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## 1. INTRODUCTION

The Man computer Interactive Data Access System (McIDAS) software was developed in the early 1970s at the University of Wisconsin-Madison to track cloud features and visualize data from the then new-generation geostationary satellites (Lazzara et al. 1999). For the past 30 years, the software has been kept current by including access to data from new instruments and by adapting to changing computing hardware and display platforms. The last major transition was during the 1990s when McIDAS was moved into the UNIX and X Window System environment and with the development and use of the Abstract Data Distribution Environment (ADDE) for data access.

The forthcoming deployment of new measurement technologies on operational weather satellites (e.g. multi-spectral imagers and hyperspectral sounders) will exceed the data processing and visualization capabilities of McIDAS-X. These technologies require a more powerful and versatile software environment for satellite data processing and visualization.

This paper describes the current effort to meet these challenges.

## 2. BACKGROUND

New sensors being developed for future operational satellites will exceed the design of the current data structures and the visualization capabilities of the McIDAS software. Innovative techniques for visualizing and developing algorithms with these new data types are needed. The Integrated Data Viewer (IDV) (Murray et al, 2003), a reference application that is being developed by the Unidata Program Center, demonstrates the flexibility that is needed in this evolving environment, using a modern, object-oriented design approach. The IDV is based on VisAD (Hibbard et al, 2005), a visualization library developed at the Space Science and Engineering Center (SSEC) that incorporates lessons learned from McIDAS and supports a universal numerical data model, flexible 2-D and 3-D displays, a distributed component architecture, and flexible user interaction and collaboration.

A plan has been developed to transition the current McIDAS-X software into a VisAD-based system, known as McIDAS-V. The goal of the

transition is four-fold:

1. Allow the extensive library of McIDAS-X heritage code to be usable in the new environment without a need to rewrite,
2. Build on the existing capabilities of the IDV, including the overlay of meteorological data from a wide variety of sources,
3. Incorporate the functionality of the Hyperspectral Data for Research Analysis (HYDRA) toolkit,
4. Provide a new environment for developing algorithms and new visualizations that are required for data from future sensors.

The main effort in this first year has been to evaluate and prototype needed functionality to provide an effective transition from McIDAS-X to McIDAS-V. This gets us closer to attaining goal #1 and is described in the following sections.

## 3. McIDAS-V

The first major effort was to create the bridge software that allows McIDAS-X image displays to be directly imported into the McIDAS-V environment. This link is essential for heritage McIDAS-X applications to make use of the McIDAS-V expanded functionality.

The state of the McIDAS-X display is contained in shared memory segments. Not only can McIDAS-X applications have access to this state, but any external software that understands the structure. The bridge software imports the three McIDAS-X frame components: the navigated image, overlaid graphics, and the color table. Data are read from McIDAS-X frame blocks in shared memory and restructured into VisAD objects. This enables the frame components to be recognized by the McIDAS-V display and other facilities and treated accordingly (e.g., reprojection of images, editing and saving color tables).

Two modes have been investigated: dynamic and static import. The dynamic import copies the currently displayed frame in McIDAS-X into McIDAS-V and displays it. As the contents of the McIDAS-X frame change, they are immediately reflected in the McIDAS-V display. This is useful for displays that are not replicated in the McIDAS-V environment yet (e.g., meteorograms).

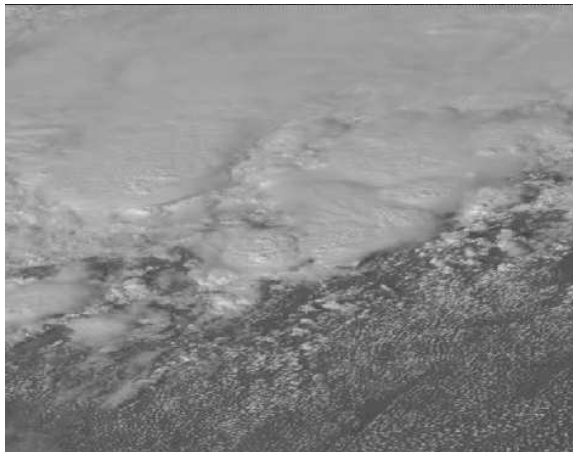
The second mode is static import. Frame(s) from McIDAS-X are interactively selected and imported into McIDAS-V. Once import is complete, all subsequent operations are performed only within the McIDAS-V

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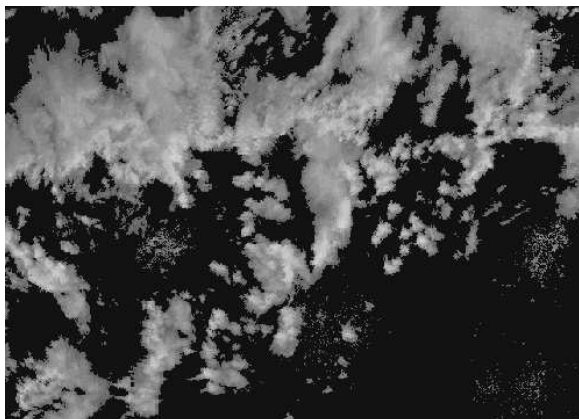
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environment, and changes in McIDAS-X are not reflected. This is useful for animated sequences and display functions not available in McIDAS-X (e.g. 3D displays, independent panels).

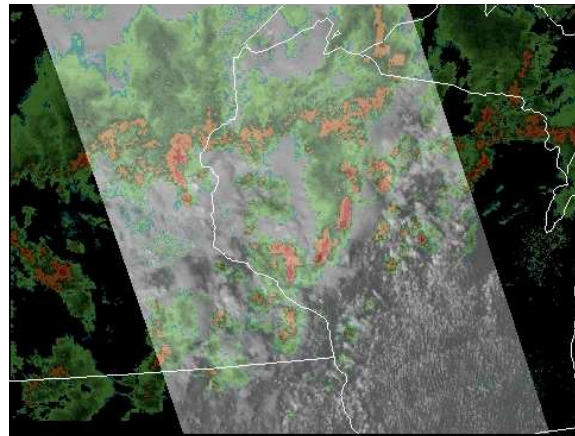
These import modes are especially important during the transition phase, when all of the McIDAS-X functionality is not present in McIDAS-V. The McIDAS-X user can immediately take advantage of the improved display capabilities (e.g. flexibility in multi-panel displays and color table editing) and the additional functionality (e.g. 3D displays, interactive compositing, and globe mapping) that McIDAS-V offers. The sequence of images in Figure 1 illustrates this. Figure 1a is a satellite image with coverage over the upper Midwest, in the original satellite projection. Figure 1b is a radar composite in the same general area, but in a tangent cone projection. These are the McIDAS-X displays.



**Figure 1a:** GOES satellite image over Wisconsin and Minnesota in the original satellite projection as displayed in McIDAS-X.



**Figure 1b:** Radar composite over Wisconsin and Minnesota in a tangent cone projection as displayed in McIDAS-X



**Figure 1c:** Both the GOES satellite and radar images reprojected in McIDAS-V, with the radar color-shaded and semi-transparent.

Figure 1c depicts these 2 images as imported into McIDAS-V, with enhanced display capabilities:

- frame compositing
- common projection of display components
- independent color tables for components
- semi-transparent color enhancement

There are some limitations to the import process. Imported McIDAS-X graphics are just colored pixels imbedded in the image. Lack of knowledge of their origins or significance makes reprojection and rescaling aesthetically unpleasant and further analysis impossible. Whenever possible, McIDAS-V graphics should be used.

Also, no calibration information is preserved for the imported images; only the 8-bit representation is transferred. In the long term, images should be acquired by McIDAS-V directly via ADDE or read from local disk files.

#### 4. OpenADDE

A key component of McIDAS is access to a variety of meteorological data. For the past decade, the ADDE servers have provided efficient access to large datasets worldwide. These will continue to be used in the forthcoming McIDAS-V era. To encourage the use and development of new servers, the ADDE servers and required McIDAS-X library modules are now available as an open source package known as OpenADDE. In addition, clients other than McIDAS (such as SGT or code written in Matlab and IDL) have access to these ADDE datasets via a VisAD Java interface. OpenADDE is available online at: <http://www.ssec.wisc.edu/mcidas/software/openadde>

#### 5. SUMMARY

A status of the McIDAS-V effort, in terms of the four goals outlined earlier, and OpenADDE use will be presented.

Acknowledgements: Thanks to Don Murray and Jeff McWhirter of Unidata for invaluable discussions and advice.

## 6. REFERENCES

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