An Earth Cube Design Approach

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Introduction

EARTHTIME sees the EarthCube initiative as a long-overdue opportunity to help redirect the NSF's approach to the earth sciences for the 21st century. EARTHTIME has four years of experience in the collaborative design and construction of cyber infrastructure for the geosciences. We are engaged in an ongoing effort with the NSF-supported EarthChem program to build systems capable of federating disparate and eclectic sources and repositories of scientific data by automating specific scientific workflows.

To date most of our work has involved U-Pb geochronological data and we have published reports of our successful efforts in G-cubed [Bowring 2011, McLean 2011]. We developed an open-source software platform or cyber infrastructure for U-Pb geochronology that provides standardized data-handling and data-reduction protocols that facilitate inter-laboratory comparisons and automates the analyst's workflow from sample to archived analyses and interpretations. Our development processes are transparent, able to respond to community input, and to serve as teaching tools. Our novel approach to creating this cyber infrastructure is an ongoing and close collaboration between software engineers (CIRDLES: cirdles.org) and geochemists (EARTHTIME: earth-time.org) that provides continuous, iterative development based on user feedback.

We are now applying our approach with NSF support into LA-ICPMS U-Pb geochronology and have made a great deal of progress in our first 15 months of funding. We are beginning to address U-series geochronology with an international effort involving British Geological Survey and a number of US and European scientists. We plan to expand our efforts to include all chronologies such as Ar-Ar and U-Th-He using our existing infrastructure as a template and thus leveraging our work-to-date. Our long-term goals also involve the development of machine learning and semantic web technologies to aid this effort. We posit our general approach as a successful and working model for study in the context of EarthCube.

Vision for EarthCube

We propose that EarthCube be considered as a vehicle for discovering how the geosciences can integrate their data rather than prescribing how they integrate their data. We argue that a scientific approach focused on discovery is appropriate in a world or "ecosystem" where there already exist many localized solutions to the cyber infrastructure problems that GEO seeks to solve. Discovering the commonalities among existing approaches will expose the implicit frameworks and knowledge management systems already present. The power of emerging web and knowledge discovery technologies lies in their ability to assist scientists in collaborative efforts involving disparate, but successful, approaches to knowledge management.

Community-Based Governance model

We suggest that EarthCube follow a community-based discovery model rather than a

governance model: eventually community-supported standards will emerge via collaborations. An excellent example is the model of the W3C: http://www.w3.org/Consortium/mission.html .

Conceptual CI Architecture
The Internet and WWW are good models: they grew organically and then standards emerged.

Design Process
This should be discovery process, per our argument above.

Operations and Sustainability Model
We suggest ongoing consideration and study as sustainability will become a funding requirement.

References

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