



## **Metadata requirement analysis for the emerging sensor web**

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Sensor web is a coordinated interoperable Earth observation infrastructure emerged from the recent development in sensor, communication, and information technologies. In sensor web, individual sensors or a group of sensors have their autonomy. Interoperation among sensors is routine. They can work together to complete a mission that can not be fulfilled individually. However, these promises require the discovery of a right sensor at right time and right location with right quality. So far, many metadata standards have been developed for sensor, platform, and data. However, analysis and practical uses of these metadata indicate that the metadata and their associations are not applicable or suitable for the sensor Web. First, at syntax level, many Earth science metadata for sensors, platforms and data are not expressed in standard XML (eXtensible Markup Language), which is commonly used for the live exchange of the descriptions of the sensor in a sensor web. Formalization and conversion of existing metadata to meet the current technology are needed. Second, the linkage between sensor and its application domains is missed in most metadata schemes. End users are more familiar with domain knowledge than the mechanics and technical specifications of sensors. Therefore, in order for users to select the best sensors from the sensor web for their specific applications, the primary application domain the sensor is designed for, as well as the application domains for which the data from the sensor are useful, should be described. Third, the metadata don't provide enough information for easy calculation or derivation of the geographic location a mobile sensor senses at a specific time. The geolocation is vital for the dynamic and on-demand tasking. Such metadata are related to the orientation, location, position, and operation status of a

sensor. Fourth, the metadata about the geometric and radiometric quality of sensor are not available. Those metadata are important for determining the usability of a sensor for a specific application. Finally, accessibility of sensors, such as the sensor tasking authority, security and copy right of data sensed by sensors are not well expressed in the sensor metadata scheme. The information is key for determine if a sensor can be used for a specific application at a specific time. This presentation reviews the current standards that have metadata components for sensor and its platform, especially those from ISO TC211, OGC, and NASA GCMD. Recommendations for sensor-web metadata are made to meet the requirements for cross-mission discovery of sensors in a pervasive Web environment. Roles of the emerging semantic Web technology for enabling robust discovery of sensor are also discussed.