SSEC OGC Initiative

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One of the pursuits of the Space Science and Engineering Center (SSEC) involves collecting, processing, and generating data and information related to the Earth's atmosphere and weather. Within the discipline of atmospheric science this data is broadly shared using systems, protocols, and data models developed over decades through work with a community of scientists and technicians. A new initiative at SSEC focuses on broadening the range of potential users by allowing new points of entry to these same data.

The approach for this initiative is the adoption of Open Geospatial Consortium (OGC) protocols. The Open Geospatial Consortium (http://www.opengeospatial.org/) sets geospatial and location standards through the work of its more than 400 commercial, academic, governmental, and organizational members. The basic OGC services include the Web Map Service (WMS) which provides geolocated and dynamically generated pictures of data, the Web Feature Service (WFS) for sharing geographic feature data (such as, points, lines, polygons, and associated values), and the Web Coverage Service (WCS) for sharing raw raster data files and associated pixel values.

The primary benefit of OGC Web Services is the capability of providing multiple levels of access to myriad data types with different temporal, spatial, and spectral scales while producing a suite of standard outputs. In turn, these outputs have scalable complexity appropriate for audiences ranging from scientists to forecasters to pilots to policy makers. By using OGC standards and open-source software, the intermediate products in this transformation of raw data to information are accessible at multiple points (Fig. 1). More and more software and hardware devices are being designed to access OGC Web Services.

The challenge for data and information providers is to establish a robust and extensible framework of automated processes, infrastructure, and interface controls that can handle new and changing sources of near real-time data. At the same time, interface controls need to be kept as simple and intuitive as possible. This will result in a system that will be able to evolve as standards are refined and as access methods change in response to technology advances.

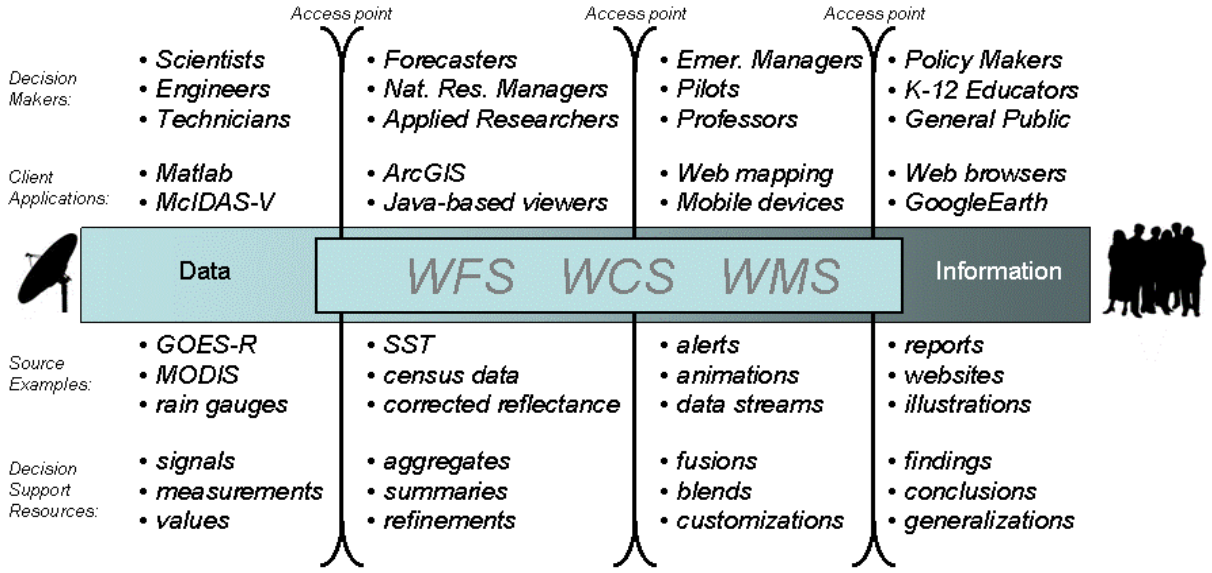

Fig. 1: OGC protocols provide multiple points of access to varied data and products for a range of users along a continuum from data to information.

The importance of OGC standards in delivering weather information and data has gained momentum recently. Two primary reasons are to facilitate the sharing of data to diverse users outside of the atmospheric science community and as additional mechanism to provide optional datasets in systems with limited bandwidth. These are enumerated below:

1. The WMO (World Meteorological Organization) is looking "to enhance the development and use of geospatial standards. It is anticipated that this collaboration will support the implementation of the WMO Information System which aims at providing a single coordinated global infrastructure for the collection and sharing of information in support of all WMO and related international programmes." (http://www.wmo.int/pages/mediacentre/infonotes/infonote60_en.html)

2. Limited bandwidth on NOAAnet (resulting from hardware restrictions and existing usage for model data sets) restrict the amount and latency of high resolution research data accessible by Weather Forecast Offices (WFOs). NASA's Short-term Prediction Research and Transition Center (SPoRT) is exploring the use of Web Map Services and secure cloud computing capabilities as means to overcome bandwidth restrictions. A prototype demonstration capability is being developed under a Small Business Innovative Research (SBIR) activity being managed by NASA/MSFC.

Both of these initiatives have selected the WMS as a key component. This intersects with recent activity within SSEC to advance our data delivery system, by developing a WMS environment. The distinguishing characteristic of the WMS-WFS-WCS is its modular construction. By using standards-based product generation and separating the products from their visualization, any number of clients can view the resulting products. At SSEC satellite remote sensing image products are reprojected into a standard rectilinear projection and written as GeoTIFF and netCDF format files. These files can be viewed and manipulated using standard client applications (e.g., web browser, Google Maps, Google Earth, ArcGIS, qGIS) providing cross platform functionality for desktop, laptop, tablet and mobile devices. Observed,

measured and derived metadata fields may be overlaid on these images as polygons and tagged objects. Goals for this demonstration system is to identify production and rendering issues that negatively impact performance of the projected service, illuminate processing issues exposed through introduction of a variety of unique data formats, and identify critical limitations exposed within the demonstration environment. Our prototype work differs from that of others in that we have developed innovative techniques for accommodating the common characteristics and demands of atmospheric science data including 1) animation of near real-time data in OGC formats, 2) high speed delivery to mobile devices 3) integration of unique atmospheric data sources with a time dimension.

The geoscience community is continuously generating important and valuable information about all the components of the Earth system, for times past, present, and future. However, most of this information is, for all practical purposes, inaccessible to people beyond the specialists of the particular discipline within which it was produced. At the same time, data of value to the atmospheric science community resides within other disciplines, some of which are also adopting OGC geospatial standards for access (such as the British Antarctic Survey and the National Snow and Ice Data Center). Our goal is to use widely adopted geospatial web service standards to provide access points to our data and information to a broad spectrum of potential users. But doing so will also facilitate opportunities for SSEC scientists to access the data of others. Our premise is that a user should be able to request information or data of a particular area on Earth, for a particular time period, at a scale and level of detail appropriate to their needs, from within their own existing or familiar computing environment. We also hold that the SSEC scientists and other data providers should not have to make significant changes to their existing work flows and protocols in order to implement and support standards-based access to their data.