

## **Beyond OGC Standards: The New Challenges for Open Source GIS**

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The widespread acceptance of open source GIS has been helped by the existence of OGC standards, which show how to model, archive, exchange and present 2D data structures. Standards provide a baseline to compare and evaluate proprietary and open source software. Open source GIS developers have also gained a lot from the intellectual effort that led to the OGC standards.

Despite their usefulness, OGC standards are not enough to meet the needs of the coming generation of GIS. Data collection technologies such as mobile devices and geosensor networks enable new types of geospatial applications. Examples include recording of animal movements, transport systems, monitoring oil slicks on the ocean, and tracking changes in the landscape. Emerging geospatial applications share the need for handling information in time and space, going beyond current OGC 2D static standards.

Take the Internet. OGC Web standards work on a non-cooperative environment, where users are consumers of information produced elsewhere. By contrast, emerging Web applications stress cooperation and interaction. Using the Internet, open source developers can build collaborative tools that go beyond what OGC supports.

For geosensor technologies, current OGC standards focus on low-level communication. These standards do not provide guidance on how to transform raw sensor data into information for environmental monitoring. Open source GIS applications for geosensors need high-level domain conceptualizations about change, a topic not covered in OGC standards.

Thus, open source GIS developers face a challenge. The new data collection technologies will make geospatial data widespread, allowing innovative open source GIS to reach new users before proprietary software. But we have currently no scientific consensus nor settled standards for handling spatio-temporal data. Thus, open source GIS developers have a hard choice. They could wait until OGC reaches a consensus on spatio-temporal data handling, or they could start developing ad hoc solutions, which might fail to be widely adopted. The latter choice is similar to what happened in open source scripting languages, where conflicting needs have led to many solu-

tions (e.g., Perl, Python, Scala, Ruby, and Lua, to name a few). The present author considers that open source GIS developers should not wait until OGC sets up standards for spatio-temporal applications. Instead, they should build solutions and share them widely, so the community can build insight and eventually reach a consensus. Open source GIS must move forward and beyond OGC. That will demand much work and cooperation.

### Biography

Gilberto Câmara is General Director of Brazil's National Institute for Space Research (INPE) for the period 2006 to 2010. He is responsible for the administration of INPE's research and development groups in Space Science, Space Engineering, Earth Observation and Weather and Climate Studies. Previously, he was head of INPE's Image Processing Division (1991-1996) and Director for Earth Observation (2001-2005).

He established the free and open data policy for remote sensing images from CBERS (China Brasil Earth Resources Satellite) worldwide, and for creating INPE's Remote Sensing Data Center, which has put 30 years of imagery on-line. He was also responsible for setting up a system for real-time detection of deforestation in Amazonia and for making Amazonia deforestation maps available on the Internet. He also created INPE's Earth System Science Center.

His research interests are in Geoinformatics and Environmental Modeling. He has published more than 150 full peer-reviewed papers on journals and conferences, and he led the development of SPRING, a free object-oriented GIS, and of TerraLib, an open source GIS library. According to Google Scholar, his h-index is 18, and his number of citations is more than 1900, as of July 2008. Based on this data, he is currently one of the five most-cited researchers at INPE.

He is a professor in INPE's graduate programs in Remote Sensing and Computer Science, where he has advised 21 Master and 11 PhD students, and is advising 11 PhD students. He was a keynote speaker in the "Geographical Information Science 2006", held in Munster, Germany. Gilberto is the main organizer of the Brazilian Symposiums of Geoinformatics, held yearly since 1999. He is a consultant of main Brazilian funding agencies and sat on the national committee for evaluation of graduate programs for the Multidisciplinary area from 2001 to 2004.

He is a member of the Scientific Steering Committee of Global Land Project, a research initiative of the International Geosphere-Biosphere Pro-

gramme (IGBP) and the International Human Dimensions Programme (IHDP). He is a member of the editorial board of the Journal of Earth Science Informatics and of the program committee of the most prestigious conferences of his area of research, including the Conference on Geographical Information Science (GIScience), Conference on Spatial Information Theory (COSIT), and International GeoSemantics Conference.