Unidata Survey 2001
Summary

General Information:

An *online* Unidata Survey 2001 was developed by the *Unidata Users Committee* to solicit responses from two key groups:

1. Organizational Representatives: Survey sent to the Unidata contact person or an individual who could address the overarching programmatic operations related to the organization-scale operations and perspectives, site configuration, and systems management.
2. Individual Users: Survey sent to individuals to assess use habits, needs, and perspectives of the Unidata Program and its emerging initiatives.

The Unidata Survey 2001 was distributed by email to approximately on three separate occasions between April and October 2001 using Unidata's all-community distribution list. This list includes approximately 1100 addresses with some duplicates and several non-university contacts. A total of 148 surveys were completed and returned to Unidata: 68 from Organizational Representatives and 80 from Individual Users. The majority of responses were from universities using Unidata data and applications, however, approximately 10% of the responses came from non-university organizations such as NOAA, USGS, and Woods Hole Oceanographic Institute.

The Survey sought input on a variety of issues ranging from current needs to future expectations regarding hardware, software, and data, system management, the relevance and importance of emerging Unidata initiatives, disciplinary needs and trends, and overall satisfaction with the Unidata Program Center and Unidata Governing Committees.

The 2001 Survey was the first community-wide assessment since 1993, and the second since Unidata's inception. The purpose of the Survey was to solicit input directly from the community of users that could be used to provide guidance to the Unidata Program Center and Unidata Governing Committees for the allocation of resources and improvements to the quality of service, while serving as an assessment of the level of interest in and relevance of emerging Unidata initiatives. Insights gleaned from the Survey are being incorporated into Unidata's Strategic Plan and the Unidata proposal to NSF, and will be used for internal decision making purposes.

Survey Results:

The Unidata Users Committee conducted a detailed analysis of the Survey results in order to ascertain the needs of the community. The assessment contained herein is a summary of this analysis.

- ❖ Organizational and User Profile Snapshot
    - o <u>Organizational Response:</u> **Total = 68 responses.** 63% of respondents represented universities offering B.S., M.S., and Ph.D. programs, 16% represented institutes, and 7% were from government agencies, commercial firms, and non-profit organizations (e.g., libraries). The Unidata contacts completing this survey for their organization cumulatively represent over 2700 academic and research staff. (Question 1: Org)
    - o <u>User Response:</u> **Total = 80 responses.** 61% of respondents were university users, with the remaining 39% from institutes, government agencies, and commercial firms. Several universities had more than a single user response.
    - o Approximately 32% of the organizational contacts selected the traditional area of Meteorology/Atmospheric Science as the discipline currently using Unidata applications and data at their institution. However, an increasingly significant segment are the Unidata communities of Climate/Global Change, Oceanography, Geography/GIS, Hydrology, Earth System Science, Environmental Science, Geology/Geophysics, and Computer Applications. Since 1993, the number of organizations using Unidata applications and data for Meteorology/Atmospheric Science has decreased by 8%, which is currently distributed among the climate studies (17%), and then more evenly among the other related fields listed above (51%). The organizational survey suggests a slightly more diverse range of disciplines than the individual users survey, with 42% of the individual users selecting Meteorology/Atmospheric Science as their specialty. (Question 2: Org and User)
    - o Organizations are normally distributed about a programmatic mission that emphasizes 50% research and 50% teaching, while individual users are positively skewed toward a research emphasis (66% dedicate over 50% of their time to research). (Question 3: Org and User)
    - o About 40% of the organizations responding report that they employ a full-time computing systems manager for hardware/software maintenance. Adding to this the part-time systems managers (13%), over half of the organizations responding have some level of dedicated computing support that is not multi-tasking shared academic and research responsibilities. However, 41% of organizations responding to Question 5 report that either a faculty member (25%) or a student (16%) serves as the computing systems support manager.

- The survey revealed interesting trends in the selection of operating systems running Unidata applications (Question 6). Respondents indicate that Unix, Linux, and Windows will be the preferred operating systems in the foreseeable future, while Solaris x86 and Mac OS will experience decreases. Linux and Window OS, especially, show marked increases of factors of 10 and 3, respectively.
- There is widespread use of LDM, GEMPAK, and McIDAS software packages at institutions. UDUNITS, netCDF, and DODs, while not at the levels of the others, still see significant usage.
- Asked if it was important to have computers systems that function nearly identically to those used by the National Weather Service (Question 10), 57% of both organization respondents and individual users thought that FX-Linux – FX-Net were worth investigating. About 12% of respondents thought that it was worth shifting resources to develop that functionality, while 31% thought that it was unimportant.
- There is a wide range of non-Unidata applications being used for data analysis and visualization. These include, in decreasing rank: Web, NCAR Graphics, GrADS, IDL, MatLab, VIS 5D, GIS, WXP, Neilly's WX, Bufkit, Visual Basic, FX-Linux/FX-Net, and a large set of applications used by one or two respondents.
- Organizations and individual users are employing collaborative resources in education and research. COMET, with its highly successful Web-based module library, is being used by 62% of responding institutions and by 70% of users. SuomiNet and CONDUIT exhibit usage in the range of 10 – 25%, however these are resources where increase is anticipated.
- The most common data types received by the community are, not surprisingly, conventional surface and upper-air data and textual data, numerical model data, satellite imagery, Level III radar products, lightning data, and profiler data. Sounder data, CONDUIT, ACARS, NOGAPS, and SuomiNet, and level II radar data are received by fewer organizations, however these are the data types that are likely to see the most significant increases in usage over the next five years as data assimilation techniques are refined for input into high resolution numerical models (e.g, LEAD, CRAFT, and SuomiNet).

❖ Emerging Initiatives
- MetApps: Nearly 60% of organizational contacts expressed some familiarity with MetApps compared to 40% of individual users. Unidata has committed resources and is moving forward with MetApps development. Prototypes have been developed and are undergoing testing by a group of community volunteers (UMADA). The survey reveals the need to better inform the community of this development. Not very many institutions have installed this application.
- THREDDS: Approximately 70-80% of both organizational contacts and individual users recognize the value of being able to access both real-time and historical data from a set of Internet data servers using the same

analysis and display applications on your desktop computer? Of all current Unidata initiatives, THREDDS is the one seen by the community as having the most obvious and (probably) immediate benefit. Unidata continues to engage traditional and non-traditional partners in discussions for the purpose of expanding THREDDS to include a large variety of data accessible to the user from the local desktop.

- o PlazaElectra: 75-80% of respondents indicated that an expanded Unidata web site would be valuable if it included an interactive e-Plaza of community tools, support packages, profile personalization ("My Unidata") and more.

- ❖ Community Issues
  - o Most users are highly satisfied or satisfied with Unidata programs; overall 97% are highly satisfied or satisfied with the Unidata Program Center. It the specific categories of ease of use, education value, research value, and technical support, over 80% of users and organizational contacts are satisfied or highly satisfied with Unidata. In categories of timeliness of upgrades, ease of upgrades and documentation, 75-84% of organizational contacts, probably those most directly responsible for these activities, are satisfied or highly satisfied with Unidata; 54-70% of users are satisfied or highly satisfied in this categories. In these categories, 20-40% of users indicated indifference probably because they are not responsible for these activities and have no measure of assessment.
  - o Two-thirds of organizational contacts feel that they are part of the Unidata community, whereas only one-third of individual users responded similarly. Over half of users surveyed feel only somewhat part of the Unidata community. On the other hand, many users cited lack of time for involvement as a principal reason for not feeling part of the community, i.e., they did not necessarily fault Unidata for their feeling only somewhat connected. But others cited better dissemination of activities, releases, and initiatives through the Unidata newsletter, workshops etc. to bring about more effective community building.
  - o 60% of organizational contacts and 40% of individual users participating in the survey reported that they had attended a Unidata workshop. As expected, the number of organizational contacts attending the LDM, GEMPAK, and McIDAS training workshops is higher that the number of individual users attending those same workshops. What is somewhat surprising is that the number of organizational contacts attending the tri-annual User Workshops is also higher that the individual users by a factor of two or more.
  - o Nearly 50% of organizational contacts and almost two-thirds of users do not know much about the Unidata Governing Committees (Policy Committee, Users Committee, and Advanced Technology Committee).

Perspective

It is quite significant that the Unidata community continues to expand into non-traditional, yet related fields. Traditional Meteorology/Atmospheric Science now represents only a third of the disciplines using Unidata applications and data. While Meteorology/Atmospheric Science remains the core user group, and is not likely to relinquish its primary role in guiding the direction of Unidata in the foreseeable future, targeted outreach to related communities, while being mindful of resources, can only serve to stimulate and enhance the development of new analysis and visualization tools, and broaden the availability of and accessibility to various data sets, to further encourage interdisciplinary approaches to scientific, geographic, and societal problems of concern to the expanding Unidata community of users.

Two-thirds of individual users dedicate over 50% of their time to research (Question 3). It is not clear from the survey if the same researchers use Unidata applications and data during the time spent (≤50%) in the classroom, but based on the numbers of students that are directly (5600 students) and indirectly (7700 students) exposed to Unidata applications and data, one can infer that Unidata applications and data are seeing substantial usage in both research and education. This inference is strengthened by the organizational response that, of the total number of academic and research staff (2703) cumulatively represented by the organizational survey, 69% make some use of Unidata applications and data for research and education. The fact that the majority of students exposed to direct (hands-on) use of Unidata applications and data are undergraduate non-majors, with healthy representation from the undergraduate majors and outreach activities sectors, suggests that Java-based, platform-independent applications such as MetApps, are likely to see increased student usage for display and analysis of real-time and archival data sets.

As Unidata looks to the future, guided by its Strategic Plan, it is imperative that it remains cognizant of the number of institutions that continue to rely on faculty members and/or students for computing systems management. Over 45% of the institutions responding to the survey claim that organizational support for computing systems is sustained by academic and/or research faculty or undergraduate and graduate students. More than likely these are smaller to moderate size schools with tight budgets that use Unidata applications and data for classroom instruction and operational forecasting. Unidata cannot lose sight of the importance of easy downloads and installs, seamless data transfer, intuitiveness of applications functionality, documentation, and support for this community of users.

Unidata made a decision a few years ago to incorporate Java-based, platform-independence into development of its applications. MetApps is a prime example of Unidata's commitment to this programmatic strategy. Organizational responses indicate that a parallel and concurrent move toward platform-independent systems running Linux and Windows is occurring at universities.

The use of McIDAS was surprising in light of discussions among members of the Unidata Users Committee that generally assume that more users employ GEMPAK. The survey does not bear this out. Moreover, with the newly developed high-resolution national radar composite, which must be viewed using the McIDAS GUI, and with ADDE architecture being incorporated into MetApps as a remote file transfer protocol, McIDAS is well poised for sustained development. GEMPAK continues to be a workhorse application used by many institutions for education and research. Many of the features of both packages are being incorporated into MetApps functionality.

Over half of both organizational respondents and individual users indicated the FX-Linux/FX-Net was worth investigating but not at the expense of shifting resources. Considering that another 31% indicated that it was unimportant, the resounding message from the community is to <u>not</u> direct resources toward this activity and away from other important applications development. Universities apparently not interested in replicating NWS computing systems for education and research if the result is a reduction in the development and support of other applications they perceive as more important to their needs. It could be that the community does not want to see Unidata spread too thin. Another interpretation is that universities do not see themselves as a computing systems training ground for NWS meteorologists. Rather, universities remain committed to analysis and visualization applications that can convey straightforward concepts using architecture that can function efficiency in both a research and classroom setting.

The widespread usage of non-Unidata applications by the community, many of them commercial, should be considered when building new applications with transparent interfaces and common data formats.

Organizations and users are employing Unidata's collaborative resources: COMET, SuomiNet, and CONDUIT. The highly successful Web-based COMET modules are used extensively in educational settings and are likely to see continued usage as new releases come available. Unidata's IDD is used to relay high resolution GPS to UNAVCO (GST), where solutions are derived to produce 2-D products of precipitable water vapor and total electron content, which are then distributed via the Web. Only about 30% of the 100+ registered SuomiNet sites are currently transferring GPS data. As more universities come online, the volume of data will increase. In addition, universities are encouraged to produce 3-D products for dissemination to the community, and numerical mesoscale modelers are already experimenting with data assimilation methods to incorporate SuomiNet data. CONDUIT has not made significant inroads into the university community except in select instances were an individual user is interested in archival model data. However, recently the Unidata User Committee selected a liaison to serve on the CONDUIT steering committee with the anticipated outcome being greater accessibility to CONDUIT resources.

The size and type of data sets is likely to experience significant increases during the period covered by the five-year proposal and the strategic plan. Level II radar data, ACARS, and other real-time data streams, currently being

received in high volumes by only a limited number of institutions for data assimilation into mesoscale numerical models, is expected to increase dramatically if any one of several proposals are funded. Unidata has begun to address these data transfer issues by exploring the NNTP (Network News Transfer Protocols) as a potentially viable alternative to the push-technology of current LDMs. It is imperative that institutions have the ability to select and pull data from any number of distributed and redundant data repositories. In addition, as Unidata bridges to communities outside the meteorology-atmospheric sciences domain, data formats, metadata, and data types are sure to increase. Unidata's mission is to provide data, applications, and support to a community of users. Historically that community has been institutions offering degree programs in meteorology/atmospheric science. Unidata must remain true to this community, while trying to find resources to develop inroads into other communities. The wide range of data types bodes well for applications like MetApps and THREDDS. The increase in data types and volumes is seen as one of the principal challenges to Unidata over the duration of the proposal five-year plan.

MetApps, THREDDS, and Plaza-Electra are emerging initiatives central of the five-year strategic plan and the proposal to NSF. Although too many in the Unidata community still do not know about these initiatives, the survey makes it apparent that respondents see value in each. MetApps, a community-built, next-generation interactive meteorological Java-based, platform-independent application has features that should quickly entice researchers and educators to begin moving away from platform-specific and more static applications such as Gempak and McIDAS when it is released. While some survey reviewers find it troubling that MetApps is not yet well known, it appears reasonable to assume that this will continue to be the case until this application emerges from its beta test mode. Researchers and educators just do not have time to "play" with something that is in the process of changing. Unidata workshops, offered at both the UPC in Boulder and regionally, would be an effective way of disseminating MetApps to the community.

The value and potential benefit inherent in the THREDDS initiative are self-evident as indicated by the number of respondents that selected somewhat valuable or very valuable as their response. THREDDS is essential if Unidata is to expand to meet the needs, and provide data, applications, and support to an ever-expanding interdisciplinary community of users. The cornerstone of Unidata's success is the rapid delivery of data using a distributed system of servers. THREDDS will build on the experience base of Unidata's highly successful IDD system to enable users to access real-time and historical data from a network of thematic servers seamlessly from the local desktop.

There are not many programs that engage such a large community of users who can boast a satisfaction rate of 97%. Unidata is unique in its service to the community, and its engagement of the community in application building and decision-making. It is a successful venture by any measure and provides a real benefit to the research and educational activities that take place at over 150 universities nationwide.

The large number of organizational contacts that feel part of the Unidata community is likely due to the fact that these individuals are deeply involved in maintaining the computing systems that ingest data and run applications, dialogue more frequently with Unidata support staff, and must deal with technical issues related to installations and upgrades that directly connect them with the Unidata staff. Users, on the other hand, are typically more passive participants not likely to give Unidata much consideration when the data feed is uninterrupted and the applications are working as expected. However, there is a caveat to this assessment, in that, individual users have less frequently attended User Workshops, maybe because they lack the time. But efforts should be made to reach beyond the organizational contacts to the users. The Unidata governing committees, in consultation with the Unidata staff and through suggestions made by users in this survey, should consider more effective ways of reaching the users and enhance their participation at Unidata workshops.

Is it that the Unidata governing committees are transparent that so many organizational contacts and users do not know much about them, or is it that the governing committees have not engaged the community effectively? The consequence is the same in that a large fraction of the community does not know if the governing committees are meeting their needs. Efforts should be made to ameliorate this situation so that users are aware that they are being represented in the areas of policy and users needs. Based on the results of this survey, an ongoing effort on the part of the Unidata Policy and Users Committees in particular should emerge to make the community aware of committee activities, decisions, action items, deliberations, and outcomes. A significant upgrade to the Unidata web site would be one way of connecting with the community. The web site is in dire need of a major enhancement. A second, and more appealing way would be to proceed toward the development of personal profiles, "my Unidata," where committee highlights would be available to an individual that entered through a web portal.