Background

IRIS – the consortium of US universities – is established to serve needs of its member institutions that are driven by the seismological and geophysical research interests of their faculties. Those research interests are "global"; they span all of the geologic settings around the world. Necessarily, therefore, the institutional needs are "international"; members of their faculties work in, collect data from, and collaborate with numerous countries.

To date, IRIS activities serving the relevant international needs of its member institutions have been supported almost exclusively by science-related funding from the US Government. GSN stations were installed with funding from NSF and DOD, and are operated by UCSD with NSF funding and by the USGS. PASSCAL instruments were purchased with NSF and DOE funding and the instrument center is operated by NMT with NSF funding. The DMC was built with NSF funding, and NSF funds both DMS operations and E&O activities.

The implications from IRIS relying almost exclusively on science-related funding from the US Government include:

- IRIS activities are constrained by limitations on the funding agencies, such as proscriptions against support for capacity building efforts.
- Legitimate questions are asked about contributions by foreign governments to activities that benefit other countries as well as the US.
- Nearly all IRIS funding competes, even if only indirectly, with funding for other government-supported science activities in the US.
- Capability of the faculties of IRIS member institutions are not fully utilized because of the finite resources of science-related US government funding.
- Funds from other sources for activities of interest to IRIS members are used suboptimally due to the lack of appropriate institutional participation.

A broader funding base could include "in kind" contributions to science support that do not involve monetary transfers to IRIS. This mechanism is especially appropriate for funding from national governments other than that of the US. Thanks partly to the efforts of IRIS program managers, this is already occurring to some extent. Examples that could be expanded include:

- Directly support GSN stations located on their territory, for example by purchasing the sensors and data acquisition systems or installing and paying recurring costs of real-time telemetry.
- Directly support field experiments on their territory or in which their own scientists participate, for example by purchasing portable instrumentation that can be used jointly with PASSCAL instruments.
- Building and operating data centers with funding sufficient to attain the same standards as the IRIS DMC for service (such as continuous data) and to develop parts of the software that is required for seamless data access.

Each of these "in kind" contributions has the potential to satisfy some of the needs of IRIS member institutions, which would allow science-related funding from the US Government to IRIS to be used for other activities.

Framework for IRIS International Activities

Other non-traditional support might involve transfer of funds to IRIS or reimbursement of expenses of members of the faculties of IRIS member institutions. Generally, however, such funding will be more readily available for activities that differ from those that IRIS has carried out previously. Examples include

- US A.I.D. funding for disaster response or mitigation in other countries, which could involve training seismologists as well as building or updating monitoring systems.
- UNESCO funding for short, intensive training courses and workshops that improve the capabilities of existing scientific institutions in less developed countries.
- World Bank funding for developing infrastructure that is expected to foster economic growth or for making existing infrastructure more robust to sustain economic growth.
- GEOSS-related funding to develop scientific facilities and international scientific collaboration in service to society.

New activities supported by non-traditional funding would only facilitate the research efforts of the faculties of member institutions, rather than supporting those efforts directly. That is, strengthening scientific institutions in countries around the world prepares them to support GSN-quality stations on their territory, collaborate as full partners in field experiments, and freely and openly exchange data with American geophysicists.

To secure a role in activities based on non-traditional support, we must demonstrate to the funding agencies both that IRIS can help organize a resource to contribute to their goals and that IRIS is flexible enough to adapt their particular activities from year to year. This is not fundamentally different than the situation at the time that IRIS was formed, when the NSF encouraged the consortium because of its potential to advance NSF's agenda. As in that case, we have the advantage that this is a genuine "win-win situation". Seismologists and geophysicists on the faculties of IRIS member institutions really can contribute to disaster mitigation and capacity building in many places around the world.

Implementation

Strengthen IRIS International Affiliates: Many sources funding for international activities (including the World Bank, UNESCO, US A.I.D., UNDP – the UN Development Program) have country-specific or region-specific departments. Staff members in each department work closely with people in the country or region for which they are responsible. Projects are more likely to be funded with support from these regional departments, and in some cases project proposals must originate from within them. Thus, the funding organizations are structured to favor proposals that build on collaboration between organizations in developed and developing countries and IRIS's obvious partners are our scientific collaborators. Indeed, any other approach risks being seem as an intrusion that fails to avoid pointlessly re-inventing the "wheel" of extant geophysical infrastructure and might well be opposed by exiting in-country geophysical organizations. Thus, it will be helpful to establish and deepen institutional links to the institutions with whom IRIS is most likely to work. The Foreign Affiliates program is well suited to this purpose, and the Foreign Affiliates should *not* be limited to universities, since many of our potential partners are foreign government agencies.

Framework for IRIS International Activities

Develop a Training Initiative: Staff members from IRIS and IDA have roles in post-Sumatra training courses around the Indian Ocean that are sponsored by US A.I.D. and the IOC and organized by the USGS. Partly because the funding agencies had only a limited awareness of the Consortium, however, IRIS was not invited to participate at an early stage, when faculty members from multiple IRIS member institutions might have been available to give advice on course content. What's more, because we has no institutional role, our participation may result in only a modest increase of the awareness of IRIS at US A.I.D. There are two important benefits that could be achieved by preparing to make an institutional contribution in the aftermath of earthquakes that are sure to happen in the future. First, better training would contribute to improved operation of new networks so that they produce data and products that are more useful both to themselves and to the IRIS community. Second, agencies that fund international

both to themselves and to the IRIS community. Second, agencies that fund international activities would begin to recognize IRIS as an organization that can help coordinate resources that contribute to their goals and adapt to the time scales on which they must act.

Develop Relationships with Funding Agencies: The first IRIS proposal to NSF did not arrive at NSF unexpectedly, nor did it come from people unknown to NSF. The proposal was well received at NSF at least partly because the staff members handling the proposal and the panels evaluating it were both confident that the team was dedicated to and capable of carrying out the proposed activities. In addition, because of extensive pre-proposal consultation, the proposed activities were adapted to the organizational requirements of NSF. This familiarity and consultation did not occur at a single meeting, but was built on a relationship. To obtain funding for new international activities from non-traditional sources, IRIS staff and members of the IRIS governing bodies – the Board of Directors, the Planning Committee and the Standing Committees – must build a relationship. One of the first steps could be briefing staff at UNESCO, the World Bank, US A.I.D., the State Department, and NSF OISE about preliminary plans for international activities, including a training initiative. Conversely, staff members from those organizations should be invited to IRIS activities, including the Workshop.

Loan Refurbished Instruments Strategically: While the expertise of the faculties of member institutions is the most valuable resource that IRIS can bring to the table, more concrete contributions can both serve as a demonstration of IRIS's vision and help projects that IRIS sees as having good potential to leverage further resources and quickly begin progressing towards the long-term goals of IRIS's international activities. As demonstrated by AfricaArray, open-ended loans of reconditioned PASSCAL instruments can gain both of these benefits of concrete contributions.

Long-term Goals

Self-sustaining, permanent seismographic networks

Self-sustaining training program

International PASSCAL investigators have framework for sustained cooperation

Context for GSN station operator training, DMS network data management training, etc.