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Weather Data at Your Fingertips

Accurate & Timely Aviation Weather Support

In support of the FAA's goal to modernize the U.S. air transportation system (NextGen), NSF NCAR created a foundation for timely, accurate, and consistent weather information and products distributed to airlines, pilots, and air-traffic decision makers.

Common Support Services-Weather (CSS-Wx) System

Delays, cancellations, and rerouting are costly to both passengers and airline companies. Adverse weather can be a significant contributor to these. Until recently, access to accurate and timely weather information has been a challenge for pilots and air-traffic managers, due to outdated and inconsistent standards and practices. NSF NCAR's Transportation Meteorology Applications Program is dedicated to providing integrated information and technologies that improve aircraft operations through improved data processing and delivery methods to mitigate costs.

A Virtual Repository Of Weather Data

In support of the FAA's Common Support Services-Weather (CSS-WX) System, NSF NCAR designed and developed software and prototype systems for a network-based infrastructure for distributing weather

Benefits & Impacts

- Accurate, timely, & consistent weather information
- Flexible product delivery
- Increased airspace capacity
- Optimized efficiency & improved safety & resiliency

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data. Over two decades, NSF NCAR collaborated with NOAA, MIT, and MITRE to develop a web-based service that distributes gridded weather data, based on the Open Geospatial Consortium's (OGC) Web standards. Successful system tests were achieved ahead of schedule in 2023, and the initial operating capability was completed in 2025.

NSF NCAR and its partners have continued their work with the OGC to extend the Web Coverage Service (WCS) standard where necessary to accommodate three- and four-dimensional gridded weather data sets. The team even developed a first-generation reference implementation of the FAA WCS server software for weather data. Some of the more notable capabilities of this server are its ability to spatially and temporally subset the weather data as are required for NextGen weather data queries.

Delivering reliable weather data where and when aviation needs it.

Weather Data Discovery & Acquisition

CSS-Wx has been built upon a Service Oriented Architecture (SOA) of web services to enable effective, efficient opportunities for data dissemination. SOA integrates services (applications) running on heterogeneous platforms using common standards (e.g., HTTP, SOAP, XML, etc.) and information models like the International Civil Aviation Organization (ICAO) Meteorological Information Exchange Model (IWXXM). CSS-Wx is



The delivery of timely, accurate weather information reduces costs in both dollars and labor.

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The flow of operation-specific weather-related data and information to end users is critical.

designed for flexibility, allowing different systems to connect and exchange information seamlessly without being tied to a single software vendor or specific technology. This modular approach allows the system to easily share critical weather data between different aviation partners, ensuring that vital information is always ready when and where it's needed. CSS-Wx builds upon the FAA's existing digital infrastructure, ensuring a seamless and reliable flow of information for the entire aviation community.

Developing weather and impact guidance to support operational decisions under uncertainty.

Real-Time Weather Data

The CSS-Wx web services provide real-time weather information to consumers at various levels using identical protocols. The NextGen Weather Processor (NWP) uses CSS-Wx to access weather model output and observations for its forecasting algorithms, then provides the outputs of those hosted algorithms back into CSS-Wx for distribution to other consumers. Air Traffic Control (ATC) facilities access CSS-Wx data through the Aviation Weather Display (AWD) software in addition to their legacy systems. Airlines, dispatchers, and other public consumers will also have access to the same services used internally by the FAA. As the FAA advances CSS-Wx, NCAR continues to serve as an expert technical advisor, while also applying our specialized experience in cloud-based weather systems to help guide the development of this new infrastructure.



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