

Result

Incomplete but still on the ToDo list.

Action 4

Snapshot view of NSF Unidata visualization packages -- purpose and use [DougD]

Result

To be incorporated into updated web site structure.

Action 5

Brainstorming session next steps: collate, digitize, thematic analysis, explore more gaps/strategies. Share out at the Fall meeting. [TanyaV]

Result

Complete; report to be sent ahead of the Users Committee meeting andthe topic is on Fall agenda.

Action 6

Discussion about Spring Virtual UsersCom meeting format (part of wrap up with setting Spring dates) [TanyaV, Chairs]

Result

Complete; topic included on Fall agenda.

Action 7

Create DeSouza award materials [DougD, Chairs]

Result

Complete

Action 8

Equipment Awards review discussion, come up with key recommendations, present at Fall meeting (TanyaV, AlexD, ToddM, JenO)

Result

Discussion postponed until after the Joint meeting.

Action 9

Coordinate w/volunteer subcommittee (CaseyD, CraigR, AaronK, RogerR) to investigate ways NSF Unidata can provide support for AMS Educational Guidelines; meet over summer and report out at Fall meeting [CaseyD, CraigR, AaronK, RogerR, TanyaV, ThomasM, potentially NicoleC]

Result

Complete; Casey to report out at the Fall meeting.

Action 10

(Carryover from previous meeting) Schedule time during Fall meeting to discuss education agenda, align with beta release of Science Gateway education hub [TanyaV, NicoleC]

Result

Complete; topic is on the agenda for the Fall meeting.

Action 11

023 Users Workshop follow-up survey [TanyaV, NicoleC, AlexH, KevinG, KimW, DougD]

Result

Re-evaluated given timelapse; effort to progress community survey or other methodologies of collecting community input.

Action 12

Ask UPC staff who are interested to present at committee meetings; design a presentation format. [TanyaV to solicit participants and confer with chairs]

Result

Complete; folded into educational topic item presentation for Fall meeting.

Action 13

Restructure full status report document to have same structure as the summary report (non-alphabetical) [DougD]

Result

Complete

Status Report: AI/ML

April 2024- September 2024

Thomas Martin, Nicole Corbin

Executive Summary

Unidata ML Staff have been working on educational materials, Jupyter Notebooks, technical work, and blog posts. The Cybertraining Award from NSF is a focus moving forward with our colleagues at MSU Denver for in classroom AI/ML content and materials. **This no-code module is ready to be shared at other institutions**, please get in touch if you are interested.

Questions for Immediate Committee Feedback

These questions are the same as last time, but always looking for feedback along these themes

- What are the biggest challenges to incorporating AI/ML into curriculum and research?
- What python packages are the biggest source of frustration in your teaching?
- What size of datasets are common in your research?

Activities Since the Last Status Report

- Continued working on CyberTraining projects (see Community Services update for more in depth information)
- Working 1 on 1 with many students to answer specific ML related questions
- Assisted with mentoring both Unidata Interns
- NCAR project work coming to a close, was a great experience learning hands on current issues and pain points for large scale ML projects
- Working closely with the Science Gateway Team

New Activities

The next few months will be focused on AMS short course, technical work for the current NSF Cybertraining grant, and writing the next Cybertraining grant. Continued

Prepared *September 2024*

Status Report: AWIPS

April 2024- September 2024

Tiffany Meyer (Shay Carter)

Executive Summary

A major AWIPS upgrade for RHEL8/Rocky8 has been released in beta (version 23.4.1) and has been available since June 26, 2024 which addresses the RHEL7/CentOS7 EOL which was June 30, 2024. Both EDEX and CAVE are available for install, but source code cannot yet be released. The National Weather Service still has not released this version operationally, so we are limited in what we can release to the public, but we wanted to make sure we had something out there to address the RHEL7 EOL.

Our public EDEX is still running version 20 (on CentOS7) through the rest of this semester to help fill the gap from the delayed release of version 23 for Universities, but will be turned off in December.

Based on feedback from Universities running a Windows Lab, we've created a CAVE installer for Windows that installs at the admin level. This way, CAVE only needs to be installed once, but all users on that machine can use CAVE.

Tiffany is planning on attending AMS 2025 where she will be available during the Student Career Fair and throughout the conference for discussions. She will also be presenting on the latest Unidata AWIPS updates.

Questions for Immediate Committee Feedback

Did any of your students that went to AMS attend the AWIPS Student Workshop? Is this something we should plan on doing again in the future?

Activities Since the Last Status Report

AWIPS

Our EDEX servers have been continuously running on the new Jetstream2 platform. There have been numerous issues (from Jetstream or their vendors) that we've encountered on the new platform that have caused some outages. The AWIPS team has worked closely with Unidata IT, Science Gateway coworkers (Ana and Julien) and the Jetstream staff to troubleshoot and resolve issues that arise.

Since the last status report we've put out two beta releases of a major upgrade for version 23 which includes significant upgrades:

- RHEL (from RHEL7 to RHEL8) - we're running Rocky8
- Python (from 3.6 to 3.11)
- Java (from OpenJDK 11.0.13 to 11.0.22)
- Eclipse (from 4.17.0 to 4.21.0)

Unfortunately, version 23 is still considered in beta because the National Weather Service has yet to release version 23.4.1 operationally which limits our ability to fully release. This beta EDEX server is available to the public for all CAVE OS's (Windows, Mac, and Linux) as well as a VM running Rocky8. Additionally we have a beta version of EDEX for install. Anyone experiencing issues can report here.

Because version 23 is still in beta and Universities expressed the need for access to a version 20 EDEX for the fall semester we are still maintaining a public v20 EDEX. The backup server for v20 has been turned off to preserve Service Units. The plan is to turn off the public v20 at the end of the year since CentOS7 is very outdated and Universities should plan on upgrading to version 23.

Tiffany has been working with CIMSS (UW-Madison)/SSEC to obtain access to new GOES experimental products and incorporate them into AWIPS. Additionally, working with Stonie to look into adding the mPING dataset.

In July, staff levels were reduced which greatly impacted the AWIPS team. With these reductions, a decision was made to put the AWIPS Tips blog on hiatus. The major priorities for the single AWIPS team member has been to get a RHEL8 EDEX release out before the start of the fall semester, maintaining support, working on a new windows code signing certificate for CAVE.

Our blog series, AWIPS Tips, successfully ran every other week for just over three years. The breakdown of all the entries can be found on our documentation website in the Educational Resources page. Announcements and important information is shared through our mailing list (awips2-users@unidata.ucar.edu), and our social media accounts (Facebook, Twitter, LinkedIn, and YouTube when applicable).

We have asynchronous training available for both CAVE and Python-AWIPS on the Educational Resources website. We encourage everyone to check out both courses regardless of your experience level or familiarity with python or CAVE. Our courses can be accessed from our elearning website.

The AWIPS team has started tracking the number of users that are connected to our public EDEX. These numbers are likely an underestimate because any user who uses our Virtual Machine option comes across as "awips@localhost" which is only counted once. In addition to

tracking the number of users, the team hopes to gain a better understanding of who is connecting by tracking IP addresses and mapping them to Universities, private or government entities, or the general public.

Daily AWIPS Users Connected to Public EDEX
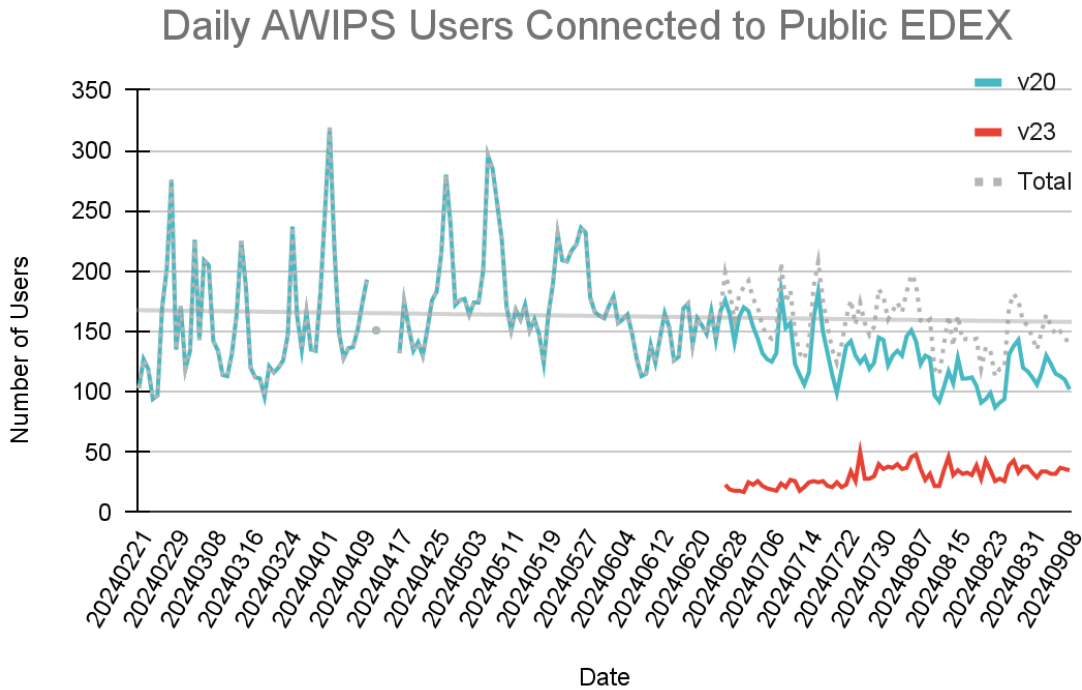
NSF Unidata's AWIPS group has the highest support interactions out of all the individual projects, as seen here in the latest support reply summary. Through our support signatures we still have an active support evaluation survey. The majority of our feedback has been overwhelmingly positive, and the graphic below is a summary from all responses we've received regarding the quality of service we provide:

Service Quality
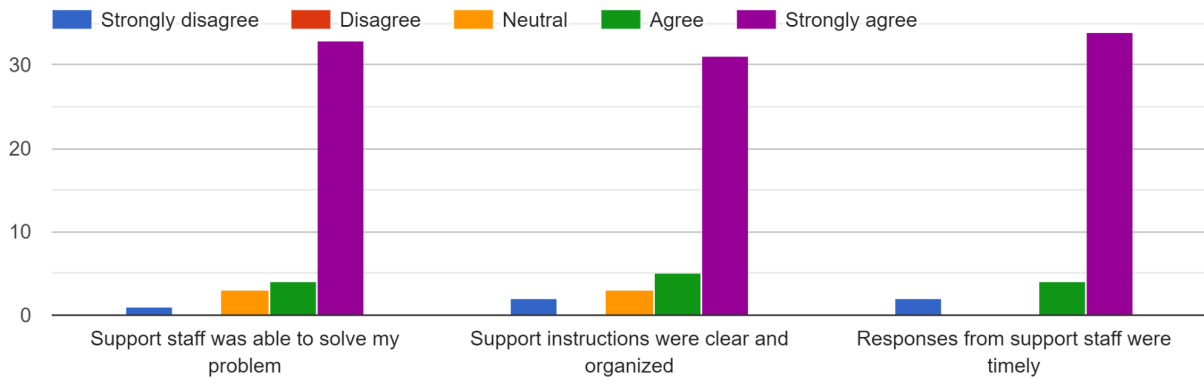
Some of the latest open-ended feedback from the support evaluations includes the following:

- *Shay was clear and helpful, and was timely in responding. Issue was fixed.*
- *The support received was very good.*
- *Great job and much appreciated!*

Tiffany is planning on attending AMS 2025 where she will be available during the Student Career Fair and throughout the conference for discussions. She will also be presenting on the latest Unidata AWIPS updates.

Software Releases

AWIPS	Date	EDEX	Win	Mac	Linux	VM
23.4.1-0.3	2024-07-25	X	X	X	X	X
23.4.1-0.2	2024-06-26	-	X	X	X	X

Since our last status report we have put out two beta releases for version 23 which is a major upgrade to RHEL8/Rocky8. We continue to support CAVE for Windows, Mac, and Linux as well as a Virtual Machine option which runs Rocky8 and has CAVE installed. As mentioned, because the NWS has not released v23 operationally, we are still in beta and cannot release the source code.

The naming convention the AWIPS Team follows for AWIPS releases tries to follow/reference

the NWS. For example, version 23.4.1-0.3 is based off the NWS 23.4.1 code base where:

23 - is the year the NWS planned on releasing (although this is typically delayed)
4 - is the fiscal quarter the NWS planned on releasing
1 - is the major version
0.3 - is the subversion that Unidata uses for releases. If there is a preceding "0" that means the release is in beta. Each release made we will increase this number.

Activities Ongoing/In-Progress

AWIPS development activities are constantly ongoing. Currently the following activities are in progress:

- looking into users of AWIPS (number of users, University vs public vs government vs private, etc.)
- actively developing new content to incorporate into v23
- maintaining the Jetstream2 platform with multiple production and development EDEX servers for multiple different versions (v18, v20, and v23), with the help of the Science Gateways team
- responding to all AWIPS support questions from the community and striving to provide realistic solutions in a timely manner
- actively updating and refining our online documentation to be as accurate and useful as possible

Future Activities

Future plans are constantly evolving to meet the needs of our users. The AWIPS team is focused on developing and releasing a production version of AWIPS on RHEL8 (Rocky 8) once the okay comes from the NWS. In the meantime updates will continually be made as well as focusing on updating the python-awips package to have the latest v23 installation available on Conda and pip. The team is actively participating in conferences, workshops, and virtual message boards (blogs) to expand our user base.

Metrics

Downloads November 1, 2023 - March 31, 2024

AWIPS downloads: 3,482

Prepared *September 2024*

Status Report: IDV with RAMADDA

April 2024- September 2024

Yuan Ho, Julien Chastang

Executive Summary

We continue to support, update, and enhance the 3D data visualization and analysis tool IDV for our community. Our current activities include: coordinating with netCDF-Java group to add new data formats, collaborating with the SSEC developers to enhance the VisAD library, and working with our community to promote the usage of the IDV in research and education.

Questions for Immediate Committee Feedback

We have noticed that many advanced features of the IDV, such as formulas and trajectory displays, have not been widely used in the community and many data servers that the IDV can directly access are less well known to IDV users. We would like to provide help to classes, research groups and project teams to use these resources. Can committee members help to establish such connections?

Activities Since the Last Status Report

IDV Releases

The IDV 6.2u2 was released in December 2023.
The release is currently on hold due to an issue with the renewal of the Windows code signing certificate.

IDV System Changes

__IDV Certificates__

Java Windows app and MacOS certificates have been renewed and will be valid until at least May 30, MacOS certificate is valid until 2024). Moreover, as properly signing the IDV under these different environments can be an involved process, this information has been thoroughly [documented here](#).

__Changes to nightly release that will eventually be incorporated into into stable version__

- IDV uses the latest Java 8 AdoptOpenJDK

- IDV employes latest Java3D (1.6.2)
- Updated the IDV code signing certificates on all platforms (i.e., MacOS, Windows, Webstart)
- IDV now "notartized" on MacOS
- Updated Unidata's Install4J license from version 5 to 8.
- Updated the IDV Install4J configuration.
- Updated the IDV Jython library to 2.7.4.

IDV Display Changes

__Pre/Post process data for ML applications __

The IDV offers a range of statistical analysis formulas, encompassing area averages, level averages, maximum, minimum, mean, percentiles, and summations. The results of these analyses can now be produced as non-geolocated data and exported in formats such as CSV or netCDF. This newly introduced feature empowers users to leverage the IDV's versatile access to multiple data servers, enabling them to preprocess data for applications including machine learning and other scientific uses.

__ More with Level II Radar Grid Displays __

With the newly developed Level 2 radar grid display feature, we've expanded its capabilities by incorporating derived formulas to calculate radar precipitation rates. These calculations are based on two key approaches: the Marshall-Palmer drop size distribution and dual polarization radar data. The Marshall-Palmer method provides a traditional estimate of precipitation rates using reflectivity, while the dual polarization approach enhances accuracy by factoring in both reflectivity and differential reflectivity. These advancements allow for more precise and varied precipitation rate calculations, improving radar data interpretation and weather analysis.

__Multi Variables Cross-Section Display__

After creating the first vertical cross-sections display, you can add a contour cross-section display for a second variable as well as a wind vector cross-section display for a derived variable. When working with multi variable cross-section displays, we recommend using a color-filled contour display or a color-shaded display, and contour displays for the second or the third variables. Multi-variable cross-section displays offer several advantages in data visualization and analysis, such as enhanced data comparisons, comprehensive analysis, and efficient use of screen space. Additionally, you can now switch the vertical coordinate scale from meters to pressure in hPa, providing greater flexibility in interpreting the data.

__Two Variables Time Height Display__

A time-height display shows samples of a 3D parameter along a vertical profile from top to bottom of the available data, with time as the independent coordinate (x-axis). You can choose between contour, color-filled, and color-shaded time-height displays. After creating the time-height display for the first variable, you can add a contour time-height display for a second variable. This setup allows for a more detailed and layered analysis of vertical atmospheric data over time.

__Zoom Enhancement__

We have updated the algorithm responsible for calculating the clip distance during zoom operations in both map and globe views. This enhancement ensures that users can now zoom in to street level without experiencing the disappearance of 3D objects, improving the overall user experience. The refined algorithm dynamically adjusts the clip distance based on zoom levels, allowing for seamless and detailed visualization at various scales. This update is particularly beneficial for users requiring precise close-up views in 3D environments, making the zoom functionality more reliable and effective.

IDV Community Support

With the tightening of computer system security, it has become more challenging for our community to host data and bundles on their own systems. As a result, UNIDATA RAMADDA is now hosting the IDV LMT Lab Manual, which is widely used in university weather teaching and laboratory settings.

https://ramadda.unidata.ucar.edu/repository/entry/show?entryid=fa7adc01-66a4-40ad-a89f-ec38be50e935

MSU IDV Project

 I have collaborated with professor Sun from MSU and submitted the proposal, "Scientific Visualization and Mathematical Modeling of Weather Data: An Interdisciplinary Approach to Learning with IDV (Interdisciplinary IDV)," to NSF. This joint endeavor seeks to weave together the realms of scientific visualization and mathematical modeling, using the Integrated Data Viewer (IDV) as a central tool. By capitalizing on the unique features of the IDV, we aim to provide a comprehensive platform for hands-on exploration of weather data, empowering learners to engage deeply with the intricacies of mathematical modeling in the context of atmospheric sciences.

This collaboration with MSU exemplifies a commitment to cross-disciplinary education and research, promising to contribute valuable insights to both meteorology and education.

Together, we anticipate achieving impactful outcomes that advance the understanding and application of scientific principles in the dynamic field of weather data analysis.

IDV Publication Highlights

[Synoptic–Dynamic Meteorology in 3D: Introducing an IDV-Based Lab Manual](#) by Gary Lackmann, B. Mapes and K. Tyle

A [Google Scholar Search](#) reveals a number of publications that cite use of the IDV ([doi:10.5065/D6RN35XM](#)).

IDV and RAMADDA Training, Conference Attendance and Presence

__2025 AMS Annual Meeting__

- Scientific Visualization and Mathematical Modeling of Weather Data: An Interdisciplinary Approach to Learning with IDV (InterdisciplinaryIDV)

Ongoing Activities

We plan to continue the following activities:

__Investigation of Java 3D Alternative__

Because of concerns about the long-term viability of the open-source Java 3D project, the IDV team has begun discussions with our University of Wisconsin, SSEC collaborators to replace Java 3D with a more viable alternative within the VisAD API. We have started investigating whether the [Ardor 3D](#) can meet that objective. Looking into alternatives to Java 3D was also a goal described in the [Unidata 2018 Five-year plan](#).

New Activities

Over the past few months, we plan to organize or take part in the following:

We plan to upgrade the version of OPenJDK Java. This change will necessitate in depth testings and the IDV building and distribution workflow.

Relevant Metrics

__E-Support__

The IDV team continues to provide the geoscience community with high-quality support through e-support software and idv-users mail list. In the last half year the IDV team has closed ~40 e-support tickets. Each individual ticket may and often does involve many back-and-forth messages. There is an especially large number of support requests coming from international users.

Top ten universities running IDV are: Millersville, Oklahoma, University of Utah, St Cloud state, Plymouth, NC State, West Kentucky, Lyndon State, University of Illinois, and San Francisco State.

__GitHub Pull Requests__

In the area of greater collaborative development, since the migration of the IDV project to github, we have closed a total of 125 "pull requests" or code contributions from internal and external collaborators.

__Youtube IDV Instructional Videos__

In the area of online IDV training, the Youtube IDV instructional videos have been viewed thousands of times.

Prepared *September 2024*

Status Report: Python

April 2024- September 2024

Ryan May, Drew Camron, Julien Chastang, Ana Espinoza, Nicole Corbin, Thomas Martin

Executive Summary

Unidata's Python efforts continue to encompass: training on the use of Python for the community; development and maintenance of several tools for the community (most notably MetPy but also Siphon and data processing scripts); and participation within the broader scientific Python community. We have offered fewer synchronous trainings in this period, instead focusing our limited resources on authoring high quality asynchronous online examples and prioritizing our presence at the American Meteorological Society (AMS) Annual Meeting. We led the design and facilitation of the 2024 Project Pythia Cook-off, a 4-day hackathon in which we grouped over 60 remote and in-person participants together to design these online examples. As part of the hackathon, the *MetPy Cookbook* has reached its first draft for publication to the Project Pythia website. MetPy development continues with the 1.6.3 bugfix release to address upstream changes. We are also planning a 1.7 release this fall which will center around min/max identification and S3 cloud data clients, as well as incorporating a variety of community contributions. MetPy's impact on science continues to grow, with 330 theses and peer-reviewed publications mentioning or citing MetPy, including 57 so far in 2024. While we continue to work with the broader scientific Python community as needed for our goals, Siphon development is completely stalled at the moment; both efforts are difficult to prioritize given limited time and other areas of the portfolio with dedicated awards (e.g. MetPy, Project Pythia) that need to be prioritized.

Questions for Immediate Committee Feedback

Nothing at this time.

Activities Since the Last Status Report

Python Training

We have offered fewer synchronous trainings in this period, instead favoring the authoring of high quality asynchronous online examples and a focus on effective use of our presence at the 2025 AMS Annual Meeting. The only synchronous offering we most directly authored was the 2024 Project Pythia Cook-off, a 4-day hackathon in which we grouped over 60 remote and in-person participants together to create effective online programming learning resources. As part of the hackathon, the *MetPy Cookbook*, a dedicated Pythia Cookbook for example analyses of real-world weather and climate datasets, has reached its first draft for publication to the Project Pythia website. The 2024 Unidata Internship participants contributed their expertise to the hackathon and developed their collaborative software authoring skills at the start of the summer. We have also led and supported technical efforts with Project Pythia to further modernize their online resource

review and publication infrastructure with support from projects and players in the ecosystem, like the MyST Markdown and JupyterBook v2.0 initiatives.

We are collaborating with the Unidata AI and Machine Learning projects to offer our first ever 2-day synchronous short course at the 2025 AMS Annual Meeting, *MetPy and Machine Learning: Unit Handling and Metadata Management Throughout the Machine Learning Lifecycle*. To manage the time and work necessary for this course, we will be taking a more supportive role in the 2025 AMS Student Conference, supporting a Project Pythia student workshop on Git and GitHub instead of offering our own dedicated Python Workshop once more.

Progress has been made on the following:

- Our *MetPy and Machine Learning* short course proposal was accepted for presentation at the 2025 AMS Annual Meeting, new content is under development now
- *MetPy Cookbook* is under review for its publication to the Pythia Cookbook Gallery
- Unidata continues technical and community leadership with Project Pythia
- "MetPy Mondays" are on hiatus while we await the finalization of a new subaward with John Leeman to continue this high-visibility, impactful video series.

MetPy

Development continues to be driven by requirements for our dedicated awards. MetPy 1.6.3 was released in late August 2024, which had fixes to work with the latest releases of Numpy and Pint. Beyond this, much of the development time goes to maintenance of the project and its associated infrastructure. While this infrastructure has proven critical to the on-going stability of the project within a relatively chaotic scientific Python ecosystem, its ongoing upkeep does have its own associated cost. We also have a steady, light stream of community contributions that add functionality, such as a recent pull request to add support for plotting emigram and Stuve plots.

Moving forward, 1.7 is planned for release in mid-Fall 2024. Internal priorities for this release are focused on automatic identification of field maxima and minima, combined with plotting support, as well as shipping clients for S3-based datasets like NEXRAD Level ⅔ and GOES. This will also include the community contributions that are currently in review.

Progress has been made on the following:

- MetPy 1.6.3 released late August 2024
- 337 total theses or peer-reviewed publications citing or mentioning MetPy, with 57 so far in 2024.

Siphon

Siphon continues to exist in a steady state, with its needs largely meeting what is needed at the moment. There is a growing amount of deferred maintenance that needs to be addressed in order to make releases to address upstream changes, as well as bring the infrastructure into sync with MetPy. Finding time to tackle this remains a challenge given the focus on the Pythia and MetPy awards.

Ongoing Activities

We plan to continue the following activities:

- Engage in support of Project Pythia and adjacent UCAR Python education efforts
- Engaging in synchronous Python teaching opportunities, virtual or otherwise
- Making progress towards the goal of MetPy's dedicated award to address big data challenges
- Maintaining Siphon as a tool for remote data access across a variety of services
- Growing and developing MetPy as a community resource for Python in meteorology
- MetPy Mondays for engaging the community

New Activities

Over the next three months, we plan to organize or take part in the following:

- Offer a two-day short course on MetPy & ML in Python at AMS 2025 Annual Meeting
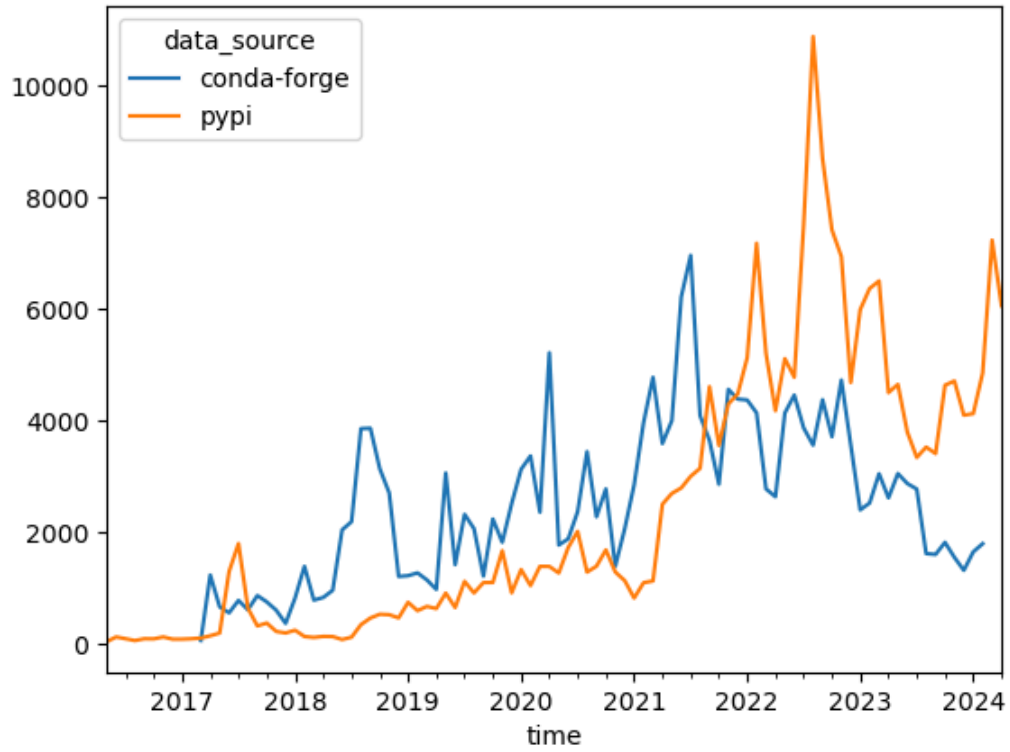- Release MetPy 1.7 including high/low identification and cloud data clients

Over the next twelve months, we plan to organize or take part in the following:
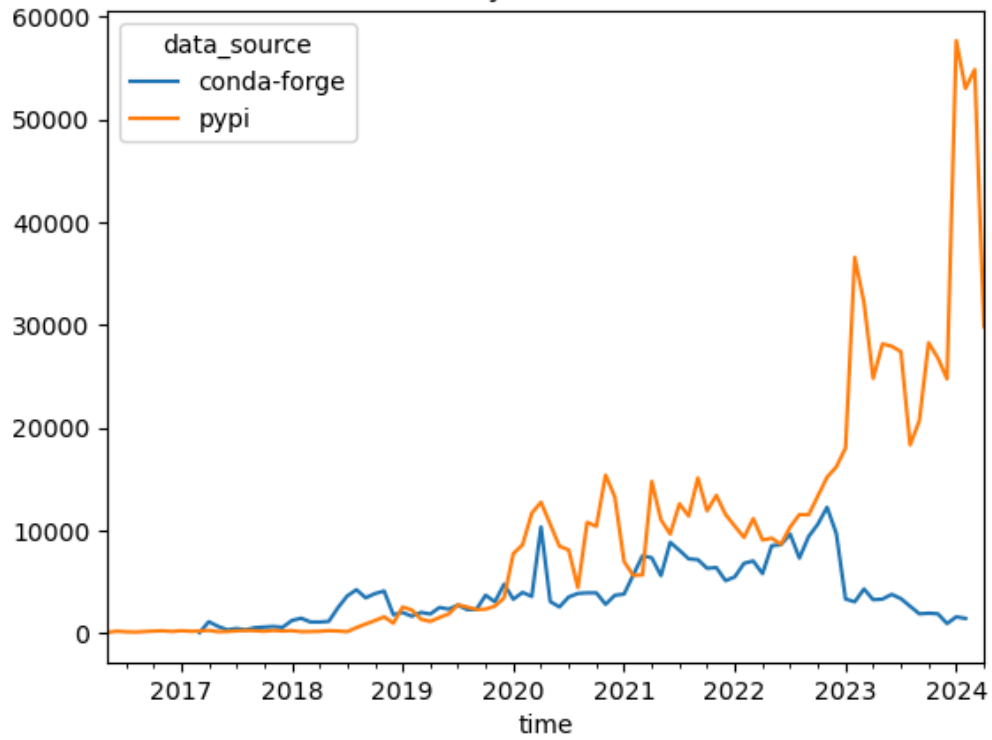
- Attend SciPy 2025

Relevant Metrics

NOTE: conda-forge numbers are problematic due to an upstream known issue with "new format" packages that has hopefully been addressed for future downloads.

Siphon Downloads

MetPy Downloads

- MetPy
  - According to GitHub, 595 repositories and 64 packages depend on MetPy
  - 57 citations/mentions in 2024, 337 total
  - Downloads for the releases made in the last year (Conda + PyPI):
    - 1.6.0: 16040
    - 1.6.1: 121156
    - 1.6.2:
    - 1.6.3:
- Siphon
  - According to GitHub, 222 repositories and 26 packages depend on Siphon

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Prepared *September 2024*

Status Report: Data Standards and Technical Engagement

April 2024- September 2024

Ethan Davis, Ward Fisher, Tara Drwenski, and Ryan May

Executive Summary

Engage with federal science agencies, international standards bodies, and other communities focused on data and technology including NASA, NOAA, USGS, World Meteorological Organization (WMO), Open Geospatial Consortium (OGC), Earth System Information Partners (ESIP), CF Conventions for netCDF community, and the Zarr (and GeoZarr) community.

Unidata's netCDF teams continues to engage with the Zarr community on:
1) Zarr support in both the netCDF-C and netCDF-Java libraries;
2) the development of the Zarr version 3 specification; and
3) the development of the GeoZarr convention.

Unidata has been tracking the development of the WMO Information System 2.0 ([WIS2](#)) and discussing, internally and with WIS2 developers, how it might interact with Unidata technologies like LDM and THREDDS. Moving forward (2-6 years) WIS2 will be the framework for WMO data sharing, eventually replacing the GTS. WIS2 is built on modern messaging and data [standards](#) (e.g., MQTT and OGC APIs).

Questions for Immediate Committee Feedback

No questions at this time.

Activities Since the Last Status Report

NCZarr/Zarr Specification Efforts

As part of implementing Zarr support in both the netCDF-C and -Java libraries, the NCZarr convention/extension has been developed to provide a clean and complete mapping between the netCDF and Zarr data models. During this work, the netCDF developers have been participating in discussions around clarification and evolution of the Zarr (version 2 and 3) specifications.

Progress has been made on the following:

- Members of Unidata's netCDF teams have membership on the Zarr Implementation Committee and the Zarr Enhancement Protocol (ZEP) Committee and regularly participate in the bi-weekly Zarr Community and ZEP calls.
- Members of Unidata's netCDF team participated in discussions around the GeoZarr

convention. GeoZarr builds on the Climate and Forecast (CF) Conventions for netCDF and will be developed within the OGC community standards process.
- Members of Unidata's netCDF team are assisting with GeoZarr interoperability testing of netCDF-C and -Java libraries.

CF Conventions for netCDF activities

Unidata has a long history of involvement in the development of the [Climate and Forecast (CF) Conventions for netCDF](#). These efforts continue with ongoing participation in development conversations on the [CF GitHub repositories](#), participation in and help in organizing the annual CF Workshops, and participation in the governance of CF.

Progress has been made on the following:

- The 2024 CF workshop ([announcement](#)) will be held at SMHI, Norrköping, Sweden on 17-20 September 2024.
- Ethan Davis continues serving as chair of the [CF Governance Panel](#).

OGC activities

Planning continues for UCAR to host the Oct 2025 OGC Member Meeting.

Ongoing Activities

We plan to continue the following activities:

- Track and engage in WMO data standards efforts
- Continue efforts to update and reorganize the NetCDF User's Guide (NUG)
- Represent Unidata in Earth System Information Partners
- Represent UCAR and Unidata in OGC and various OGC working groups
- Organize regular meetings of the OGC netCDF SWG.

New Activities

Over the next three months, we plan to organize or take part in the following:

- Continue conversations with CF, WMO, and others on the development of mappings between CF Standard Names and GRIB/BUFR variable names.

Over the next twelve months, we plan to organize or take part in the following:

- Deploy a draft version of the new, library independent, NetCDF User's Guide (NUG).
- Submit request for full registration of the netCDF media type with IANA

Prepared *September 2024*

Status Report: IDD and LDM

April 2024- September 2024

Stonie Cooper

Executive Summary

NSF Unidata's LDM developer and IDD maintainer continues to update LDM source code and operating paradigms with ever-changing computing implementations and user requests. The IDD continues to be enhanced with data redundancy and inclusion of new data.

Questions for Immediate Committee Feedback

None at this time.

Activities Since the Last Status Report

Although not the only technology for distributing data, the IDD is the preferred source for automatically streaming environmental data in real-time. The service-level software for streaming data across the IDD is LDM, and as such, emphasis is placed on maintaining the source code for stability and efficiency.

Progress has been made on the following:

- IDD: in conversations with federal entities to create more geographically diverse ground station data redundancy specific to NOAAPort.
- IDD: have started conversation to hopefully add mPING data for researchers and education (U of OK).
- IDD: have added new value-added data from CIMSS (U of Wisc).
- IDD: implementation of new rtstats interface tested, waiting for final approval (Thank you Mike Zuranski).
- IDD: reviewed ground station processing for GRB data in preparation for operational GOES-19 (NOAA/NESDIS).
- LDM: identified build-time vulnerabilities and removed.
- LDM: have updated external application requirements for inclusion of modern implementation of Linux distributions (ss vs. netstat).
- LDM: implemented community-provided source code for added utility (pqlist - Thank you Dan Vietor!).
- LDM: implemented a new middle-ware client that is generic to replace NOAAPort-specific interface.
- Data Monitoring: extended implemented Grafana to incorporate higher resolution on statistics polling and additional parameters.

Dependencies, challenges, problems, and risks include:

- Ever changing landscape of new data types, adjustments from data source paradigms.
- User hesitation to upgrade to current versions, but indicating issues resolved in current versions.
- Reduction in developer and maintainer resources and multitasking across multiple responsibilities.

Ongoing Activities

I plan to continue the following activities:

- Supporting and maintaining LDM and ancillary software.
- Supporting IDD data sourcing with new opportunities and operational observation platforms.
- Implementing data bandwidth metrics to provide real-time data usage accounting.
- Supporting users of the LDM and IDD with quick and professional responses.
- Migration of LDM training to on-demand video/wiki training sessions.

Relevant Metrics

- The LDM software provides the streaming technology for the NSF Unidata IDD network. Metrics on that program are available upon request.
- Number of LDM package downloads immediately following latest version releases.
- Number of support tickets and training requests, views, or downloads.

Prepared *September 2024*

Status Report: Information Technology

April 2024- September 2024

Mike Schmidt, Matt Perna, & Jennifer Oxelson

Executive Summary

Our role is to maintain and enhance the productivity of the staff and assist with the resolution of issues in service to the community. Primarily, that consists of keeping end-user and developer systems secure, and keeping servers and services highly available, patched, and operational for the community. This report is informational and there are no pressing issues.

Questions for Immediate Committee Feedback

Unless committee members or the community are experiencing performance issues that we could help resolve, no other feedback is requested.

Major Activities

- Unidata has a new support ticketing system in place!
- At UCAR's behest, Unidata IT staff have been migrating hosts and services to meet security requirements on a very short deadline.
- UCAR continues to migrate select services to a centralized model and Unidata is involved in implementing the service(s) for our systems and users. Recently competed and/or anticipated are;
  - centralized backups (CrashPlan, complete)
  - centralized end-user security agent (Palo Alto Cortex XDR, complete)
  - staff net deployment (all office networks, complete)
  - corporate device management (in progress)
  - centralized access and identity management (in progress)
  - All systems have Disk Encryption enabled (Mac and Windows - Complete)
  - Working with help@ucar.edu to obtain systems for our staff to migrate to, and awaiting a timeline on this from them.

As of writing this, we have implemented 2 MDM solutions to manage our Macbooks as well as our remote Windows clients. Firewalls, antivirus, and overall configurations are monitored constantly and report back when there is an anomaly on both Operating systems. Cloud backups have been implemented on all Unidata client workstations for the past year and we see a foreseeable upgrade in the way we back up clients to the cloud in the coming year. Disk encryption will be enforced across the board on all client operating systems. Unidata IT can remotely manage any Unidata client workstation if it is connected to the internet.

UCAR's Mesa Lab Data Center (MLDC) co-location facility upgrade is mostly complete, and Unidata is participating in staged moves rack-by-rack and are currently about 33% complete.

There may be the need to roll some of our Internet-based services to the NWSC in Cheyenne to avoid community visible service outages.

Daily, we continue efforts to keep services and systems secure which takes consistent attention and occasional herculean efforts (to patch everything all at once). UCAR continues to embark on new initiatives to segment the network into smaller and smaller zones and gain a more dynamic inventory of assets on the network. Unidata continues to play a role in these efforts.

Ongoing Activities

We plan to continue the following activities:

- Day-to-day system and network support to the community as needed
- Resolve daily staff help desk issues
- Maintain security profile and exceed UCAR security standards
- Following UCAR directives regarding cybersecurity initiatives

Prepared *September 2024*

Status Report: netCDF

April 2024- September 2024

Ward Fisher , *Tara Drwenski* , *Ethan Davis*

Executive Summary

The netCDF team continues to work towards maintaining the sustainability and viability of the netCDF libraries. While facing challenges when prioritizing work against the resources available, we are fortunate to have an engaged community of users and developers.

The status of the netCDF team can be summarized as follows:

NetCDF is healthy and remains viable, but remaining so will require continued support from our community.

Our efforts to serve the community are reciprocated, through high levels of engagement and contributions, for which we are immensely grateful. The netCDF team lacks the resources to quickly evaluate every potentially useful emergent technology or address every bug report, and we must therefore triage based on what best serves our communities interests at large. We continue to advocate for our community through participation in external data-oriented/focused groups.

Questions for the Committee

How can we encourage additional community engagement, from students and/or faculty? We benefit greatly from the involvement of our community, making netCDF truly a collaborative effort. How can we encourage/expand this collaboration? What makes it rewarding to engage with the netCDF developers?

NetCDF Project Status

Team Status

With the retirement of Dennis Heimbigner, the active team is composed of the technical team lead, Ward Fisher, Tara Drwenski as the lead developer on netCDF-Java, and our community of developers. Work continues apace, but is largely focused on community building and bug fixing.

Status of Community Relationships

NetCDF User and Developer Community

NetCDF continues to enjoy a high amount of community engagement, for which we are very grateful. The primary avenues of engagement with the netCDF community are as follows:

- Committee Meetings (always a pleasure, you're all great).
- Github (issues, conversations)
- Email - Direct, or through the NSF Unidata eSupport system
- Professional events - AGU, RMCC HPC Symposium, etc.

Broader Community Engagement

The netCDF team continues to represent the netCDF community in the following areas:

- Zarr Implementation Council (ZIC); NSF Unidata has a seat, represented by Ward, and the ZIC committee. While the ZIC is currently undergoing reorganization, we have spent years acting as a voice for the interests of our communities.
- Renewed collaboration with the HDF Group; we have revived an older tradition of having regular, informal meetings where we discuss the work each team is doing, consult on roadblocks, and consider the bigger picture re: the NSF Unidata community.
- Various one-off symposia, conferences, workshops, etc, focused on data formats and data standards.

Short-Term Priorities

We are focused in the short term on the v4.9.3 release of netCDF-C, with accompanying releases of the Fortran and C++ interfaces. This release will improve the documentation and functionality for cloud-based ncZarr storage options in the C library, and expand the interface libraries to allow for the use of these new features. We need to introduce versioning to the netCDF spec, as this is long overdue.

Areas of Concern

Lack of resources refers to "Not having enough developer hours to address all of the issues which need to be addressed, in parallel". This leads to triaging issues and figuring out which issues need to be addressed in what order. Even assuming perfect efficiency, the overhead of this sort of project management is in-and-of-itself requires an allocation of resources which would otherwise be spent addressing said issues. The netCDF team does not enjoy perfect project management efficiency.

The reduced resources limit the amount of effort that can go into directly implementing new features in netCDF. Furthermore, time is spent between purely technical tasks and other, equally important but nebulous tasks such as community maintenance and support, project management, and research into emergent technologies and how they can be used to meet the needs of our community.

Roadmap

The following items are prioritized in the medium-to-long term:

- Documentation
  - NetCDF has added a lot of functionality that has not been documented as well as we would like.
  - The documentation organization isn't very good.
- More reliable Amazon AWS access via ncZarr + documentation.
- Integration of cloud-HDF functionality.
- Continued bug fixes, optimization.
- Evaluation of the next generation of emergent technologies; we have had great success in the past anticipating what will be useful to our community. We want to continue this success.

Prepared *September 2024*

Status Report: THREDDS

April 2024- September 2024

Tara Drwenski, Jennifer Oxelson, Ryan May, Ethan Davis

Executive Summary

New versions of NetCDF-Java and the TDS were released in July. We also performed a significant number of upgrades to the TDS to ensure it remains secure, which were needed due to the end of life of the Spring 5 framework. There is currently only one developer left working on the THREDDS projects.

Questions for Immediate Committee Feedback

None at this time.

Activities Since the Last Status Report

General

- Hailey Johnson left the THREDDS team, so Tara Drwenski is the only THREDDS developer.
- Leo Matak was a summer intern working on extensible NcML enhancements for server-side data preprocessing.

NetCDF-Java

- Version 5.6.0 was released. This contained a number of bug fixes, security updates, and improvements. See also: https://github.com/Unidata/netcdf-java/releases/tag/v5.6.0.

TDS

- Version 5.5 was released. This contained a number of bug fixes, security updates, and improvements. See also: https://github.com/Unidata/tds/releases/tag/v5.5.
- A series of updates had to be performed as the Spring 5 framework is end-of-life in August 2024. These include:
    - Gradle 6 -> 7
    - Java 11 -> 17
    - Jakarta EE 8 -> 9
    - Spring 5 -> 6
    - Tomcat 8/9 -> 10

Ongoing Activities

Server management

- Unidata hosts and maintains the following THREDDS servers:
  - thredds.ucar.edu always runs the latest stable release of the TDS (unless a quick security update is required)
  - thredds-test.ucar.edu always runs the latest development version
  - thredds-dev.ucar.edu is intended to be used by THREDDS developers to test changes
  - Additionally, the Cloud Activities group manages cloud-hosted TDS instance (see cloud activities report for details).

Development

- Closely monitor the security status and update dependencies or fix issues as needed
- Continue to help users with upgrades to TDS 5.x
- Respond to user issues and fix bugs
- New feature development in the THREDDS libraries is on hold while we consider future directions

The following active proposals directly involve THREDDS work:

- Partnering with the NetCDF team on a proposal to fund the development of shared, modernized build and CI infrastructure across the netCDF libraries.
- Potentially assisting the NASA SERVIR group by investigating their performance issues.

New Activities

We are waiting on plans for the future direction of the THREDDS projects before making definite plans on what activities to take on in the coming months.

Relevant Metrics

THREDDS Startup Metrics

	2023-03 — 2023-10	2014-08 — 2023-10
TDS Startup (unique IP address count)	2185	44219

|	Total Servers	Information page updated

Publicly Accessible[1] TDS count	119	68

Over the past 4 months, **2,185** unique IPs started up the TDS (November 2023 through April 2024). Since we've started tracking these metrics (v4.5.3, August 26th, 2014), we've seen the TDS startup from **44219** unique IP addresses. There are currently **135** publically accessible TDSs running "in the wild". Of the **119** publically accessible servers, **68** have updated the name of their server in their server configuration file (taken as a sign that they are maybe, possibly, intended to be used by others…maybe…).

The figures below show the distribution of TDS versions (top), and the fractional share of servers running version X or older (bottom). Each labeled version includes betas and snapshots, not just the official release of that version, for presentation simplicity. TDS v5.0 remains the dominant specific version running in the wild, although there are almost as many instances of 5.4.

Versions of TDS Running at Unique IP Addresses as of April 21st, 2024
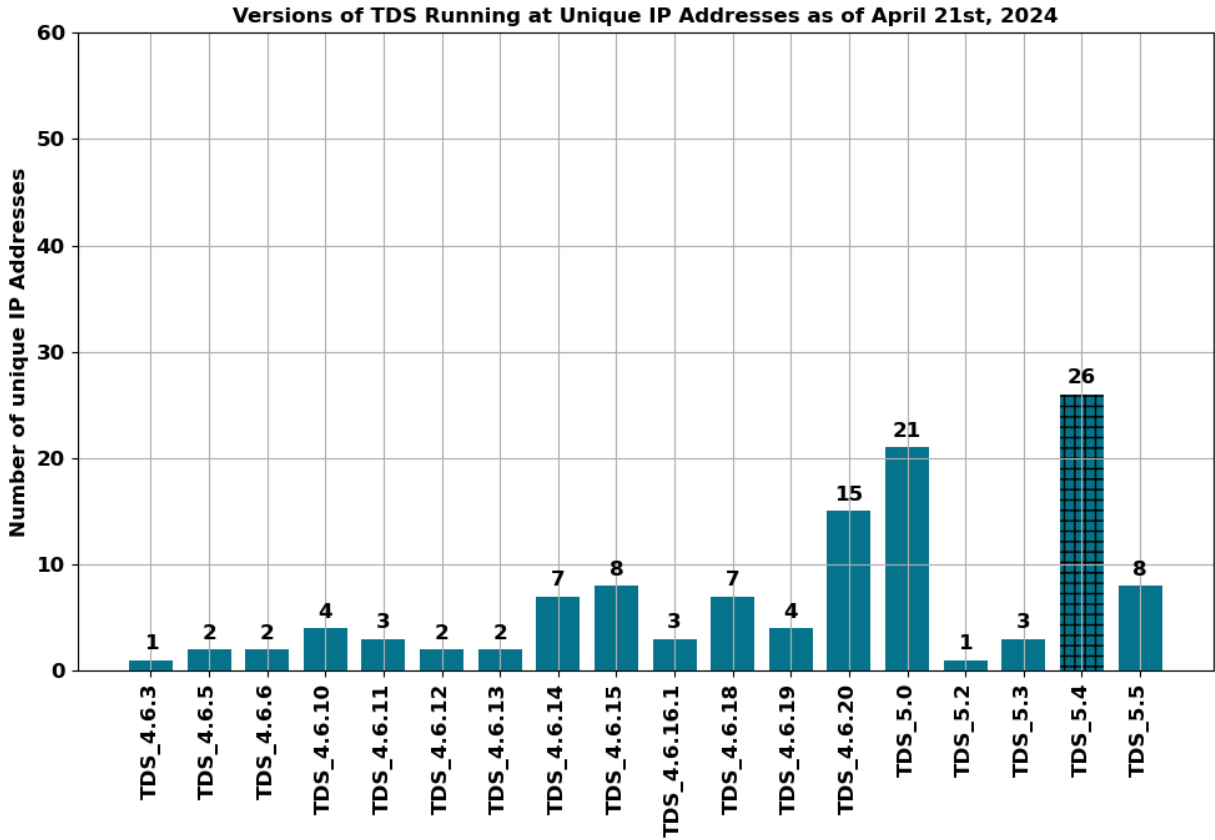
[1] "Publicly accessible" means we could find a top-level THREDDS Client Catalog. We checked <server>/thredds/catalog.xml (version 4), <server>/thredds/catalog/catalog.xml (version 5), including the most common ports of 80, 8080, 443, and 8443.

Versions of TDS Running at Unique IP Addresses as of April 21st, 2024
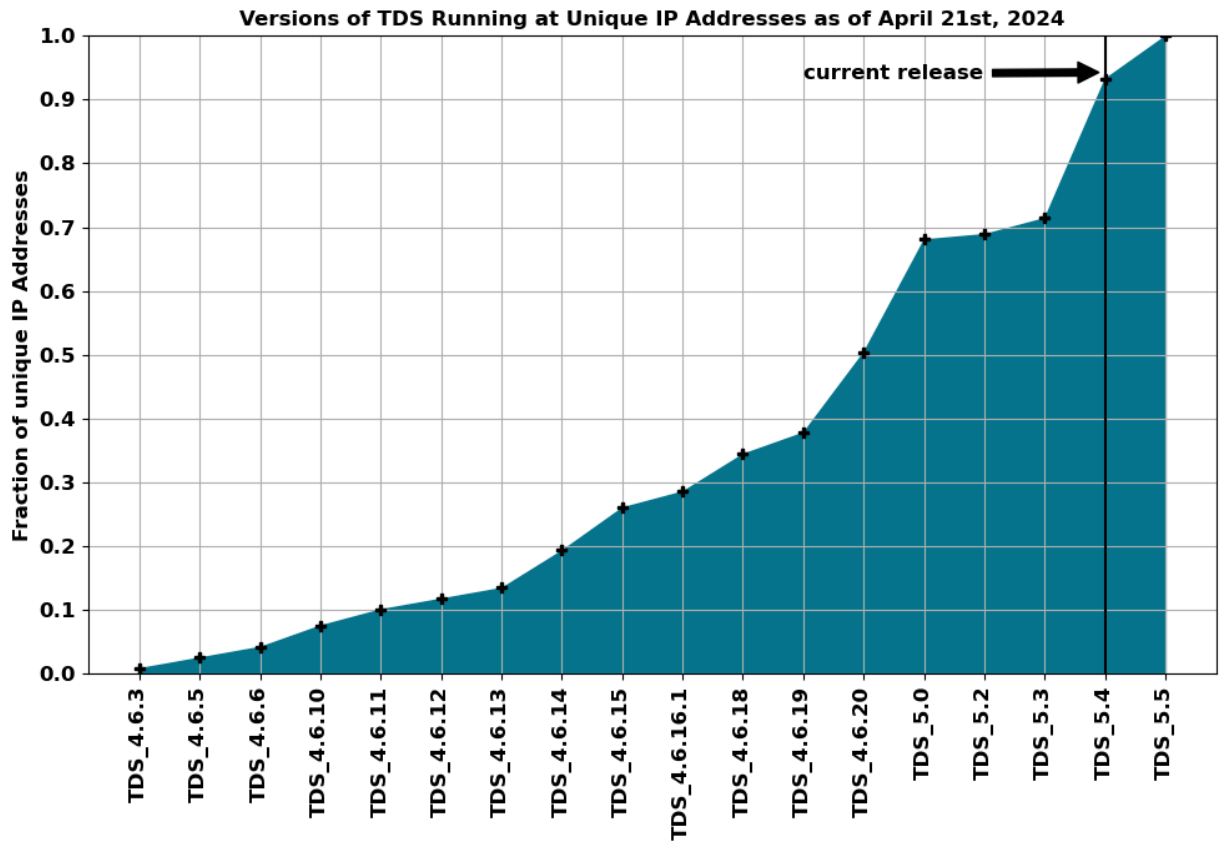
Prepared September 2024

Status Report: Science Gateway and Cloud Computing Activities

April 2024- September 2024

Julien Chastang, Nicole Corbin, Ethan Davis, Doug Dirks, Tara Drwenski,
Ana Espinoza, Ward Fisher, Thomas Martin, Ryan May, Tiffany Meyer, Jennifer Oxelson Ganter,
Mike Schmidt, Tanya Vance

Executive Summary

Jetstream2 Allocation Renewal: A request for 8.7M CPU SUs and 742K GPU SUs for the 2024-25 cycle was recently approved. This will sustain essential services like PyAOS (Python for Atmosphere and Ocean Science) JupyterHubs and AWIPS EDEX.

Increased GPU Access: Jetstream2 has halved GPU SU costs, effectively doubling GPU resources, allowing broader access for students, educators, and researchers.

LROSE Collaboration: NSF Unidata is supporting Colorado State University and NSF NCAR's radar meteorology efforts by integrating SAMURAI software into JupyterHub. Presentations and workshops are planned for several conferences.

Science Gateway Re-Imagined: Development is progressing in phases, with private beta testing of JupyterHub request workflows complete. The full release, with features like on-demand notebooks and app streaming, is planned for 2027.

JupyterHub Support: Since Spring 2024, 419 students at 17 institutions have used tailored JupyterHub servers, with several workshops and new university collaborations.

NOAA Big Data Program: NSF Unidata continues to manage NEXRAD level 2 data on AWS, ensuring real-time access to radar data for the community.

Ongoing Collaboration: Active partnerships with Jetstream2 staff and collaborators to optimize the cloud-based deployment of JupyterHub servers and AWIPS EDEX to improve system reliability.

Conference Participation: NSF Unidata will present at the Science Gateways 2024 conference and the American Meteorological Society 2025 meeting.

Questions for Immediate Committee Feedback

None at this time.

Activities Since the Last Status Report

Jetstream2 2024-25 ACCESS Grant Request

NSF Unidata has successfully secured a grant for 8,677,305 CPU SUs and 742,848 GPU SUs from the ACCESS program for the upcoming Jetstream2 cycle. This allocation, effective October 1, 2024, ensures continued access to essential servers such as EDEX, JupyterHub, THREDDS, RAMADDA, and LDM/IDD nodes. The awarded resources are similar to those received for the 2023-24 cycle, allowing uninterrupted operation of CPU and GPU virtual machines (VMs) with various configurations.

Increased GPU Accessibility Through Reduced SU Costs

Jetstream2 announced earlier this year that the Service Unit (SU) cost per hour of virtual machine uptime has been cut in half. The capabilities of JS2 and the total SUs allocated to us remain untouched, effectively doubling the GPU resources available to the community accessible via the NSF Unidata Science Gateway. We hope to continue increasing our GPU offerings to reach even more students, educators, and researchers.

LROSE Collaboration between Colorado State University and NSF NCAR EOL

NSF Unidata science gateway staff continue to collaborate with Professor Michael Bell's team at Colorado State University and NSF NCAR EOL to further develop their science gateway, which features a JupyterHub environment equipped with LROSE (Lidar Radar Open Software Environment) for radar meteorology. Recent work has focused on adapting the SAMURAI (Spline Analysis at Mesoscale Utilizing Radar and Aircraft Instrumentation) software for use within JupyterHub servers for the benefit of all Hub users. Our team has shared expertise in JupyterHub, OpenStack and Jetstream2 technologies to support this effort. We will be presenting a paper, "A Lidar and Radar Meteorology Science Gateway for Education and Research on the NSF Jetstream2 Cloud," at the Science Gateways 2024 conference and are preparing for an LROSE workshop at the AMS 2025 meeting in New Orleans. Submissions have also been accepted at the 2024 ERAD (European conference on RADar in meteorology and hydrology). Additionally, NSF Unidata secured $70K in funding to support Ana and Julien's contributions to the project.

NSF Unidata Science Gateway Re-Imagined

The Science Gateway Re-Imagined (SGRI) team—consisting of Nicole Corbin, Ana Espinoza, and Julien Chastang with managerial support from Ethan Davis and Tanya Vance—convenes bi-weekly to move the project forward. We are synchronizing our efforts with Doug Dirks and the NSF Unidata web group to ensure our initiative moves in harmony with NSF Unidata's overall web strategy.

The SGRI team is proceeding on schedule with the planned phased approach to development, with a private beta trial for the JupyterHub requests section having been completed in August 2024. This new requests workflow leverages Drupal technology to streamline both the user experience and facilitate the management of the numerous JupyterHub requests the Science Gateway team receives each semester. Beta testers unanimously preferred this workflow to the current Google request form.

Additional feedback from our beta testers will be incorporated into an update that will coincide with the Education Hub private beta trial, scheduled to begin at the end of October 2024. The Education Hub will present existing learning resources in a user friendly manner and allow visitors to the website to request new resources. Beta testers will be asked to provide feedback on navigation, resource metadata, and resource access.

Phased Approach to Development Summary

Phase 1 (Jan 2025 Release): Requests and Education – Users can request both compute resources (in the form of JupyterHubs) and educational resources (trainings, modules, etc.) and browse existing educational resources

Phase 2 (Apr 2026 Release): On-Demand Notebooks, Data Integration, and Community Hub – Users can interact with NSF Unidata curated "on-demand" notebooks without the need for a JupyterHub request, access data which is proximate to the computational environment, and share and develop ideas with colleagues in a community forum

Phase 3 (July 2026): Community Contributions – Users can contribute to the content (educational materials, notebooks, workflows, etc.) found on the Science Gateway according to written guidelines for the management and maintenance of this content

Phase 4 (Jul 2027 Release): App Streaming & Fully Re-Imagined Science Gateway – Users can "test-fire" NSF Unidata products such as the IDV or NSF Unidata's version of AWIPS CAVE in their browser as a substitute for or prior to a local installation

JupyterHub Activities

JupyterHub Servers for Workshops, Spring and Fall Semesters

NSF Unidata is employing our Jetstream2 resource allocation for the benefit of students in the atmospheric science community by providing access to customized JupyterHub servers at a steady pace. NSF Unidata tailors these servers to the requirements of the instructors so they can accomplish their Earth Systems Science teaching objectives. Since the spring semester of 2024 encompassing the length of this status report , 419 students at 17 academic institutions and various workshops have used NSF Unidata JupyterHub servers running on Jetstream2.

Notably, we provided JupyterHub resources to:

- Rocky Mountain Advanced Computing Consortium (RMACC) 2024 conference

- UCAR 2024 Summer SOARS Proteges
- June 2024 UCAR Professional Development Workshop
- New Institutions:
  - SUNY Oswego
  - Vermont State University
  - University of Florida

Ongoing Activities

NOAA Big Data Program

- NSF Unidata continues to manage the NEXRAD level 2 archive in Amazon S3, ensuring that realtime data are successfully delivered to the noaa-nexrad-level2 bucket. LDM is employed to deliver these data.
- Public Bucket for level II NEXRAD:
  https://s3.amazonaws.com/noaa-nexrad-level2/index.html
- NSF Unidata also continues to deliver NEXRAD level 3 products to the NSF Unidata-nexrad-level3 bucket, part of the AWS public datasets program.
- TDS on Jetstream2 for level II NEXRAD:
  https://tds-nexrad.scigw.unidata.ucar.edu/thredds/catalog/catalog.html

University of Oklahoma REU Students

NSF Unidata continues to collaborate with Ben Schenkel (OU) to provide data sets via the science gateway RAMADDA server. We also deployed a JupyterHub server so that NSF REU (Research Experience for Undergraduates) students at OU could access those data for their projects.

Jetstream2 and Andrea Zonca Collaboration

The NSF Unidata collaboration with Jetstream2 has made steady progress over the past six months. NSF Unidata staff continue to work closely with NSF Jetstream2 personnel to ensure the smooth operation of VMs, particularly addressing recurring issues with AWIPS EDEX VMs becoming unavailable and challenges related to disk attachments. Given the resource-intensive nature of EDEX, these problems are expected but are being actively managed.

Additionally, NSF Unidata has collaborated with Andrea Zonca (UCSD/SDSC/Jetstream2) and Jetstream2 staff to refine the "Zero to JupyterHub" workflow ported to OpenStack and Jetstream2. This includes testing, refining, and co-authoring tutorials featured in Andrea's blog, such as those on soft scaling, NFS mount refinements, and GPU image testing. Efforts have also focused on developing a minimal Ubuntu image optimized for use in Kubernetes-based JupyterHub environments. This work remains ongoing.

Docker Containerization of NSF Unidata Technology

We continue to employ Docker container technology to streamline building, deploying, and running NSF Unidata technology offerings in cloud-based environments. Specifically, we are refining and improving Docker images for the LDM, RAMADDA, and THREDDS. In addition, we also maintain a security-hardened NSF Unidata Tomcat container inherited by the RAMADDA and THREDDS containers. Independently, this Tomcat container has gained use in the geoscience community. To keep our containers up-to-date, especially with respect to security, we programmatically monitor and respond to upstream updates by automatically building and deploying the refreshed containers to DockerHub.

Tomcat 8.5 reached end of life on 31 Mar 2024. Staff have transitioned the Tomcat Docker containers and any dependencies to the newer version of Tomcat.

AWIPS EDEX in Jetstream2 Cloud

NSF Unidata continues to host our publicly accessible EDEX servers on the Jetstream2 cloud platform where we serve real-time AWIPS data to CAVE clients and the python-awips users. The distributed architectural concepts of AWIPS allow us to scale EDEX in the cloud to account for the desired data feed (and size). We continue using Jetstream2 to develop cloud-deployable AWIPS instances as imaged virtual machines (VMI) available to users of OpenStack CLI. Unfortunately, our systems have had quite a few issues on Jetstream2 and both the AWIPS team and the Science Gateway team have spent significant time troubleshooting and repairing machines to keep our servers operational.

Because we are needing to spin up new machines fairly often, we have simplified and streamlined this process by creating custom CentOS 7 and Rocky 8 images that can be used for deployment on Jetstream2. We have successfully created and launched a Rocky 8 EDEX system which the AWIPS team has been using to develop the latest version of AWIPS.

EDEX is designed so different components can be run across separate virtual machines (VMs) to improve efficiency and reduce latency. Our current design makes use of three VMs: one large instance to process most of the data and run all of the EDEX services including all requests, and two other ancillary machines which are smaller instances used to ingest and decode radar and satellite data individually.

We are currently supporting 4 sets of servers as described above: one set has been running our v18 software, another running production v20, and a development and beta server on Rocky8 running v23. Having backup servers allows us to be able to patch, maintain, and develop our servers while still having a functional server for our users and to minimize any down time. The plan is to decommission the v18 and v20 systems by the end of the year with CentOS7 being EOL. With those systems being shut down, we will likely spin up new Rocky8 systems to start developing on.

Nexrad AWS THREDDS Server on Jetstream2 Cloud

As part of the NOAA Big Data Project, NSF Unidata maintains a [THREDDS data server](#) on the Jetstream2 cloud serving Nexrad data from Amazon S3. This TDS server leverages Internet2 high bandwidth capability for serving the radar data from Amazon S3 data holdings. TDS team

member, Tara Drwenski, and Science gateway staff collaborate to maintain this server.

The URL for the THREDDS Nexrad radar has been changed from thredds-aws.unidata.ucar.edu to tds-nexrad.scigw.unidata.ucar.edu to better reflect its purpose. It will also be integrated into the science gateway's data services section.

Jetstream2 and Science Gateway Security

We continually work with NSF Unidata system administrator staff to ensure that our web-facing technologies and virtual machines on Jetstream2 adhere to the latest security standards. This effort involves such tasks as ensuring we are employing HTTPS , keeping cipher lists current, ensuring docker containers are up-to-date, limiting ssh access to systems, etc. It is a constantly evolving area that must be addressed frequently.

NSF Unidata Science Gateway Website and GitHub Repository

Website

The [NSF Unidata Science Gateway web site](#) is regularly updated to reflect the progress of what is available on the gateway. The news section is refreshed from time-to-time for announcements concerning the gateway. The conference section and bibliography is also maintained with new information. We are in the process of redesigning this web site. See "NSF Unidata Science Gateway Re-Imagined" section above.

Repository

All technical information on deploying and running NSF Unidata Science Gateway technologies is documented in the [repository README](#). This document is constantly updated to reflect the current state of the gateway.

Presentations/Publications/Posters

- J. DeHart, B. Javornik, J. Chastang, A. Espinoza, M. Dixon, and M. Bell, "A Lidar and Radar Meteorology Science Gateway for Education and Research on the NSF Jetstream2 Cloud," in Gateways 2024, Bozeman, Montana, USA, 2024.

New Activities

Over the next three months, we plan to organize or take part in the following:

Forthcoming conference attendance

- Science Gateways 2024, Bozeman, Montana
- American Meteorological Society 2025 Annual Meeting, New Orleans

- ○ Presentation Entitled: Expanding Access to Advanced Scientific Workflows: The NSF Unidata Science Gateway Leverages Innovative Capabilities of the NSF Jetstream2 Cloud for Atmospheric Science Education.
  - ○ Python Student Workshop
  - ○ Python MetPy Workshop
  - ○ Student Fair
  - ○ Career Fair

Over the next twelve months, we plan to organize or take part in the following:

- Please see the "NSF Unidata Science Gateway Re-Imagined" section above.
- Organizing and hosting PyAOS workshops leveraging Jetstream2 for atmospheric science. Topics might include GPU-accelerated workflows for machine learning and data analysis.
- Develop workflow that uses trained AI models for NWP on Jetstream2 GPU resources in conjunction with Thomas Martin

Relevant Metrics

Spring 2024 / Summer 2024 / Fall 2024 JupyterHub Servers

Since spring of 2020, NSF Unidata has provided access to JupyterHub scientific computing resources to about 1900 researchers, educators, and students (including a few NSF REU students) at 27 universities, workshops (regional, AMS, online), and the UCAR SOARS program. Below are the latest metrics since the last status report.

Spring 2024		
AMS MetPy short course	27	NSF Unidata Staff: Drew
AMS Python workshop	38	NSF Unidata Staff: Drew
Florida Institute of Technology	14	Milla Costa
Florida State University	14	Christopher Homles
Millersville University	34	Greg Blumberg
Seoul National University	22	Duseong Jo
Southern Arkansas University	12	Keith Maull
University of Alabama Huntsville	12	Sean Freeman
University of Louisville	5	Jason Naylor
University of Maryland	17	Maria Molina

University of Northern Colorado	0	Wendilyn Flynn
University of Oklahoma	3	Ben Schenkel
Penn State University	1	Karl Schneider
USGS MetPy Workshop	7	Drew, Thomas
RMACC 2024	21	Thomas
UCAR Professional Development Workshop	25	Drew, Nicole, Thomas, Jerry Cyccone (UCAR EDEC)
Summer 2024		
UCAR SOARS Internship	19	Keith Maull, UCAR/UCP
Fall 2024		
UND Fall Workshop	34	David Delene
Florida Institute of Technology	23	
Florida Institute of Technology B	8	
Southern Arkansas University	29	
Seoul National University	2	
University of Florida	7	
University of Wisconsin	24	Hannah Zanowski
Vermont State University	8	
SUNY Oswego	13	

Jetstream2 Allocation Usage Overview

In addition to service units (SUs) used for running various kinds of virtual machines–"regular" CPU and GPU instances–NSF Unidata was also granted a limited number of compute, storage, and network resources to carry out Jetstream2 operations. These three kinds of resources are ephemeral, being created and destroyed as necessary. Thus, metrics regarding these resources are representative of short-term utilization, while SU usage is a metric that can be representative of our long-term Jetstream2 utilization.

Following NSF Unidata's 8M+ SU grant renewal, which went into effect October 2023, NSF Unidata staff has been proactive in ensuring Jetstream2 resources are being used effectively in a non-wasteful manner. The Science Gateway team has automated SU usage data collection through interactions with the JS2 API. This data is extrapolated forward in time to predict future SU usage, allowing us to make meaningful decisions about the science gateway's capabilities. The scripts have been shared with our LROSE collaborators.

SU usage and resource metrics, current as of April 17, 2024, are presented below.

SU Usage

Type	SUs Used	SUs Allocated	% Usage *
CPU	7,254,760	8,191,300	89 %
GPU	633,765	672,768	94 %

Resource Metrics

Compute			
Type	Used	Total	Percent Usage*
Instances	117	150	78 %
vCPUs	1355	4035	36 %
RAM	5.0 TB	15.8 TB	32 %

Storage			
Type	Used	Total	Percent Usage*
Volumes	323	400	81 %
Volume Snapshots	5	50	10 %
Volume Storage	37.3 TB	39.1 TB	95 %

Network			
Type	Used	Total	Percent Usage*
Floating IPs	47	310	15 %
Security Groups	82	100	82 %
Security Group Rules	254	300	85 %

Networks	3	100	3 %
Ports	137	250	54 %
Routers	2	15	13 %

* Percent Usage is rounded to the nearest whole number

Github Statistics*

Repository	Watches	Stars	Forks	Open Issues	Closed Issues	Open PRs	Closed PRs
science-gateway	7 (+1)	19 (+2)	13 (+2)	5	167	16 (+6)	774 (+13)
tomcat-docker	11	65 (+1)	70 (+4)	0	42	0	97(+9)
thredds-docker	15	33 (+2)	28(+1)	3	120	0	184 (+6)
ramadda-docker	4	0	2	1	10	0	38 (+3)
ldm-docker	9	12	14	1	40	0	70
tdm-docker	5	4	7	0	10	0	27 (+3)

* Numbers in parentheses denote change from last stat report

Prepared *September 2024*

Status Report: Community Services

April 2024- September 2024

*Doug Dirks, Nicole Corbin, Tanya Vance, and *Jeff Weber*

Executive Summary

Our group lost a team member, Jeff Weber, due to reduction in staff actions July 2024. Reorganization of our group activities is ongoing. We have engaged with historically marginalized and underrecognized communities and institutions as part of NSF Unidata's outreach efforts to groups such as Rising Voices, SACNAS, AIHEC, TCUs. We participated in outreach to the Earth System Science community at conferences, workshops, and working groups. We also facilitated the 2024 NSF Unidata Community Equipment Awards, supported NSF Unidata UsersCommittee and SAC activities and communications, progressed NSF Unidata's core award post-submission activities, worked to advance cross-program and cross-organization collaborations and activities, and expanded learning and development materials, resources, and offerings.

Activities Since the Last Status Report

Community Outreach and Services

Community Communications:

- Posts to the News@Unidata blog appear regularly, but not on a specific schedule. Some highlights:

    - [Why is the Keras 3 Release a Big Deal for the Deep Learning Community?](#)
    - [SSEC Unidata Server Shutting Down in April 2024](#)
    - [Welcome Summer Intern Ana Castaneda Montoya](#)
    - [Welcome Summer Intern Leo Matak](#)
    - [Convolutional Neural Networks (CNNs) for Earth Systems Science](#)
    - [NSF Unidata Funding Proposal Approved by U.S. National Science Foundation](#)
    - [NSF Unidata at the 2024 Earth Educators' Rendezvous](#)
    - [New eLearning: Machine Learning Foundations in the Earth Systems Sciences](#)
    - [Summer 2024 NSF Unidata Interns Wrap Up Their Projects](#)
    - [Recent Changes at the NSF Unidata Program Center](#)
    - Software release information
    - A new [series of posts on AI/ML topics](#)
    - Many AWIPS Tips and MetPy Mondays episodes
        - AWIPS Tips is no longer in development as of July 2024, as a result of staff reduction
        - MetPy Mondays is currently on hiatus
- Community meetings and other announcements

- Updates to NSF Unidata's social media channels (Facebook, Twitter, LinkedIn)
- Continue to publish short videos on the Unidata YouTube channel

Engagement with historically marginalized and underrecognized communities and institutions

- Supported AIHEC Summer Climate Resilience Student Research Program (Stonie Cooper)
- NOAA Midwest CAP Train-the-Trainer and NICC Weather Station Installation in Santee, NE (Stonie Cooper)
- Umonhon Nation Engagement and Weather Station Site Evaluation in Macy, NE (Stonie Cooper)
- Delivered Machine Learning Foundations in the Earth Systems Sciences (CyberTraining Project) at MSU Denver
- Sovereign Data Network efforts moved to NSF NCAR Directorate Office with Jeff Weber's role transition.
- See conference, workshops, events, and working group activities below.

Outreach to the Earth System Science community at conferences, workshops, events, and working groups

Conferences:
- Presented at NSF CSSI/SCIPE/CyberTraining PI meeting (NC)
- Presented at Earth Educators' Rendezvous, 2024 (NC)

Workshops and Events:
- Presented and participated in Rising Voices 12th Annual Workshop, 'Co-creating Research, Policy, and Action: The Rising Voices of Indigenous Peoples and Partners in Weather and Climate Science (TV)
- Participated in Center for Ocean Leadership 'Fostering a Diverse and Inclusive Ocean Workforce' Workshop (TV) and UCAR/UCP/NSF NCAR Engagement Reception
- Participated in Environmental Data Science Innovation & Inclusion Lab (ESIIL) Innovation Summit (JW)
- Participated in National Weather Service Partners events and webinars (TV)
- Delivered data analysis and visualization professional development workshop to 30 UCAR interns (NC)
- Supported Colorado State University Python Readiness learning series for new graduate students (NC)
  - This is the third iteration of this series at CSU, and the first time it will be entirely student-led
- Drew Camron and Thomas Martin delivered Quantitative Analysis of Meteorological Data with Python to seven USGS staff

Working Groups:
- See Ongoing Activities section below for working group activities
- NSF SOARS Intern Selection and Community Coach, NSF Earth Data Relations Working Group, NSF ESIIL Maka Sitomniya Working Group, Review panel for CUAHSI fellowship awards and Chair CUAHSI DEI committee (JW)

NSF Unidata Community Awards

[2024 Awards](#) Community Equipment Awards

- The 2024 Equipment Awards solicitation closed on April 12 and the review panel met on April 26 to evaluate the proposals received on April 26. Communications were delayed due to pending core award notification and new guidelines from NSF for issuing subawards under the new core award.
- As of this report, awardee(s) community announcements are still pending finalization of subawards.

DeSouza Award

- Jim Steenburgh selected for 2024 NSF Unidata DeSouza Award and will accept the award at 2024 Joint Fall Committee Meeting.

Supported Users and Strategic Advisory Committee activities and communications

- Led workshop session and conducted thematic analysis resulting in a report on broadening community participation and increasing committee engagement with the Users Committee as well as identified implementation activities.
- Facilitated communications regarding status of our NSF core funding award, and program changes made based on award parameters.
- Facilitated Joint Fall Committee planning and delivery with members, representatives, and NSF Unidata program center staff

Progressed NSF Unidata's Core Award

- Supported post-submission actions and committee and community communications.

Cross-program and cross-organization collaborations and activities

- Participate as member and subcommittee lead for NSF Unidata DEI Committee
- Spearheaded planning and coordination for the NSF Unidata All Staff Retreat
- Led the planning and completion of UCAR Community Programs (UCP)'s Strategic Plan, provided consultation support for UCP Implementation planning, and provided oversight advice on UCAR's Strategic Plan
- Provided formal mentorship for the 2024 UCAR Leadership Academy Cohort and for the UCAR Mentorship Program

Learning Services

Web presence

- Science Gateway Reimagined project – a community-directed virtual hub to enable learning and support research for current and future earth systems students,

educators, and professionals.
- Phase 1a: Rolled out a beta test of the JupyterHub request form. See Cloud Computing Activities for more details.
- Phase 1b: Beta test for the Education Hub (catalog of available learning resources) coming late October 2024.
- Actively collaborating with COMET on a unified experience for eLearning access, coming tentatively in early 2025.

New learning offerings

- [NSF #2319979](#) "Machine Learning Foundations and Applications in the Earth Systems Sciences" (Nicole Corbin, PI and Thomas Martin, Co-PI) in collaboration with Dr. Keah Schuenemann (MSU Denver) and Dr. Karen Kortz (Community College of Rhode Island)
  - [Module 1 is live for public enrollment](#)
  - Presented a [poster](#) at the Earth Educators' Rendezvous and the NSF CyberTraining PI Meeting
  - The preliminary evaluation shows that the material is challenging yet attainable, and learners are able to make connections between ML concepts and the physical sciences. The evaluation also revealed a few areas to refine for the next delivery in Spring 2025.
- Partnered with COMET and USGS on development of a series of NetCDF/CF learning resources, to be live soon
  - Three modules on [MetEd](#): Reading NetCDF Metadata, Visualizing NetCDF Data, Subsetting and Appending NetCDF

Ongoing Activities

We plan to continue the following activities:

- Ongoing activities related to above (community communications, support for governing committee activities, facilitating awards, outreach and engagement, supporting cross-program, cross-organization, and external collaborations, learning services, etc.)
- Participation in Working Groups:
  - Serve as Ambassador on NSF NCAR Convergence Science Program Ambassadors Community of Practice and Community Interest Network (TV)
  - Participate on the NSF NCAR-MSI Collaborators Community of Practice and Community Engagement Group (TV)
  - Participate on the NSF NCAR/UCP/UCAR Community Engagement Group (TV)
- Seeking partnerships to build and deliver community learning and development
- Ongoing work to transition NSF Unidata's website to UCAR-mandated system
- Support the pursuit of funding and bringing greater public awareness to NSF Unidata

New Activities

Over the next three months, we plan to organize or take part in the following:

- Participate and present at UCAR Members Meeting
- Roll out a beta version of the NSF Unidata Education Hub
- Progress First Phase of Community Gap Analysis and Needs Assessment (i.e. Community Survey(s))
- Progress Committee Model Structure Efforts
- Progress SAC Decision-making Framework for Community Priorities and the NSF Unidata Portfolio
- Progress priority implementation activities from the Users Committee Brainstorming Workshop on Community and Committee Engagement
- Support conference participation efforts and materials

Over the next twelve months, we plan to organize or take part in the following:

- Delivery of NSF Unidata Education Hub website
- Delivery of all three Machine Learning in the Earth Systems Sciences learning modules
- Engage other historically marginalized communities and institutions
- Follow up proposals and collaborative activities
- Support and implementation of annual award tasks for year one

Beyond a one-year timeframe, we plan to organize or take part in the following:

- Continued maintenance of the reimagined NSF Unidata Science Gateway, including community contributions and adding resources to the Education Hub
- Champion CARE and FAIR principles

Areas of opportunity and challenge:

- Community communication content and engagement with NSF Unidata social media streams.
- Diverse and sufficient pool of committee nominees and community award proposals.
- Broadening our applications, reach, and impact across new Earth System Science communities with varying resources, capacities, and expectations.
- Resources to develop new learning experience materials.

Relevant Metrics

Statistics from the Community pages on the NSF Unidata web site. Comparisons are made with statistics from the previous six-month period.

All community pages

Most recent six months:

- 30,191 unique pageviews (39,397 in previous period)
- 17.3% of total unique pageviews (18.2% in previous period)

Top community pages

1. All blog pages
   25571 unique pageviews (32549 in previous period)
   85% of total community pageviews (83% in previous period)
2. www.unidata.ucar.edu/community
   2113 unique pageviews (3937 in previous period)
   7% of total community pageviews (10% in previous period)
3. www.unidata.ucar.edu/about
   1374 unique pageviews (1686 in previous period)
   5% of total community pageviews (4% in previous period)
4. www.unidata.ucar.edu/events
   782 unique pageviews (886 in previous period)
   3% of total community pageviews (2% in previous period)

Social media statistics, September 3, 2024

1. # of Twitter/X followers: 2083 (up from 2056)
2. # of Facebook followers: 913 (up from 912)
3. # of YouTube subscribers: 3960 (up from 3798)
4. # of LinkedIn followers: 210 (up from 185)

Unidata eLearning statistics, September 3, 2024

1. Total unique users: 300 (equal to April 2024, note that several inactive accounts were deleted)
2. Enrolled users in Machine Learning Foundations in the Earth Systems Sciences: 7 (new course)
3. Enrolled users in Learn AWIPS CAVE: 256 (up from 215)
4. Enrolled users in Learn Python-AIPS: 35 (up from 23)
   - Note that microlearning courses are available without an account and are unable to be tracked

Status Report: Support

April 2024- September 2024

Jennifer Oxelson, UPC Staff

Executive Summary

Unidata has a new support ticketing system in place!

Questions for Immediate Committee Feedback

- When seeking information or support about Unidata software, data, or projects from **online** sources, which of the following do you use?
  - Software documentation
  - Support archives
  - Mailing list archives
  - Don't know, I just use a search engine or ChatGPT
  - None of the above
- Do you find the information that you are looking for?

Activities Since the Last Status Report

New in-house support package in use!

- The old support ticketing system package has been replaced! The new ticketing system addresses many of the staff interaction flaws of the old system. [The new system also has a web-based user interface](), providing another avenue for users to seek support:
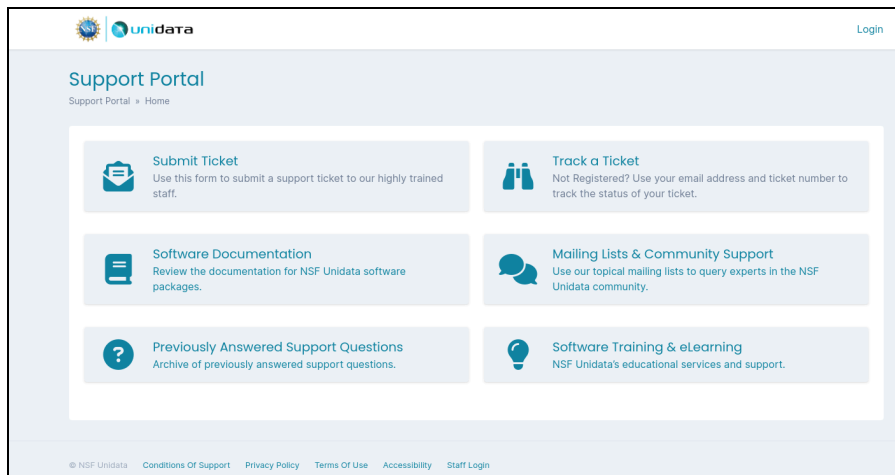
Next Phase: Improving online self-support availability

The next phase of revamping Unidata support is to make finding online information easier. The current repositories for this information are:
- Software documentation
- Support archives
- Mailing list archives

The support archives and mailing list are voluminous, crufty, and practically unusable unless using a search engine or ChatGPT.   Both are currently populated programmatically, which while convenient for the staff developers, it has become unwieldy for the user.

We will be looking at this current system and exploring alternatives that are more user-friendly and discoverable.

Training

Unidata training/workshop information can be found in the [Community status report](#).

New Activities

In order to fulfill our objectives articulated in the Unidata 2018 Proposal, focused efforts are needed in two major areas:

- Enhance electronic support offerings
- [Create instructional materials for online virtual training](#)

Metrics

[User Support Metrics](#)

Prepared *September 2024*