

Development of WMS Capabilities to Support NASA Disasters Applications and App Development

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Motivation

- Two programs at NASA Marshall Space Flight Center are engaged in supporting end-users by providing unique NASA observations and research data sets for various applications.

The NASA Short-term Prediction Research and Transition (SPoRT) Center, which integrates unique NASA satellite and weather forecast modeling capabilities for the weather forecasting community.



NASA's SERVIR Program, which integrates satellite observations, ground-based data, and forecast models to improve disaster response in Central America, the Caribbean, Africa, and the Himalayas.

- SPoRT provides NASA datasets in the Advanced Weather Information Processing System (AWIPS), the decision support system used by the National Weather Service.
- The SERVIR Program, and other end users, receive data through a Web Mapping Service (WMS)
- SPoRT has begun developing open standard GIS data sets via WMS to respond to end-user needs

Web Mapping Tile Service

Early prototypes of a WMS included a Web Mapping Tile Service (WMTS). With WMTS, the input imagery is pre-sliced and scaled to various zoom levels, then served from a normal webserver.

Benefits:

- Does not require changes to the existing web infrastructure.
- Provides high-performance serving of data.

Issues:

- Requires significant computing power to process the images.
- Large amounts of disk space to store the images.

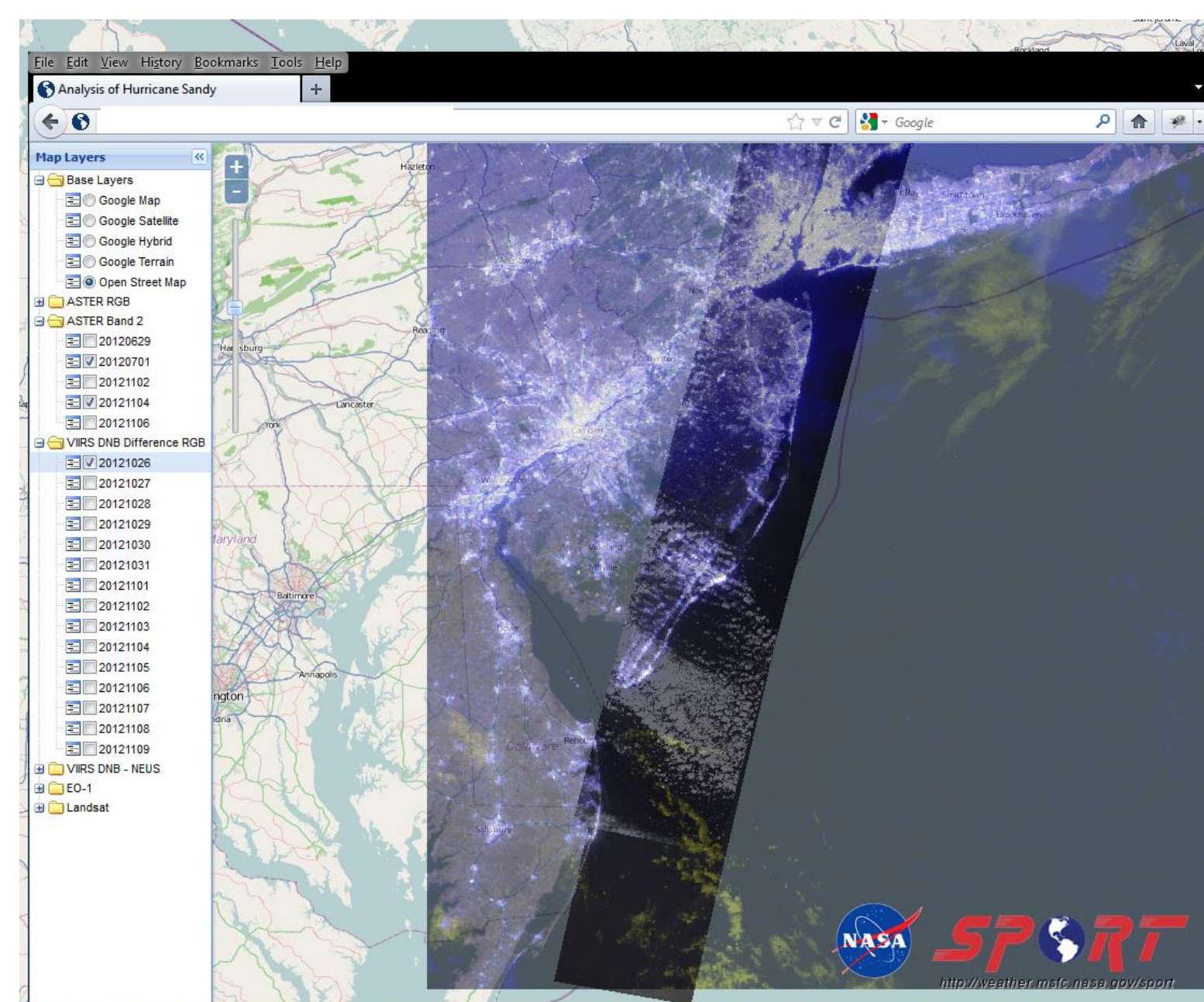


Figure 1. Day/Night Band difference image from Superstorm Sandy served from WMTS.

Web Mapping Service

SPoRT began developing a Web Mapping Service (WMS) during the summer of 2013.

The benefits of a WMS include:

- more flexibility
- less labor intensive solution

The system developed is based on

- Geoserver as Web Mapping Server
- GeoWebCache to provide on-the-fly caching of the map tiles.
- Restful interface to provide supplemental information
- PostgreSQL/PostGIS database
- Spring and Camel

NASA Data Mobile, GIS, and Web Users

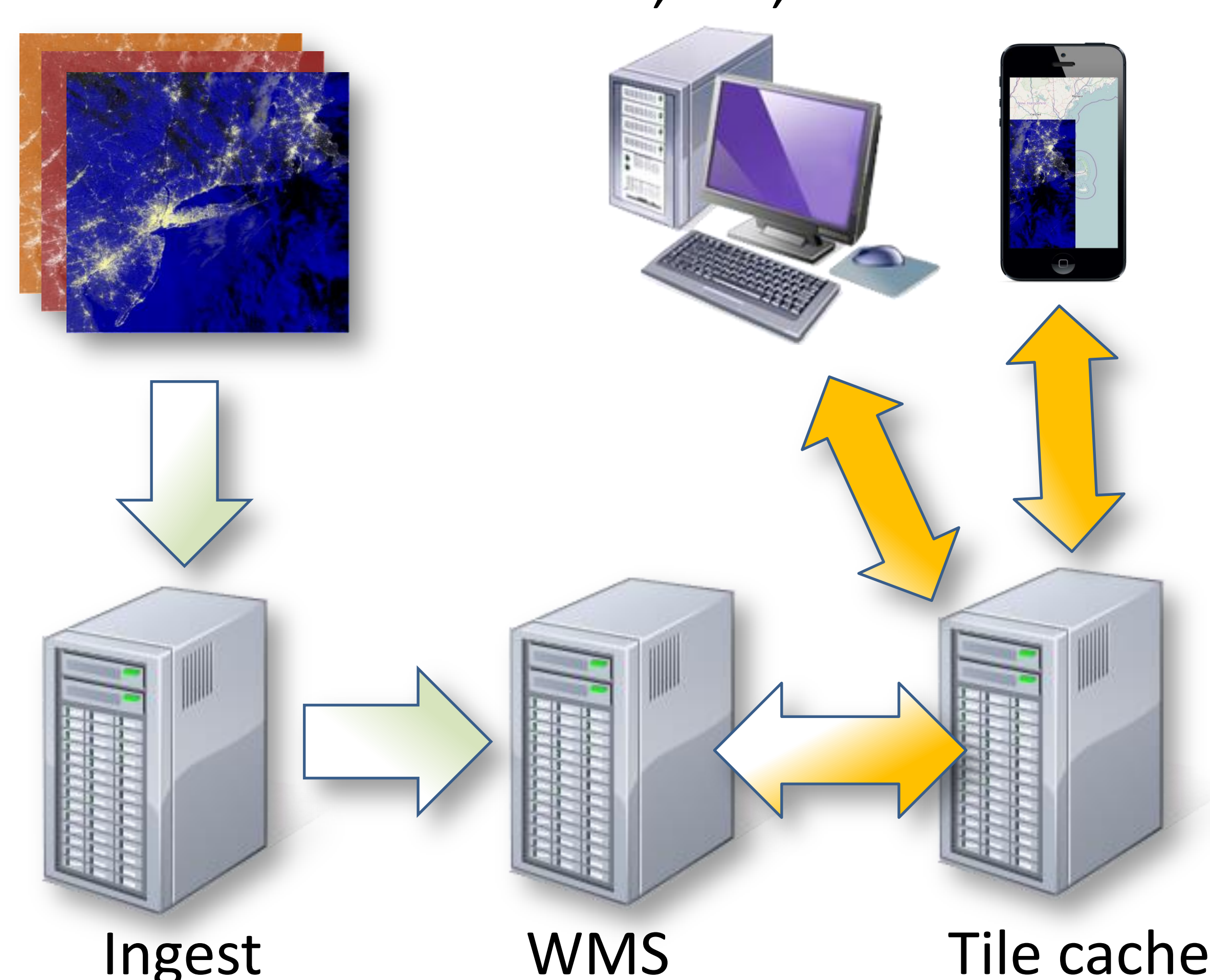


Figure 2. An overview of the system for import of NASA data, management via WMS and tile cache, and dissemination.

End User Application ("App") Development

Extension of the WMS with a Restful framework allows:

- Development of a smartphone application
- Use of data in a similarly formatted web browser

Both mobile phone and web clients utilized:

- OpenLayers JavaScript mapping framework
- jQuery or jQuery Mobile
- Equivalent code base as to control the costs of development and maintenance.
- Current system provides an easily maintained, flexible architecture which is easily extended. This architecture can be scaled to accommodate larger amounts of data and increased client usage.

Integration of Products into the NOAA/NWS Damage Assessment Toolkit

The National Weather Service has been developing an app for smartphones and tablets to better organize storm damage surveys, referred to as Damage Assessment Toolkit (DAT). This toolkit is GIS-based and allows users to plot damage on a map while performing their surveys. As part of a NASA ROSES Applied Science: Disasters proposal, SPoRT examined the feasibility of integrating NASA imagery and datasets to help with storm surveys.

The work performed as part of that research consisted of developing:

- imagery to help NWS identify damaged areas
- web mapping infrastructure to deliver the data to the DAT
- An initial proof of concept has been performed on delivering the data to the DAT. With the current system the imagery just needs to be flagged as "DAT" and it automatically will show up in the DAT application. SPoRT has collaborated with the DAT team to provide functionality to be able to use the data offline in a cached mode.

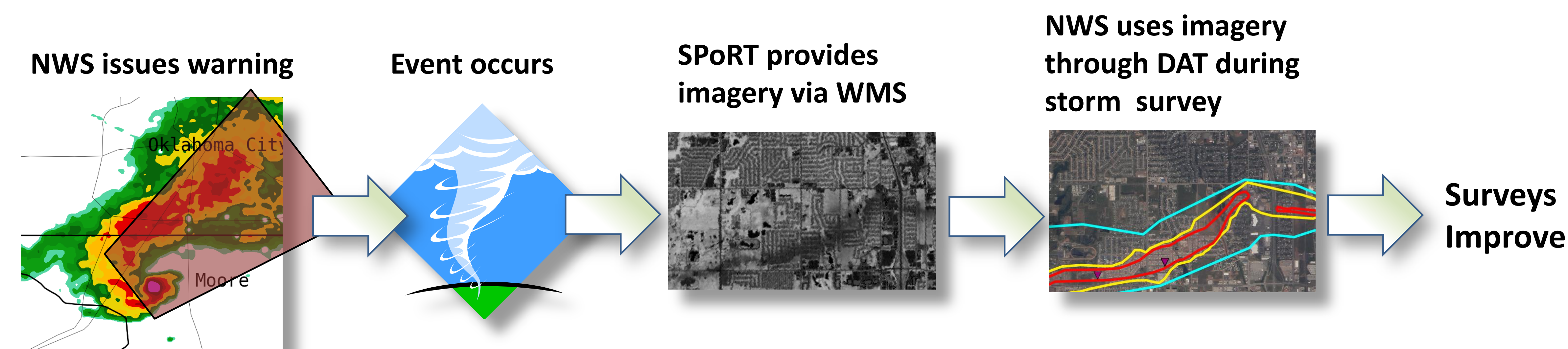


Figure 3. National Weather Service storm survey process using the DAT and supplemented by SPoRT imagery.

Imagery Developed to Support the Damage Assessment Toolkit

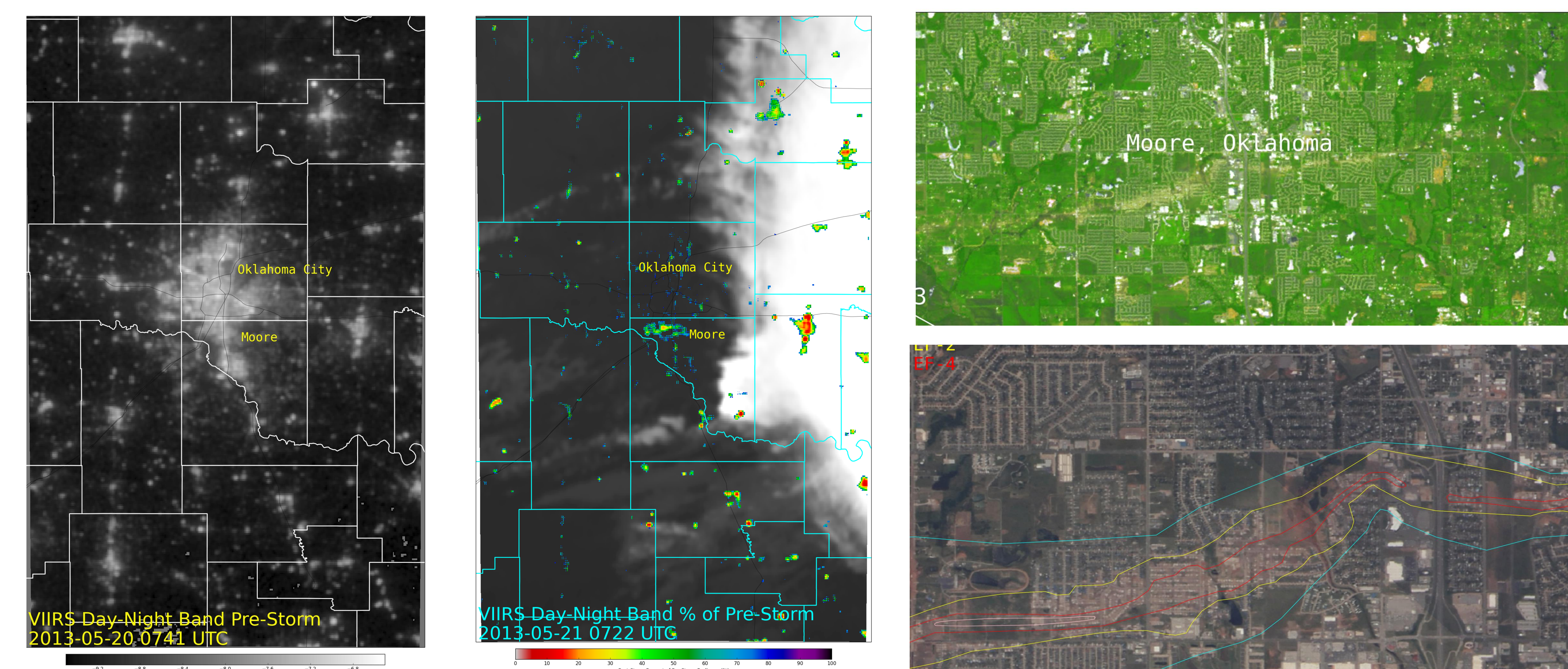


Figure 4. VIIRS day-night band pre-storm and post-storm percent of normal light, immediately following the event, and tornado damage scars visible in an ASTER natural color composite or ISS/ISERV imagery over Moore, Oklahoma.

Conclusions

The WMS provides functionality and flexibility without compromising performance. The WMS can be extended to future application development. WMS provides an excellent platform for delivering disaster imagery to both mobile phone, web and GIS based clients. The use of open GIS standards allow for integration into DSS without much additional effort.