Reneal International Education Outreach Incorporated

2016-II Philippines Project Plan

March 2016

Contents

1. PLAN SUMMARY

Reneal International Education Outreach (Reneal IEO) installs low-cost computer labs in high schools in the Philippines and Tanzania. Six schools in the Philippines were evaluated via on-site visits in February and March of 2016, and five schools (two Junior High and three Senior High) that were judged to meet or exceed Reneal IEO criteria for project involvement have been approved by the Reneal IEO Board of Directors for implementation. The sixth school has very new IT teachers, so it will be considered again during deliberation for 2017 projects.

The Reneal IEO mission statement is provided in Section 2. Section 3 includes a summary of estimated costs and required resources for Reneal IEO to complete the projects. Project completion is contingent upon those resources being available.

Section 4 outlines expectations for the beneficiary schools. School Heads must read and agree with these expectations before the project will be implemented at their school. Project implementation will begin in September of 2016, and schools must have their IT labs fully prepared per expectations by that time.

2. RENEAL INTERNATIONAL EDUCATION OUTREACH MISSION STATEMENT

Our purpose:

The specific purpose of Reneal International Education Outreach (Reneal IEO) is to provide support for students, their parents, teachers, and school administrators to enhance education opportunities in schools in developing countries. Recognizing the power of technology in particular to change lives, the primary focus of this organization is to provide Information Technology expertise and assets (computer hardware, computer software, and learning resources) to these schools.

What we do:

Our goal is to give students and teachers in developing countries better resources for learning. Key Reneal IEO activities are:

- Developing and installing low-cost computer systems for schools
- Providing teacher training in IT
- Serving as a conduit to get educational materials to schools
- Providing funding for scholarships and microfinance programs

How we do it:

To support these activities, Reneal IEO will:

- Develop hardware and software solutions and associated trainings that are tailored for developing countries
- Freely share these solutions and trainings with other individuals, agencies, and corporations
- Perform on-site installation, consultation, and training in developing countries
- Capitalize on connections and cultural skills built through the founders' United States Peace Corps experiences
- Leverage multiple decades of experience in software and technology
- Seek corporate support for projects and provide tax deductions for donations

Why we do it:

Information Technology has the potential to ignite the love of learning in students and teachers and to open doors for new opportunities for those in developing countries. We wish to share our passion for IT with others in order to help them achieve a better life. The ultimate reward is seeing the spark in

someone's eyes as they realize this potential themselves.

3. PROJECT DESCRIPTION

3.1. Beneficiary Organizations

With inputs from local team members and partners in Cebu, six schools in the Philippines were identified as candidates for projects beginning in September of 2016. These schools were evaluated via on-site visits in February and March of 2016. Three of schools had already been visited in 2015 but resources were not available to support them in the first round of 2016 projects. The other three schools are existing Reneal sites but will be starting substantial Senior High activities in June of 2016 as part of the Philippines Department of Education K-12 transition.

The following five schools have been approved by the Reneal IEO Board of Directors for implementation of the Reneal IEO low-cost computer infrastructure in September of 2016. Each of these schools meets or exceeds the Reneal IEO criteria for selection.

- Calape National High School, Daanbantayan, Cebu
- Tominjao National High School, Daanbantayan, Cebu
- Arcelo Memorial National High School - Senior High, Liloan, Cebu
- Carmen National High School - Senior High, Carmen, Cebu
- Daanbantayan National High School - Senior High, Daanbantayan, Cebu

The remaining candidate (Maya NHS) will be reconsidered for installation in 2017.

A summary of the evaluation criteria as well as the selected schools is included in Appendix A.

3.2. Technical Details

The Reneal IEO low-cost computer infrastructure was initially developed to support a high school in the Philippines. This approach allows a school to connect many (up to 40) less powerful computers ("clients") to a single powerful computer (the "server"). Each of the clients looks like a capable unit to the user, but programs are actually running on the server. More powerful clients allow for local load-sharing as well.

Key features of the Reneal IEO low-cost computer infrastructure include the following:

- Centralized file storage and management
- Use of a client/server architecture
- Use of Open Source software (Linux, Libre Office, other applications)
- Integrated software environment, customized for secondary schools

A description of the advantages of this approach and details of the software environment are provided in Appendix B.

3.3. Estimated Resources Required

Estimated Reneal IEO costs and the donated hardware required to complete these projects are summarized in Figure 1.

Figure 1: 2016-II Philippines Projects Estimated Costs and Hardware Needs

School	Proposed Implementation	Estimated Reneal IEO Costs*	Donated Hardware Needed**,***
Calape National High School, Daanbantayan, Cebu	Add server, 1-Gbit NW switches, plus 8 additional client units	926 USD	8 units + server monitor + keyboard
Tominjao National High School, Daanbantayan, Cebu	Add server, 1-Gbit NW switches, plus 16 additional client units	982 USD	16 units + server monitor + keyboard
Arcelo Memorial National High School Senior High, Liloan, Cebu	Add server, 1-Gbit NW switches, plus 20 additional client units	1045 USD	20 units + server monitor + keyboard
Carmen National High School Senior High, Carmen, Cebu	Add server, 1-Gbit NW switches, plus 20 additional client units	980 USD	20 units + server monitor + keyboard
Daanbantayan National High School Senior High, Daanbantayan, Cebu	Add server, 1-Gbit NW switches plus 20 additional client units	980 USD	20 units + server monitor + keyboard
TOTALS		***4913 USD***	***84 units, 5 monitors, 5 keyboards***

* Does not include the value of the donated used computer hardware or shipping costs

** A "unit" is either a laptop or a desktop+monitor+keyboard; note that Carmen NHS already has 20 monitors available for use

*** PLEASE NOTE THAT THESE QUANTITIES ARE CONTINGENT UPON RENEAL IEO RECEVING SUFFICIENT HARDWARE DONATIONS – THEY ARE NOT GUARANTEED.

A comprehensive, detailed list of computer equipment required to stand up the five laboratories is provided in Figure 2. Donated items are shaded with light blue. Reneal IEO will supply all other project hardware. These are the costs noted in Figure 1 in the column marked "Estimated Reneal IEO Costs".

The main expense is the server, which requires a multi-core processor, a large amount of RAM, two high capacity hard disks, and two Gigabit network cards. Servers are typically custom built and the software image is then copied to the disk. Donated units will also require one mouse per seat. A network switch is required for connectivity between the server and clients. Ethernet cables are fabricated to reduce cost and to give maximum flexibility for room set-up. It is also essential to provide voltage regulation and surge suppression for the server, all clients, and the network switches due to variations in power that are sometimes experienced. Quantities for these will be estimated once the specific computer layout is determined at each school.

The rationale for the column in Figure 1 entitled "donated hardware needed" is summarized in Figure 3. A total of 84 laptops or desktop/monitor/keyboard sets is desired. **If this hardware is not obtained, then the number of computer units that can be provided to each school will be reduced**.

Note that the estimate in Figure 2 does not include shipping costs of $85 per large box. This will likely add around 30% to the total Reneal IEO costs.

Figure 2: Detailed Estimated Costs for Reneal IEO 2016 Philippines Projects (as of 3/19/2016)

Item	**Unit Cost (PhP)**	**Unit Cost (USD)**	**Calape NHS**	***Calape NHS Total***	**Tomin-jao NHS**	***Tomin-jao NHS Total***	**Arcelo MNHS Sr Hi**	***Arcelo MNHS Sr Hi Total***	**Carmen NHS Sr Hi**	***Carmen NHS Sr Hi Total***	**Daan-bantayan NHS Sr Hi**	***Daan-bantayan NHS Sr Hi Total***	***Total Quantity***	***Estimated Total Cost***
Server computer	28520	620	1	620	1	620	1	620	1	620	1	620	**5**	***3100***
Ubuntu Operating System, applications, custom software for schools, installation, and training	0	0	1	0	1	0	1	0	1	0	1	0	**5**	***0***
Network switch Gigabit 24-port	4600	100	1	100	1	100	1	100	1	100	1	100	**5**	***500***
Network switch Gigabit 16-port	3450	75		0		0		0		0		0	**0**	***0***
Network switch Gigabit 8-port	1150	25		0		0		0		0		0	**0**	***0***
Cable ties, clamps, tape, labels, etc.	92	2	1	2	1	2	1	2	1	2	1	2	**5**	***10***
RJ45 connector	6.9	0.15	40	6	40	6	50	8	50	8	50	8	**230**	***35***
CMOS batteries	46	1	5	5	0	0	0	5	5	5	5	5	**15**	***20***
Optical mouse	200	4.35		0	17	74	21	91		0		0	**38**	***165***
Keyboard	200	4.35		0		0		0		0		0	**0**	***0***
Uninterruptible power supply (UPS)	3600	78	1	78	1	78	1	78	1	78	1	78	**5**	***391***
Voltage regulator	270	5.87	1	6	1	6	1	6	1	6	1	6	**5**	***29***
Power strip, 4-outlet	365	8		0		0		0		0		0	**0**	***0***
Power strip, 6-outlet	600	13	5	65	4	52	6	78	8	104	8	104	**31**	***404***
Cat 5e Ethernet cable (per meter)	12.33	0.27	150	40	150	40	200	54	200	54	200	54	**900**	***241***
Cable tacks (box)	160	3.48	1	3	1	3	1	3	1	3	1	3	**5**	***17***
Laptop (used, donated)	4600	100		0	16	1600	20	2000		0		0	**36**	***3600***
Desktop (used, donated)	4600	100	8	800		0		0	20	2000	20	2000	**48**	***4800***
Monitor (used, donated)	2300	50	9	450	1	50	1	50		0	21	1050	**32**	***1600***
Optical mouse (used, donated)	230	5	9	45		0		0	21	105	21	105	**51**	***255***
Keyboard (used, donated)	230	5	9	45	1	5	1	5	21	105	21	105	**53**	***265***
TOTAL				**2266**		**2637**		**3100**		**3190**		**4240**		**15433**
Equipment donated to Reneal IEO				*1340*		*1655*		*2055*		*2210*		*3260*		*10520*
Equipment purchased by Reneal IEO				*926*		*982*		*1045*		*980*		*980*		*4913*

Exchange rate 46 PhP/USD

Figure 3: Summary of Schools' Student-to-Computer Ratio

School	No. Students	Current No. of Computers	BEFORE: Ratio	Desired No. of Seats to Add	AFTER: Ratio	Comments
Calape NHS	878	9	98	8	52	
Tominjao NHS	530	0	N/A	16	33	Significant damage from Yolanda
Daanbantayan NHS - Senior High	Unknown	0	N/A	20	Unknown	Senior High starting in June of 2016 – no existing resources
Carmen NHS - Senior High	Unknown	0	N/A	20	Unknown	Senior High starting in June of 2016 – no existing resources
Arcelo Memorial NHS - Senior High	Unknown	0	N/A	20	Unknown	Senior High starting in June of 2016 – no existing resources

Expectations for beneficiary schools are summarized in the next section. Please read this section carefully. These expectations must be agreed to by the school and met in order for the project to proceed.

4. EXPECTATIONS

Beneficiary schools are expected to provide space and security for the IT lab. Tables for the computers and chairs for users must also be supplied. Electricity must be present and reliable.

If the classroom space and/or tables planned for the Reneal computers will be used for NComputing instead, we ask that Reneal IEO be informed immediately so the resources can be redeployed to another school in need.

Additional Condition for Tominjao NHS: Right now there is no electricity wiring in the IT lab at Tominjao NHS. If this wiring is not completed by July, the project at Tomijao NHS will have to be delayed since the schedule cannot be kept.

Beneficiary schools are expected to provide resources for maintenance and for limited-life items (such as mice and CMOS batteries) as needed. Provision should be made for regular cleaning of the equipment. Optional items that have been proven to be useful to schools (a projector or large refurbished TV for projection, a printer, and cooling) are also suggested if not already available.

IT coordinators at the beneficiary schools will be expected to spend time with Reneal IEO volunteers to learn about the system and to assist with teacher trainings. Training sessions will be provided by Reneal IEO for teachers at the selected schools, with special system administration training for the IT teachers. These trainings will be scheduled in cooperation with the school heads to minimize disruption to classes.

School heads and IT coordinators at the schools will be expected to commit to use of Open Source software with the installed system. In addition, it is expected that United States copyright laws will be respected in the use of this equipment. Installation of pirated software or downloading or storage of pirated audio/video on any computer hardware provided by Reneal IEO is strictly prohibited. However software that is already installed on existing computers at the school does not have to be erased.

Equipment donated by Reneal IEO to schools cannot be sold, removed, or used for purposes other than education without the express written consent of the Board of Directors of Reneal IEO. Donated equipment should never be taken from the IT lab, even for temporary use. Experience has shown that it frequently is not returned.

This donation is made solely to assist the students and teachers of these schools in their pursuit of quality education. It is expected that the computers provided by Reneal IEO will be used by students to learn about IT and for projects and research in other subject areas. It is expected that the computers will be used by teachers to prepare for classes, complete school reports, compute grades, and other school-related tasks. Because of limited Internet bandwidth, video streaming (even for educational purposes) is discouraged. Computers provided by Reneal IEO should be treated as a learning resource for students and teachers, not as an Internet café.

Finally, and very importantly, if it is determined that the system and equipment donated by Reneal IEO are not meeting the needs of the school, as demonstrated by low student usage and/or inadequate care of the equipment, then Reneal IEO reserves the right to remove the donated equipment upon direction of its Board of Directors so it can be given to another school in need.

5. PROJECT MONITORING

Each of the selected schools will be asked to track measures of success to monitor the project and evaluate its effectiveness. One key measure is computer usage in the IT lab. This will be tracked monthly by the IT coordinators.

6. PROJECT RISKS AND MITIGATION

Below are listed the project risks:

- A key risk is hardware failure. The server is configured with two hard disks and daily backup so that single disk failure is not catastrophic. Clients can be removed or added to the configuration seamlessly in case of failure. However other hardware failures (e.g., a network switch) would be catastrophic, at least until they can be replaced.
- While provisions for security have been discussed with the schools, IT laboratory security is a concern.
- Reneal IEO experience has been that once computers arrive on campus, there will be intense competition for use, including IT classes for students, teacher administrative tasks, and use by teachers of all subject areas for research and teaching. A process must be in place for IT lab scheduling to minimize conflicts in use while maximizing use.
- The Linux user interface has been customized to look like Microsoft Windows®. However teachers that have some familiarity with Microsoft OS and applications will need to learn new skills. This risk will be mitigated by training sessions conducted by Reneal IEO for the teachers that will be done coincident with the installations.
- IT teachers are usually not familiar with Linux and Open Source software when the system is first installed. System administration training is provided, along with a detailed system administration manual plus custom software to aid in identifying and correcting system problems. For schools with internet, Reneal IEO volunteers can log in to the server remotely to assist with troubleshooting. There is also a local expert in Compostela to help with any issues that arise.

7. ORGANIZATIONAL QUALIFICATIONS

Reneal IEO is a 501(c)(3) organization, incorporated in April of 2012. The co-founders have planned, designed, and executed multiple similar projects since they served as United States Peace Corps Volunteers in the Republic of the Philippines (2006-2008). The co-founders each have almost three decades of experience in technology-related fields. Brief background information is included as Appendix C. A history of their work is provided on the Reneal IEO website at http://reneal.org/content/history.

8. CONTACT INFORMATION

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Reneal International Education Outreach Incorporated is a 501(c)(3) public charity. All donations are tax deductible to the full extent allowed by law.

APPENDIX A: BENEFICIARY SCHOOLS

For Reneal IEO computerization projects, the following criteria are used to determine suitability for a recipient organization:

- Basic infrastructure to support school computerization (e.g., secure space for computers, source of electricity, tables and chairs, internet desired but not required)
- A designated school Information Technology point-of-contact, such as an IT teacher or IT lab head
- Existing basic computer skills among the teacher population
- School is accessible from a main road with reasonable proximity to a city
- Potential to get internet
- Priority given to secondary school level
- Interested, enthusiastic principal and IT teacher, supportive parents and community
- A vision and passion for using IT in education

Selected schools for 2016 are listed below, along with comments from their evaluation visits.

1. Calape National High School, Daanbantayan, Cebu

Calape NHS has about 900 students. They have a new computer lab housing approximately 9 working Red Fox computers. There are older working computers as well, but they do not have the needed capability to be clients. The lab has internet. Security is in place and adequate. There is space for additional client computers. Public transportation to the school is available.

2. Tominjao National High School Day, Daanbantayan, Cebu

Tominao NHS has about 530 students. All of their computer equipment was destroyed in Yolanda. Last year when we visited, there was no room available to serve as an IT lab. Now that the new building has been completed, a room has been designated as an IT lab. Tables are currently being built for the NComputing system. These tables would also work for laptop computers but would not work for desktop/monitor units. The school can be accessed by v-hire.

3. Arcelo Memorial National High School – Senior High, Liloan, Cebu
4. Carmen National High School – Senior High, Carmen, Cebu
5. Daanbantayan National High School – Senior High, Daanbantayan, Cebu

These three schools already have Reneal IEO systems installed and are experienced, active users. Each school is large and will expand to Senior High beginning in 2016. Because of the size of the student population and their current level of expertise with the Reneal system, these three were chosen to be the first Senior High School installations for Reneal. Each school has already verbally committed to providing space for a new Senior High IT lab. It is expected that the IT teachers at these schools will engage actively in the physical layout and cabling of the systems, so actual Reneal IEO staff time can be limited to server delivery and set-up. Carmen already has 20 spare monitors that can be used, so additional monitors will not be provided.

APPENDIX B: SUMMARY OF RENEAL IEO LOW-COST COMPUTER APPROACH

Advantages of the server/client architecture and open source software environment:

- Easy maintenance – software is only on the server
- Clients can be added or removed easily
- Clients can be less capable computers (original implementation used obsolete P1/P2 machines as clients)
- Modular, extendable architecture: can run multiple servers in a large school
- Open source software is free, with no concerns about piracy
- No problems with viruses – this is a significant issue for schools
- All access to Internet is controlled through a single computer to provide filtering of content
- Users can access their own files from any computer
- Files are centralized for easy backup

Software is integrated and customized for a school environment:

- Internet filtering and caching
- Automatic backup
- Teachers
    - Individual password-protected accounts
    - Individual user profile information
    - Personal file storage space for each account
    - Shared file storage space for all teachers
- Students
    - Common look-and-feel for all student accounts
    - Folders for each student for individual file storage

Software elements:

- Linux Ubuntu operating system
    - Linux XFCE user interface created to look like Windows
- Libre Office (word processor, spreadsheet, presentations)
    - Can save/read Microsoft Office format
- Other standard applications (Mozilla Firefox and Google Chromium web browser, Adobe Reader, VLC movie viewer, Gimp photo editor, Bluefish web page design, CUPS printer manager)
- GCompris, TuxType, and TuxMath educational software

School resources configured for immediate use:

- WordPress blog
- School Wiki
- Moodle
- Squid internet filtering and caching with filters in place and set up for weekly update
- Internal Apache web server, home page with links to internal services and key external sites
- Firewall configured to protect all internal resources
- VPN for remote trouble-shooting and maintenance
- Prebuilt student and teacher accounts and file management structure
- Individual file storage area for each student
- Student accounts that are automatically rebuilt upon student logout to remove unwanted student changes
- Teaching and training resource repository, including 4000+ Khan Academy videos and Rachel educational materials

Complete documentation available at
http://reneal.org/sites/default/files/documents/ComputerInfrastructureForSchools.pdf

APPENDIX C: CO-FOUNDER CURRICULA VITAE

Neal R. Bierbaum, Reneal IEO Board President

Work Experience

April 2012 – Present, President and Full-time Volunteer for Reneal IEO
Continued projects in the Philippines and Tanzania. Primary focus is on software development.

January 2009 – April 2012, Full-Time Volunteer
Continued work in Philippines. Developed Philippines Student Information System, provided low-cost integrated software system to Aboitiz Foundation. Began work in Tanzania.

March 2006 – December 2008, United States Peace Corps Volunteer
Served as Volunteer at Compostela National High School, Compostela, Cebu, Philippines. Created low-cost distributed computer infrastructure on campus.

June 2001 – March 2006, Consultant - PACE, Inc.
Engineering consultant for Sandia National Laboratories. Developed simulation models of specialized network applications, a new network protocol, and remote high performance file systems. Designed and implemented major integrated multi-host software general test package.

September 1999 – February 2002, Consultant - PACE, Inc.
Continued consulting with Hybrid Networks. Performed significant redesign of numerous system elements for reliability and ease of use. Ported entire system to Solaris, Linux, and a new version of FreeBSD. Developed software architecture for Hybrid's next generation hardware.

May 1999 – August 1999, Transcontinental tandem bicycle ride with wife

October 1998 – May 1999, Consultant - PACE, Inc.
Chose to become consultant. Continued work with Hybrid Networks.

May 1995 – October 1998, Senior Engineer - Hybrid Networks
Primary engineer for "Head End" system. Designed and implemented all GUI Configuration, Monitoring, and Subscriber Database applications. Designed all control for 2-way cable system.

July 1991 – May 1995, Senior Engineer - Make Systems
Chief engineer for NetMaker Internetworking Simulation and Design tool. Created new conceptual model for simulation; personally designed and wrote all internetworking simulation software.

February 1989 – June 1991, Staff Engineer - Vitalink Communications
Senior software engineer in product engineering department. Developed software for wide area network bridge/routers. Created integrated software development environment.

September 1986 – January 1989, Systems Development Engineer - General Electric
Development engineer under contract to NASA Ames National Aeronautics Simulation (NAS) supercomputer center. Primary work in computer network communications.

June 1983 – August 1983, Transcontinental bicycle ride

August 1974 – June 1983, US Air Force
Commissioned officer (highest rank Captain). Experiences included instructing advanced students in the T-38 supersonic jet trainer and serving as C-130 Aircraft Commander.

Education

- Engineers' Degree Electrical Engineering, Stanford University, Stanford, CA, August 1986 (Thesis: "Space Station Experimental Control by a Remote Control Center". Same academic load as a Ph.D.)
- Master of Science in Electrical Engineering, Stanford University, Stanford, CA, December 1984
- Bachelor of Science in Electrical Engineering, US Air Force Academy , Colorado Springs, CO, June 1974 (double major in Electrical Engineering and Computer Science)

Rene L. Bierbaum, Reneal IEO Board Treasurer

Work Experience

November 2013 – Present, Treasurer and Full-time Volunteer for Reneal IEO
Continued projects in the Philippines and Tanzania. Primary focus is on Reneal IEO operations and teacher training.

June 2014-Present, Part-Time Consultant - Sandia National Laboratories

January 2009 – November 2013, Reliability Analyst - Sandia National Laboratories
Resumed career as reliability analyst following U.S. Peace Corps service. Received Individual 2012 Defense Programs Award of Excellence for work in surveillance metrics and sampling rationale.

March 2006 – December 2008, United States Peace Corps Volunteer
Served as Volunteer at Compostela National High School, Compostela, Cebu, Philippines. Conducted 41 training classes and modules for the teachers of CNHS and other municipal high schools, downloaded web resources for teachers, developed admin tools for teachers.

September 1999 – March 2006, Reliability Analyst - Sandia National Laboratories
Responsible for reliability analysis of various Sandia hardware and methodology development. Appointed Distinguished Member of Technical Staff (top 10% of technical staff) in 2000.

May 1999 – September 1999, Transcontinental Tandem Bicycle Ride with husband

January 1998 – May 1999, Reliability Analyst - Sandia National Laboratories
Because of desire to make greater technical contribution, returned to technical staff position following 5-1/2 years of management experience. Was responsible for reliability analysis of various Sandia hardware.

August 1992 – January 1998, Manager - Sandia National Laboratories
Managed a group of ten technical staff and a budget of approximately 3M$. Department mission included reliability analyses and use of electrical simulation tools to support Sandia products.

December 1988 – August 1992, Project Leader - Sandia National Laboratories
Led multi-agency system integration effort involving system and component designers and production engineers. Responsible for liaison and requirements negotiation with external customers.

December 1986 – December 1988, Systems Analyst - Sandia National Laboratories
Developed computer software to analyze the effectiveness of various sensor technologies in tactical battlefield applications using high-resolution war gaming models.

June 1984 – December 1986, Electrical Engineer - Sandia National Laboratories
Part of a team responsible for developing an infrared imaging system. Specific tasks included acquiring and configuring test instrumentation and characterizing imaging system performance.

Education

- Master of Science in Electrical Engineering, Stanford University, Stanford, CA, June 1984.
- Bachelor of Science in Electrical Engineering, University of Nebraska, Lincoln, NE, May 1983 (also completed all requirements for a major in Mathematics, plus extensive coursework in chemical engineering and computer science)