CyberWay –An integrated geospatial cyberinfrastructure to facilitate innovative Way of Inter- and Multi-disciplinary Geoscience Studies

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In the past several years, the U.S. NSF EarthCube program has funded a number of building block projects to demonstrate the advantage of cyberinfrastructure (CI) technologies in facilitating and transforming geoscience research. Most of building blocks attempted to solve the disciplinary-specific issues identified through the Earth-Cube end-user domain workshops. Although capabilities of many building blocks are complementary and combination of those capabilities is potentially much more powerful than individual capabilities alone in term of helping geoscience research, they still exist within individual building blocks and combined use of them to solve geoscience problems are difficult or even impossible at current settings. In this study, we have attempted to solve this problem by integrating the capabilities and systems of multiple existing EarthCube building blocks into a system of systems, namely CyberWay, which consists of the integrated capabilities of four EarthCube building blocks: BCube, CyberConnector, CHORDS, and GeoWS. BCube enables broker-based data discovery. CyberConnetor unifies pre-processing, virtual geo-processing machines, and data discovery, access, and interoperation through open geospatial standards. CHORDS connects small instruments and sensors to Internet in real time. GeoWS provides a framework and infrastructure for data management and distribution with unified RESTful interfaces. Selected capabilities from other building blocks are also integrated through standard service interfaces and additional services are being developed to meet specific requirements identified from the science use cases. Four disparate use cases have been developed as examples to demonstrate the innovative way of conducting geoscience research on CI through CyberWay. The four use cases include (1) improved teleconnection study of regional model outcomes – polar science and regional climate science, (2) inter-comparison and inter-validation with model outcomes and Earth Observations through interoperation, (3) streamlined data pre-processing, access, and interoperation for modeling, and (4) enhanced dissemination of model outcomes through customizable, flexible, dynamic workflows of composed Web services. This presentation will discuss the CyberWay architecture, capabilities, use cases, and potential impacts on geoscience research.