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International Convergence on Geoscience Cyberinfrastructure

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There is growing international consensus on addressing the challenges to cyber(e)-infrastructure for the geosciences. These challenges include: Creating common standards and protocols; Engaging the vast number of distributed data resources; Establishing practices for recognition of and respect for intellectual property; Developing simple data and resource discovery and access systems; Building mechanisms to encourage development of web service tools and workflows for data analysis; Brokering the diverse disciplinary service buses; Creating sustainable business models for maintenance and evolution of information resources; Integrating the data management life-cycle into the practice of science.

Efforts around the world are converging towards de facto creation of an integrated global digital data network for the geosciences based on common standards and protocols for data discovery and access, and a shared vision of distributed, web-based, open source interoperable data access and integration. Commonalities include use of Open Geospatial Consortium (OGC) and ISO specifications and standardized data interchange mechanisms. For multidisciplinarity, mediation, adaptation, and profiling services have been successfully introduced to leverage the geosciences standards which are commonly used by the different geoscience communities -introducing a brokering approach which extends the basic SOA archetype.

Principal challenges are less technical than cultural, social, and organizational. Before we can make data interoperable, we must make people interoperable. These challenges are being met by increased coordination of development activities (technical, organizational, social) among leaders and practitioners in national and international efforts across the geosciences to foster commonalities across disparate networks. In doing so, we will 1) leverage and share resources, and developments, 2) facilitate and enhance emerging technical and structural advances, 3) promote interoperability across scientific domains, 4) support the promulgation and institutionalization of agreed-upon standards, protocols, and practice, and 5) enhance knowledge transfer not only across the community, but into the domain sciences, 6) lower existing entry barriers for users and data producers, 7) build on the existing disciplinary infrastructures leveraging their service buses. . All of these objectives are required for establishing a permanent and sustainable cyber(e)-infrastructure for the geosciences.

The rationale for this approach is well articulated in the AuScope mission statement: “Many of these problems can only be solved on a national, if not global scale. No single researcher, research institution, discipline or jurisdiction can provide the solutions. We increasingly need to embrace e-Research techniques and use the internet not only to access nationally distributed datasets, instruments and compute infrastructure, but also to build online, ‘virtual’ communities of globally dispersed researchers."

Multidisciplinary interoperability can be successfully pursued by adopting a "system of systems" or a "Network of Networks" philosophy. This approach aims to: (a) supplement but not supplant systems mandates and governance arrangements; (b) keep the existing capacities as autonomous as possible; (c) lower entry barriers; (d) Build incrementally on existing infrastructures (information systems); (e) incorporate heterogeneous resources by introducing distribution and mediation functionalities. This approach has been adopted by the European INSPIRE (Infrastructure for Spatial Information in the European Community) initiative and by the international GEOSS (Global Earth Observation System of Systems) programme.