

**Strategies for involvement of the United Nations
University International Institute for Software
Technology (UNU-IIST) in building ICT infrastructure**

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United Nations University

- Founded in 1975; headquarters in Tokyo.
- Rector of UNU is Under Secretary General of United Nations.
- Institutes in Venezuela, Belgium, Germany, USA, Iceland, Japan, Macau, Jordan, Ghana, the Netherlands, Canada, and Finland.
- Topics include: Biotechnology, Environment and Human Security, Geothermal Energy, Fisheries, Software Technology, International Leadership, Natural Resources in Africa, Water Management, Health, and Economics.
- Mission is Knowledge Generation, Knowledge Transfer, and Capacity Building.
- Focus on challenges facing developing countries.

UNU-IIST

- United Nations University International Institute for Software Technology
- UNU-IIST was established in Macau in 1992. Its mission is to help developing countries strengthen their education and research in computer science and their ability to produce computer software.
- UNU-IIST is an institute for advanced study, a centre for postgraduate training, a resource for curriculum development, and the focal point for research and development projects for software technology between the developed countries and the developing countries.
- UNU-IIST mission is “To Bridge the Digital Divide”.

Formal Methods

- Embedded systems
- Component systems
- Multi-view analysis: modeling, design, testing, and verification
- Integration of component-based and object-oriented techniques
- A laboratory for the integration of existing tools in the analysis process
- Security issues
- UNU-IIST is a major partner in the “Grand Challenge”.

Training

- Courses and schools in developing countries
- International conferences
- Fellows in Macau
- Joint PhD programmes
- Faculty development
- Post-doctoral positions
- Project positions

Current Projects

- e-governance
- Open Source Software Certification
- Open Source Software Community Building: the Global Desktop Project
- Water resources management
- Doctoral programme development

e-governance: e-Macau Project

- Goal - lay the foundation for e-government in Macau
- Means
 - software development
 - software technology research
 - capacity-building for government IT workforce
- Partners
 - UNU-IIST
 - Government of Macau
 - University of Macau
 - INESC-Macau

e-governance: e-Macau Project

- Users - 45 government agencies
- Staff - 10 full-time, 20 part-time
- Trainees - 250 government employees
- Duration - 24 months

e-governance: e-Macau Project

- Technical Focus - software infrastructure for e-governance, built using sound software development methods
- Training Focus
 - object design and analysis (UML)
 - object-oriented programming (Java)
 - open data formats (XML)
 - open software architecture (web services)

e-governance: e-Macau Project

- Open source tools used for implementation

| | |
|------------------------------|----------------------------------|
| user interface | Open-azlo |
| web/business tier controller | Struts |
| workflow engine | JBoss -JBPM |
| application server | JBoss Application Server |
| database | MySol |
| object relational mapping | Hibernate |
| configuration management | Control Versioning Systems (CVS) |

e-governance - UNeGOV.net

Goal is to build a global community of practice in e-governance - practitioners, researchers, and developers from academia, government, and industry

- exchange experience
- highlight best practices
- share technical know-how
- transfer skills and knowledge
- promote research and development
- give guide to funding opportunities

e-governance - UNeGOV.net

The focus of the effort is as much about solving concrete problems as it is on building consensus and advancing the practice in the field.

The UNeGOV.net portal will provide technical support for collaborative problem-solving by offering a rich collection of web resources - papers, software, projects, experts, and a mechanism to assemble such resources into “solution patterns”.

The UNeGOV.net Open Source Library will provide a repository of “certified” open-source components for multi-channel delivery of basic public services, including software that addresses the set of 20 basic public services identified by the e-Europe initiative.

e-governance - UNeGOV.net

UNeGOV.net will begin with a series of network-building workshops in developing countries.

- Tunis, Tunisia WSIS2005
- Bethlehem, Palestine
- Arman, Jordan,
- San Luis, Argentina
- Kathmandu, Nepal AACCC2005
- Hanoi, Vietnam
- Lagos, Nigeria
- etc.

OSS Certification

- OSS is increasingly important (public and industrial sectors)
- Risk: quality can be hard to assure
 - Bazar-like, distributed developing process: Who contributes?
 - Rapid evolution of the source code: Is a version stable?
- The risk limits the acceptance of OSS
 - especially in critical applications (security, safety)
- Project: Certification of security-sensitive OSS
 - according to the Common Criteria standard
 - supported by analysis and verification tools
- Vision: UN as an international certification authority for OSS

OSS Certification - Research

- How to apply Common Criteria certification to OSS?
 - Problem: Common Criteria assumes classical development
 - UNU-IIST approach:
 - * introduction of Open Models in parallel to conventional development process
 - * model-based testing and formal verification
- How to cope with huge amount of legacy code?
 - UNU-IIST approach:
 - * re-engineering techniques: slicing, automated abstraction, reverse application of program calculi
 - * deriving interface specifications (models) from code
- Case study: Global Desktop Project

Open Source Software Community Building

Open Source is the only chance developing countries have to join the IT revolution, and they should be supported in doing so.

- IT is today's industrial revolution
- IT provides ability to leapfrog into latest technology
- IT complements industrial development
- Missing the IT revolution is like missing the industrial revolution
- Open Source is the way forward for developing countries

Cost Example

- cost Windows XP + MS Office
 - standard version: \$560
 - professional version: \$800
- cost in Vietnam (GDP per capita \$440/year)
 - standard version: 1 year, 3 months
 - professional version: 1 year, 10 months
- cost equivalent for the US (GDP per capita \$30,200/year)
 - standard version: \$38,436
 - professional version: \$54,909
- 97 percent of software in Vietnam is pirated.

Global Desktop Project

- Problem: Developing countries have no voice in the creation of open source software (consumer vs producer).
- Solution: UNU-IIST leverages existing relationships with worldwide network of universities, open source development community, IT industry, and IT users in business and government. (contribution = technological self-determination).

Global Desktop Project

Ranking of open source development by country: (based on e-mail postings to English language open source mailing lists by country [scaled to local internet population (posts/K users)])

- 1. Norway 7.74
- 2. Germany 5.54
- 3. Netherlands 5.42
- 4. Belgium 5.39
- 5. Denmark 5.11
- 6. Sweden 5.03
- 10. Australia 4.03
- 11. US 3.79

- 12 UK 3.77
- 28 Brazil 1.02
- 36 India 0.36
- 46 Mexico 0.08
- 47 China 0.06
- 48 Vietnam 0.04
- ? Africa 0.00?

Global Desktop Project

- Project starting in Pear River Economic Zone, a region that accounts for 20 percent of China's GNP and is very strong in software education and commercial development
- Technical focus is development of open source desktop
- Year Two - expand to all of China and selected East-Asian partners
- Year Three - expand in East-Asia and selected sites in Brazil, India, and Africa

Water resource management

The sustainable exploitation of lake basins, both the water and the land draining into them, needs decision support systems that are very expensive to create. This is a major issue with many developing countries.

UNU-IIST and UNU-INWEH are collaborating to create **WaterBase**, a generic decision-support tool, with supporting metadata structure. It will be used for educational and management purposes to advance the practice of Integrated Water Resources Management in developing countries. For example, it is expected that this technology will be the basis for a tool-based module for INWEH's Virtual Learning Center.

Water resource management (current status)

- Collaboration with:
 - Univ. of Idaho (open source MapWindow GIS system)
 - Texas A&M Univ. (open source SWAT modelling tool)
 - EPA in US (They want to port their standard tool BASINS to open source MapWindow.)
- Deliverables:
 - demonstrate software to run SWAT on free data from web
 - generate tutorial examples
 - develop graphic display tool for result simulation

Water resource management (funding)

Project now funded by 45K USD from UNU's Joint Activities Fund and Inovative Capacaty Development Fund. (20% postdoc and 50% graduate researcher)

Aim is to produce prototype demonstrator by end of 2006 and seek major long-range funding from World Bank, African Development Bank, etc.

Doctoral programme development

The goal is to develop a sustainable and quality doctoral programme in computer science at universities in the developing world.

The components include:

- Identification of joint research projects between local university and UNU-IIST.
- An annual series of short courses offered locally by UNU-IIST.
- Students selected for nine month research fellowships at UNU-IIST.
- Further selection from among these for PhD study in developed countries.
- Students spend time both at UNU-IIST and local university during PhD study.

- After return to local university with PhD, students offered postdoctoral positions within three years.
- Within ten years, the local university has a well qualified faculty to run an independent and quality PhD programme.

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