Final Report

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I. Background Information

The Agahozo-Shalom Youth Village (ASYV) is a residential community which provides education to children orphaned during and after the genocide. The construction of the village started during the summer of 2006, and the first school year begin in January 2009, with 125 students. Now, there are 375 students, and ASYV plans to have 500 students next academic year, which will begin in January 2012.

Anne Heyman, a native of South Africa, founded ASYV and led its construction. The goal of the village is *"to help the youth who had gone through a time of trauma to be health, self-sufficient, and engaged in rebuilding Rwanda."*

The village sits on 144 acres. It has a school and a residential area which are 0.3 miles apart. There are two educational programs: formal education and informal education. Formal education is led by the Liquidnet Family High School, and informal education, which is the learning that comes through enrichment programs and clubs, is led by the informal education staff. Ilan Blum is the Village Director (2010 – 2011). He leads the Department of Administration and Finance, oversees the formal and informal education staff, and supervises the ongoing construction at the village. He also served as the community partner in this consulting project.

In the domain of technology, Liquidnet has been the major contributor. Each year, Liquidnet sends a team of employees who are technology experts to undertake various projects for a few days. Two years ago, a Liquidnet team installed servers and wireless access points in the village. This year, a team of four employees came to upgrade the servers, expand the wireless network, and do some troubleshooting.

The IT Volunteer, Mike Liese, is responsible for network administration, support, and maintenance at ASYV. He monitors and resolves most of the server or network related problems on the daily basis at the school and residential area. He also manages network and staff email accounts.

II. Consulting Tasks

Technology is becoming an important aspect at the village. The student consultants noticed that ASYV did not have enough computers for students' academic work. Further, the computer lab in the school had an unreliable connection to the server. ASYV also did not have enough people to manage the growing network infrastructure and to provide technical support. Staff members had many issues with their computers, such as virus infections, but only one IT volunteer was available to offer help. Some of the issues were due to a lack of basic knowledge about computers or available software at ASYV. Also, the Student Information System of ASYV contained the formal education data and none of the informal

education data. However, the village wanted to store the informal education data along with the formal education data. Finally, ASYV had places in the residential areas with low or no Wi-Fi signals.

The student consultants decided to build more labs, form an IT club, give presentations and workshops, configure the Student Information System, and design a plan for a better Wi-Fi environment for the residential area. These different tasks would not only solve the major technical issues but also help improve the use of technology at ASYV.

III. Outcomes Analysis and Recommendations

The student consultants completed building three wired computer labs in ASYV. There are 46 more computers for ASYV students to use for academic work. They have structured and organized an IT club of 16 students. They have been monitoring the computer labs and have been introduced to a ticketing system that is used to log any technical issues that are brought to them. They have started accepting computers with problems, fixing them, and logging them in the ticketing system. The student consultants have given five presentations and workshops to different groups of the community. They have also configured the Student Information System according to ASYV's requirements. Lastly, they have designed a new plan to install Wi-Fi equipments in various places of the residential areas to improve Wi-Fi signal coverage.

The computer labs that the student consultants built need to be managed to be sustainable. The IT club students are able to provide maintenance because they have been involved in the entire building of the lab.   The IT club has the support of the Informal Education Department that is in charge of all extracurricular activities. The slide files for the presentations given to the community are available in the server so that anyone can review them.   The configuration of the Student Information System has been explained to the main users of Rediker, and the student consultants have created a manual for them to read.   Lastly, the Wi-Fi plan has been discussed with the IT volunteer, and he is going to implement it in the next academic term.

The student consultants made three recommendations: installing a Course Management System, hiring a local IT expert, and creating a partnership with business process outsourcing companies.   The Course Management System would improve communication between students and teachers, and installing it would not be difficult in this network environment. However, configuration may be time-consuming. A full-time local IT expert is necessary to properly maintain the network infrastructure at ASYV because it is overwhelming for one IT volunteer to manage.   Creating a partnership with a business process outsourcing companies would provide students opportunities to develop marketable skills as well as earn money. Given the network infrastructure, ASYV would only have to assign staff to supervise students once the partnership is made.

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I. About the Organization

Organization

The official name of Rwanda is Republic of Rwanda. It is located in eastern Africa and has a population of about 11.1 million (2010). The area of the country is about 26,000 km^2.[i] During the year 1994, there was genocide in the country, and approximately 800,000 were killed.[ii] As a result, 1.2 million children became orphans.[iii]

The Agahozo-Shalom Youth Village (ASYV) is a residential community providing education for children orphaned during and after the genocide. The village started building in summer of 2006, and started the first school year in January 2009, with 125 students. Now, there are 375 students, and ASYV plans to have 500 students next academic year, which begins in January 2012.

The building of the school was led by the founder Anne Heyman. To solve the problem of large population of orphans in Rwanda, she decided to bring the model of youth villages in Israel designed to help orphans from the holocaust. The goal of the village is "to help the youth who had gone through a time of trauma to be healthy, self-sufficient, and engaged in rebuilding Rwanda."

The school of the village is called Liquidnet Family High School (LNFHS). School years are divided into three years: Enrichment year, Senior 4, and Senior 5. The school intends to include Senior 6 next year. The education programs are divided into two, formal education and informal education.

The Informal Education Department has a program called "Tikkun olam," which literally translates to "repairing the world." The program offers students an opportunity to engage in social services and to help the surrounding community. It involves performing service to the community in four areas:
1. Teaching children English in the nearby school
2. Assisting administration work and looking after the sick in the nearby clinic
3. Repairing and building houses for the poor in the nearby village
4. Other projects as needed by the neighborhood community

Every week, Senior 4 and Senior 5 students choose one of the four service areas to participate. ASYV plans to expand this program, and add an option of teaching children about computers in the ASYV computer labs, once all the labs are built.

Facilities

ASYV covers 144 acres, and the boundary has fences. ASYV is divided into two areas: village area and school area. The village area has the residential houses, two learning centers, and a village administration building; the school area has the school building. The two areas are about 0.3 miles apart. The school building has the following rooms:

17 classrooms
3 science labs
1 computer lab
1 server room
1 study lab
1 library
3 administration offices
1 volunteer room
1 social worker room
2 lounges for teachers

The computer lab has 33 computers. There has been a donation of 200 computers from South Korea, and 76 of them will be used in administration offices, library, and two new computer labs in the school. The plans for the rest of the computers are being decided by the staff and directors. They are thinking of installing a computer in each residential house, occupied by 16 students, but have not finalized the plan. There is a server room in the school, containing three windows servers, UPS, switch, Linux server that serves as a router, and voltage regulators.

In the village area, there is another computer lab in the science center, with 16 computers installed and 14 computers unopened in the box. There is a switch room next to the science center containing switches. There is a recording studio next to the administration office, containing 1 computer and some recording devices. All the rooms, both in the school area and the village area, are locked when they are not in use, and the keys are kept by the staff in charge of the rooms.

There is electricity in all the rooms; however, the voltage is unstable, and the rooms with computers or network devices have voltage regulators installed accordingly. There are frequent power outages, about once every two or three days.

Programs

The education programs are divided into two, formal education and informal education. For the formal education, the Enrichment year students review the material for Senior 1, 2, and 3 years, which are the last three years of mandatory education in Rwanda. Among the subjects they study, they have an Information Technology/ Basic Computers class, where they learn about basic functions of a computer and practice typing. School year is divided into three terms, and at the third term of the Enrichment year, students choose a combination. According to what each student selects as their combination, they study different materials about computers. The combinations offered in LNFHS are:
1. Physics – Computer Science – Math
2. Math – Economics – Computer Science

3. Biology – Chemistry – Math
4. Math – Economics – Geography
5. History – Economics – Geography
6. Kinyarwanda – English – French

All students learn about office applications, such as Microsoft Excel, Word, and PowerPoint. Students studying one of the two combinations containing Computer Science learn about programming in C or C++ and Microsoft Access database.

For the informal education, every student must choose a sport activity and an art activity. Art activities that use a computer are:
1. Digital Media and Recording (audio recording of the performing arts)
2. Photography and Movie Making

The informal education also includes club activities. An Information Technology club is recently beginning to form, but has not officially started their club activity, which involves operating and maintaining the computers in the computer labs, and offering technical support for the village.

Staff

Anne Heyman is the founder of ASYV. She is a native of South Africa, and has been engaged in philanthropic work globally. She was the former president and co-chair of the Board of Directors of Dorot, and has worked with Abraham Joshua Heschel School in New York, Young Judaea, Tufts University Hillel, and the Jewish Community Centers of America.

Tamar M. Copeland is the Executive Director, and has worked for nonprofit organizations for more than twenty years. She helped The New York Women's Foundation, and brought significant increase in fundraising revenue. She is currently the chair for the Africa Initiative at Barnert Temple in Franklin Lakes, New Jersey.

Ilan Blum is the Village Director, appointed for years 2010 to 2012. He has worked with nonprofit organizations in northern peripheral towns of Israel. He established an open democratic school Mytar and was also Director of the Language and Literacy Department at the Teachers' Center of Tel-Hay College.

Rachel Olstein Kaplan is the Director of Volunteer Services. She worked with AmeriCorps and led outdoor education programs at Teva Learning Center.

Alain Munyaburanga is the Deputy Director. He assisted in recruitment of the village staff and manages the school, farm, and the general village operations.

Shimon Solomon is the Director of Teaching and Training.

Jean-Pierre Nkuranga is the Director of Informal Education. He was involved in building the Association des Etudiants Rescapes du Genocide, an association committed to help survivors of the genocide. He was the national coordinator of Uyisenga N'Manzi, an N.G.O. working to help orphans.

Wilton Ndayisenga is the Director of Formal Education. He led the poverty eradication project for S.O.S. Children's Village.

Sylvia Gata-Salama is the Director of Finance and Administration. She manages budget development, human resources, security, and logistics.[iv]

The staff related to teaching is divided into three groups: teachers in charge of formal education, counselors in charge of informal education, and housemothers in charge of student life. There are 22 teachers, 22 counselors, and 24 housemothers.

All staff members, but two housemothers, have their own laptops. They have access to internet and Microsoft Office applications. The teachers use the computer to access internet and email. They also use Microsoft Office applications to plan lessons and write exams. The teachers are required to input the midterm grades and the final grades into a Student Information System called Administrator's Plus, a product of Rediker Software, Inc. Many are not familiar with how to input the data. Therefore, they send their grade reports in an excel spreadsheet to Sika Somberg, a long-term volunteer in charge of inputting data to Rediker, or Biira Lovell, the administration office worker.

The counselors use their computers like the teachers. They write reports and plan classes using Microsoft Word or Excel. After each class, counselors must submit evaluations of each student in a Microsoft Excel spreadsheet. Jean-Claude Parisien, Assistant Director of Informal Education, collects the reports and puts them together to report to Jean-Pierre Nkuranga, Director of Informal Education. The counselor for Digital Media and Recording activity uses software M-Audio Plus, and the counselor for Photography and movie making activity uses software Adobe Photoshop and Pinnacle Studio.

The housemothers use the computers for internet and Microsoft Office applications. They use internet mostly for email. They use Microsoft Word and Excel to write reports to submit to the administration office.

Some of the staff members, especially the housemothers, are not familiar with the computer Microsoft Office applications. The school has unlimited licenses of Windows XP and Microsoft Office 2007 and has freeware anti-virus software. However, many do not know that these are available to them. Currently, no training about computers is available for them.

There are 11 long-term volunteers, and they offer help in the art center, science center, construction, landscape, and school administration. Everyone has a laptop and use it for internet and Microsoft Office applications.

The financial accountant Christine Nzambazawe uses software Quickbook to manage financial data. She also uses Microsoft Access to report to the Social Security Fund of Rwanda, which requires reports from organization with more than 10 employees.

Role of Liquidnet

Liquidnet sends an IT team about once a year to maintain technology equipments. Al Berg, the security manager at Liquidnet, has been involved in the IT maintenance of ASYV since it

was founded. This year, an IT team of four people came and replaced most of wireless network equipments in ASYV. They also improved the school bell system, secured backup servers in the server room, and provided technical support for the villagers.

Mike Liese communicates with Liquidnet often to discuss computer related problems within ASYV. Liquidnet provides support from New York, and sometimes ships necessary parts of technology equipments.

Technology Infrastructure - Computers

The student consultants have compiled the following table:

Equipment	Name	Operating System	Specification	IP	Location	Function
Server	Earth	Windows Server 2008 R2	CPU: Intel® Pentium® D CPU 2.80 GHz 2.79 GHz RAM: 4.00 GB	192.168.100.43	School server room	Main DNS server, file server
Server	Sky	Windows Server 2008 R2 64 bit	CPU: Intel® Core™ 2 CPU 6400 @ 2.13GHz 2.13 GHz RAM: 4.00 GB	192.168.100.40	School server room	Secondary DNS server, file server
Server	RW0REDIKER	Windows Server 2003 R2 64 bit	CPU: Intel® Pentium® D CPU 2.80 GHz 2.79 GHz RAM: 2.00 GB	192.168.100.45	School server room	Rediker server, Windows update server
Server	inveneo-hub	Ubuntu Linux 8.04.1	CPU: 1.2GHz VIA C7 nanoBGA2 Fanless RAM: 946.55 MB	192.168.100.1	School server room	DNS, Routing, File Server
PC	SLC-LAB-01	Windows 7 Professional 32 bit	CPU: Pentium® Dual-core CPU @ 3.00 GHz 3.00 GHz RAM: 3.00 GB	DHCP	Science Learning Center	Homework, research, assignments from Enrichment Programs, internet, C++ programming
PC	SLC-LAB-02	Windows 7 Professional 32 bit	CPU: Pentium® Dual-core CPU @ 3.00 GHz 3.00 GHz RAM: 3.00 GB	DHCP	Science Learning Center	
PC	SLC-LAB-03	Windows 7 Professional 32 bit	CPU: Pentium® Dual-core CPU @ 3.00 GHz 3.00 GHz RAM: 3.00 GB	DHCP	Science Learning Center	
PC	SLC-LAB-04	Windows 7 Professional 32 bit	CPU: Pentium® Dual-core CPU @ 3.00 GHz 3.00 GHz RAM: 3.00 GB	DHCP	Science Learning Center	
PC	SLC-LAB-05	Windows 7 Professional 32 bit	CPU: Pentium® Dual-core CPU @ 3.00 GHz 3.00 GHz RAM: 3.00 GB	DHCP	Science Learning Center	
PC	SLC-LAB-06	Windows 7 Professional 32 bit	CPU: Pentium® Dual-core CPU @ 3.00 GHz 3.00 GHz RAM: 3.00 GB	DHCP	Science Learning Center	

PC	SLC-LAB-07	Windows 7 Professional 32 bit	CPU: Pentium® Dual-core CPU @ 3.00 GHz 3.00 GHz RAM: 3.00 GB	DHCP	Science Learning Center	
PC	SLC-LAB-08	Windows 7 Professional 32 bit	CPU: Pentium® Dual-core CPU @ 3.00 GHz 3.00 GHz RAM: 3.00 GB	DHCP	Science Learning Center	
PC	SLC-LAB-09	Windows 7 Professional 32 bit	CPU: Pentium® Dual-core CPU @ 3.00 GHz 3.00 GHz RAM: 3.00 GB	DHCP	Science Learning Center	
PC	SLC-LAB-10	Windows 7 Professional 32 bit	CPU: Pentium® Dual-core CPU @ 3.00 GHz 3.00 GHz RAM: 3.00 GB	DHCP	Science Learning Center	
PC	SLC-LAB-11	Windows 7 Professional 32 bit	CPU: Pentium® Dual-core CPU @ 3.00 GHz 3.00 GHz RAM: 3.00 GB	DHCP	Science Learning Center	Homework, research, assignments from Enrichment Programs, internet, C++ programming
PC	SLC-LAB-12	Windows 7 Professional 32 bit	CPU: Pentium® Dual-core CPU @ 3.00 GHz 3.00 GHz RAM: 3.00 GB	DHCP	Science Learning Center	
PC	SLC-LAB-13	Windows 7 Professional 32 bit	CPU: Pentium® Dual-core CPU @ 3.00 GHz 3.00 GHz RAM: 3.00 GB	DHCP	Science Learning Center	
PC	SLC-LAB-14	Windows 7 Professional 32 bit	CPU: Pentium® Dual-core CPU @ 3.00 GHz 3.00 GHz RAM: 3.00 GB	DHCP	Science Learning Center	
PC	SLC-LAB-15	Windows 7 Professional 32 bit	CPU: Pentium® Dual-core CPU @ 3.00 GHz 3.00 GHz RAM: 3.00 GB	DHCP	Science Learning Center	
PC	SLC-LAB-16	Windows 7 Professional 32 bit	CPU: Pentium® Dual-core CPU @ 3.00 GHz 3.00 GHz RAM: 3.00 GB	DHCP	Science Learning Center	

PC	RECORDINGST UDIO	Windows 7 Pro 64-bit SP1	CPU: Pentium® Dual-core CPU @ 3.00 GHz 3.00 GHz RAM: 3.00 GB	DHCP	Music center	Recording class in Enrichment program
PC	Agahozo-2	Windows XP Professional SP3	CPU: Intel® Pentium® M professor 1.3 GHz 1.29 GHz RAM: 512MB	DHCP	School administration office	Microsoft Office applications, internet, Rediker data input
PC	LAB1PC1	Windows XP Professional SP3	CPU: Intel® Atom CPU N270 @ 1.60 GHz 1.61 GHz RAM: 1.00 GB	DHCP	School computer lab	Microsoft Office applications, internet, typing practice, Formal education IT class assignment, C++ programming
PC	LAB1PC2	Windows XP Professional SP3	CPU: Intel® Atom CPU N270 @ 1.60 GHz 1.61 GHz RAM: 1.00 GB	DHCP	School computer lab	
PC	LAB1PC3	Windows XP Professional SP3	CPU: Intel® Atom CPU N270 @ 1.60 GHz 1.61 GHz RAM: 1.00 GB	DHCP	School computer lab	
PC	LAB1PC4	Windows XP Professional SP3	CPU: Intel® Atom CPU N270 @ 1.60 GHz 1.61 GHz RAM: 1.00 GB	DHCP	School computer lab	
PC	LAB1PC5	Windows XP Professional SP3	CPU: Intel® Atom CPU N270 @ 1.60 GHz 1.61 GHz RAM: 1.00 GB	DHCP	School computer lab	
PC	LAB1PC6	Windows XP Professional SP3	CPU: Intel® Atom CPU N270 @ 1.60 GHz 1.61 GHz RAM: 1.00 GB	DHCP	School computer lab	

PC	LAB1PC7	Windows XP Professional SP3	CPU: Intel® Atom CPU N270 @ 1.60 GHz 1.61 GHz RAM: 1.00 GB	DHCP	School computer lab	
PC	LAB1PC8	Windows XP Professional SP3	CPU: Intel® Atom CPU N270 @ 1.60 GHz 1.61 GHz RAM: 1.00 GB	DHCP	School computer lab	
PC	LAB1PC9	Windows XP Professional SP3	CPU: Intel® Atom CPU N270 @ 1.60 GHz 1.61 GHz RAM: 1.00 GB	DHCP	School computer lab	
PC	LAB1PC10	Windows XP Professional SP3	CPU: Intel® Atom CPU N270 @ 1.60 GHz 1.61 GHz RAM: 1.00 GB	DHCP	School computer lab	
PC	LAB1PC11	Windows XP Professional SP3	CPU: Intel® Atom CPU N270 @ 1.60 GHz 1.61 GHz RAM: 1.00 GB	DHCP	School computer lab	Microsoft Office applications, internet, typing practice, Formal education IT class assignment, C++ programming
PC	LAB1PC12	Windows XP Professional SP3	CPU: Intel® Atom CPU N270 @ 1.60 GHz 1.61 GHz RAM: 1.00 GB	DHCP	School computer lab	
PC	LAB1PC13	Windows XP Professional SP3	CPU: Intel® Atom CPU N270 @ 1.60 GHz 1.61 GHz RAM: 1.00 GB	DHCP	School computer lab	
PC	LAB1PC14	Windows XP Professional SP3	CPU: Intel® Atom CPU N270 @ 1.60 GHz 1.61 GHz RAM: 1.00 GB	DHCP	School computer lab	
PC	LAB1PC15	Windows XP Professional SP3	CPU: Intel® Atom CPU N270 @ 1.60 GHz 1.61 GHz RAM: 1.00 GB	DHCP	School computer lab	
PC	LAB1PC16	Windows XP Professional SP3	CPU: Intel® Atom CPU N270 @ 1.60 GHz 1.61 GHz RAM: 1.00 GB	DHCP	School computer lab	
PC	LAB1PC17	Windows XP Professional SP3	CPU: Intel® Atom CPU N270 @ 1.60 GHz 1.61 GHz RAM: 1.00 GB	DHCP	School computer lab	

PC	LAB1PC18	Windows XP Professional SP3	CPU: Intel® Atom CPU N270 @ 1.60 GHz 1.61 GHz RAM: 1.00 GB	DHCP	School computer lab	
PC	LAB1PC19	Windows XP Professional SP3	CPU: Intel® Atom CPU N270 @ 1.60 GHz 1.61 GHz RAM: 1.00 GB	DHCP	School computer lab	
PC	LAB1PC20	Windows XP Professional SP3	CPU: Intel® Atom CPU N270 @ 1.60 GHz 1.61 GHz RAM: 1.00 GB	DHCP	School computer lab	
PC	LAB1PC21	Windows XP Professional SP3	CPU: Intel® Atom CPU N270 @ 1.60 GHz 1.61 GHz RAM: 1.00 GB	DHCP	School computer lab	
PC	LAB1PC22	Windows XP Professional SP3	CPU: Intel® Atom CPU N270 @ 1.60 GHz 1.61 GHz RAM: 1.00 GB	DHCP	School computer lab	Microsoft Office applications, internet, typing practice, Formal education IT class assignment, C++ programming
PC	LAB1PC23	Windows XP Professional SP3	CPU: Intel® Atom CPU N270 @ 1.60 GHz 1.61 GHz RAM: 1.00 GB	DHCP	School computer lab	
PC	LAB1PC24	Windows XP Professional SP3	CPU: Intel® Atom CPU N270 @ 1.60 GHz 1.61 GHz RAM: 1.00 GB	DHCP	School computer lab	
PC	LAB1PC25	Windows XP Professional SP3	CPU: Intel® Atom CPU N270 @ 1.60 GHz 1.61 GHz RAM: 1.00 GB	DHCP	School computer lab	
PC	LAB1PC26	Windows XP Professional SP3	CPU: Intel® Atom CPU N270 @ 1.60 GHz 1.61 GHz RAM: 1.00 GB	DHCP	School computer lab	
PC	LAB1PC27	Windows XP Professional SP3	CPU: Intel® Atom CPU N270 @ 1.60 GHz 1.61 GHz RAM: 1.00 GB	DHCP	School computer lab	
PC	LAB1PC28	Windows XP Professional SP3	CPU: Intel® Atom CPU N270 @ 1.60 GHz 1.61 GHz RAM: 1.00 GB	DHCP	School computer lab	

PC	LAB1PC29	Windows XP Professional SP3	CPU: Intel® Atom CPU N270 @ 1.60 GHz 1.61 GHz RAM: 1.00 GB	DHCP	School computer lab	
PC	LAB1PC30	Windows XP Professional SP3	CPU: Intel® Atom CPU N270 @ 1.60 GHz 1.61 GHz RAM: 1.00 GB	DHCP	School computer lab	Microsoft Office applications, internet, typing practice, Formal education IT class assignment, C++ programming
PC	LAB1PC31	Windows XP Professional SP3	CPU: Intel® Atom CPU N270 @ 1.60 GHz 1.61 GHz RAM: 1.00 GB	DHCP	School computer lab	
PC	LAB1PC32	Windows XP Professional SP3	CPU: Intel® Atom CPU N270 @ 1.60 GHz 1.61 GHz RAM: 1.00 GB	DHCP	School computer lab	
PC	LAB1PC33	Windows XP Professional SP3	CPU: Intel® Atom CPU N270 @ 1.60 GHz 1.61 GHz RAM: 1.00 GB	DHCP	School computer lab	

Technology Infrastructure – Wireless network equipments

IP Address	Host Name	Location	Hardware	Station Mode	SSID	Channel
10.10.10.1	School	School	Powerstation2	Access Point	school	1
192.168.100.254	BackBone	School	Nano Station M5	Access Point	backbone-p2mp	36
10.10.20.1	dining-rtr	Dining Hall	Nano Station M5	Station	backbone-p2mp	36
10.10.20.2	dining-AP	Dining Hall	Nano Station 2	Access Point	Dining Hall	11
10.10.30.1	residence-rtr	Village water tower	Nano Station M5	Station	backbone-p2mp	36
10.10.30.2	residence-AP	Village water tower	Powerstation2	Access Point	residence	1
10.10.30.15	house16-station	Village residential area	Nano Station 2	Station	residence	1
10.10.30.20	resi-wds-L-Station	Village residential area	Powerstation2	Access Point WDS	resi-wds-l	6
10.10.30.21	resi-wds-L-ap01	Village residential area	Powerstation2	Access Point WDS	resi-wds-l	6
10.10.30.22	resi-wds-L-ap02	Village residential area	Powerstation2	Access Point WDS	resi-wds-l	6
10.10.30.45	East Lodges-Station	Village residential area	Nano Station 2	Station	residence	1
10.10.30.46	Lodge East AP	Village residential area	Powerstation2	Access Point	resi-lodgeE	11
10.10.30.31	Resi-office-station	Village residential area	Nano Station 2	Station	residence	1
10.10.60.11	Admn-Office-Printer-Station	Village administration office	Nano Station 2	Station	Administration	6
10.10.50.1	Science-Center-Station	Science Learning Center	Nano Station M5	Station	backbone-p2mp	36
10.10.50.2	UBNT	Science Learning Center	Nano Station 2	Access Point	Science Center	6

Technology Management

When there is a computer related problem, people in ASYV look for Mike Liese or Kabiriji Deo. Mike Liese is a volunteer who has been in the village for about six months. He is in charge of managing the technology infrastructure, including the three servers in the server room at school, all the wireless network stations, and other network equipments. He also communicates with the company Liquidnet in New York, asking for advice or reporting problems. Kabiriji Deo is a computer science teacher in the school, and he is in charge of all the school computer labs. Both of them fix individual laptops of the staff when brought to them. Currently, they do not log the problems.

The servers in the server room have an automated backup system. Two of the servers are used as the main DNS and the secondary DNS. All three servers create backups regularly, and stores the files in the secondary hard drive of the secondary DNS server. The third server downloads Windows update, and distributes to all the computers in the network. Each computer in ASYV automatically updates other software and virus definitions when they are connected to the internet.

Technology Planning

Mike Liese and Deo Kabirigi are responsible for technology planning at ASYV. They are both assisted by technology experts from Liquidnet who come to Rwanda once a year to help upgrade, expand, and troubleshoot the network. Deo is mostly involved with planning at the high school.

In February, Mike wrote a technology plan for the entire village. The plan identified technical issues and opportunities at ASYV such as stabilizing the wireless network and increasing the RAM on the servers. The plan also listed goals for a technology infrastructure that can support the mission of the organization.

During the same period, Mike also submitted a proposal for wiring the computer lab located in the Science Center. The proposal had three goals: Stability, Reliability, and Ease of use. These three goals would help create an attractive learning environment and ensure that the lab satisfies the needs of the students. The proposal was approved by the executive leadership, and all the equipment listed on the proposal was purchased. The wiring was completed by Mike in May.

Internal & External Communication

Rwanda has a rich oral tradition and strong collective tendencies. These two cultural dimensions are reflected at ASYV. Information is primarily communicated orally from person to person or person to group. There are no telephone landlines at the village. However, most of Rwanda has cell phone coverage. All employees and volunteers at ASYV have personal cellular phones. Therefore, cell phones are the second method of communication.
The leadership at ASYV wants email to become one of the main methods of communication among employees. They believe email will bring efficiency to the organization because it is fast, easily archived on a server, convenient, and inexpensive. Every employee has been given an email address on the organization's domain (asyv.org), but most of them are not

using it as a method of communication. Email is a new way of communicating that has just been introduced to the professional culture in Rwanda. Teaching the staff how to use email and showing them how email can enhance communication and benefit the organization as a whole will be necessary in order to convince them to adopt email as a communication medium.

ASYV has a website that is hosted in the United States. The website can be visited using any of the following two domains: www.asyv.org and www.agahozo-shalom.org. It provides relevant information about ASYV such as the mission, the history, the educational programs, and the development model that has been put in place. It also has a section for news and a section for events. The news section is updated regularly with news from the village or guest posts from visitors. The section for events promotes the latest events related to ASYV.

Information Management

The village is growing, and information is being managed in a multitude of ways. There are three dedicated servers (earth, sky, and sea) that are used to manage data. All the workstations at ASYV rely on these servers for directory and domain name services. Staff and students also have the ability to store files on one of the servers (earth). As a special precaution, all the disks on the servers are mirrored using a RAID scheme. It prevents the system from being unavailable when one of the disks fails.

At the school, Rediker is used to manage information. Rediker is a Student Information System that has many features including:

- Student Information Database
- Attendance
- Scheduling
- Report cards

- Photo ID cards
- Library Management
- Cafeteria Management
- School Health Management

Only the following features are currently being used at ASYV: Student Information Database, Scheduling, Report cards, and Photo ID cards. Sika Somberg and Biira Lovell manage Rediker, and they have processed and stored three years worth of academic data (test scores and student grades).

However, Rediker has some limitations that are affecting its use at ASYV. The system can only be accessed through a client application that must be installed on a computer. The documentation does not explain very well the system's functionalities, and the interface is not intuitive. Teachers find it complicated. At the end of each term, they submit Excel spreadsheets containing names and grades to Sika and Biira, who subsequently enter the information into Rediker.

The staff at the school and village libraries uses Excel spreadsheet to manage and track items. The libraries presently has about 1,800 books and 42 CDs and DVDs. Mike has developed a database using Microsoft Access to help with the cataloging and circulation of items, but it is not being used by the staff. They do plan to transition to the Access database sometime in the near future.

At the village's clinic, all medical records are managed via papers which are stored in file cabinets. The staff at the clinic would like to digitize the records. Paper can easily be lost or damaged. They would like to store the information in a database for easy and fast access. A database system would also allow them to share medical records safely among the nurses and analyze the information more accurately.

Business Systems

Christine Icyigetse is the person in charge of accounting at ASYV. She's responsible for recording, reporting, and analyzing the organization's financial transactions in Rwanda. She does payroll as well. Christine has been using Microsoft Excel to accomplish all these tasks since the village was founded. She also uses Microsoft Access but only to report to the Rwandan National Social Security Fund. Organizations in Rwanda with more than 10 employees are required to use Microsoft Access for reporting to most government's agencies.

ASYV has recently decided to transition from Excel to Quickbook 2006. Quickbook 2006 will allow Christine to automate some of her reporting tasks and consequently save time. She will also be able to take advantage of new features that are not available in Excel such as the snapshot function. However, she will still use Excel for payroll because Quickbook does not support the Rwandan tax code.

II. Scope of Work

Task 1. Build computer labs and install computers in the school administration building and library

Agahozo-Shalom Youth Village (ASYV) currently has 1 computer lab in the school with 33 computers, and 1 computer lab in the village with 26 computers. There are 375 students total, and they use their computers for homework, research, projects, programming, internet, and for classes.

ASYV has received a donation of 200 computers and plans to build 2 new computer labs in the school with about 35 computers each, install about 5 computers in the library, and a few in the administration office. Currently, the computers are stored in the storage within the village.

From the interviews with teachers and students, the student consultants believe the number of computers available to the students is not sufficient for the classes offered. Installing more computers will solve the problem of shortage of computers in classes, and provide more resources for the students to work on their homework or research. Further, setting up computers in the administration building will provide a better environment for the staff to work. Since there has been a donation of 200 computers, it will be advantageous for the school to make use of them instead of leaving them in the storage.

The village lacks people to install the computer labs. There are only two people who can manage to install the labs, and they are Mike Liese and Kabiriji Deo. Kabiriji Deo is a teacher, and he is almost always teaching in classes or preparing for them. The work load is too much for one person to handle alone, and the student consultants' help in building the labs and installing the computers would be very helpful. Also, the Information Technology (IT) club actively engages in working with the student consultants and shows much enthusiasm to do so. Therefore, by working with the IT club, the student consultants will effectively enhance their learning about computers and network.

A design of the labs will first be implemented, taking into account the locations of power outlets, chairs, tables, and blackboards. The location of the server room will also be considered if the lab is going to have a wired network. After installing the computers, they will be configured to be connected to the network and will be checked to ensure they are functioning. The IT club will be asked to assist in the process because the club members can learn about building computer labs, and the work can be done faster with more labor force.

As a result of this task, students will have enough computers for all classes that require computers, and have enough access to work on homework, research, and other academic work. The Administration office will make more use of computers for their work and will have more electronic documents that will be easier to access than paper documents. The students from the IT club will have worked with the student consultants in building the lab, and the club members will have learned how computers are installed and connected to a network. They will have a better understanding of computers and will learn practical skills for using and managing them.

Task 2. Structure and organize an IT club

Currently, the computers in the Science Learning Center are managed by one volunteer, Mike Liese. However, because his main job is to maintain the network within the village, and with increasing number of computers to manage, he faces many challenges. Also, during the stay in the village, the student consultants had many computer technical support requests. Most of the staff members own individual laptops, and because some are not familiar with computers, there were many problems.

There are many clubs within the village as part of students' informal education. Recently, an Information Technology (IT) Club was formed, consisting of 16 students from Senior 5. If this club provides technical support for the village, both the village staff and the students will benefit. The village staff will have their computers fixed and will be able to continue to work with their computers. The students will learn the practical skill of fixing computers and in the process gain deeper knowledge of computers.

The student consultants collectively have much experience in club activities throughout high school and college years, and they know effective strategies to structure a club. They have built new organizations in the past, and they know how to structure it so that it is efficient in doing its job. Further, they have experience in maintaining hundreds of computers within a network, and have operated a technical support help desk using a ticketing system. By applying these experiences, the student consultants will effectively structure and organize the IT club.

The club will have two meetings every week, and the student consultants will provide appropriate advice and support. They will also introduce the ticketing system for the help desk operation and share solutions to known computer problems. Further, they will have presentations and workshops on different computer related topics.

As a result of this task, the Information Technology club will be officially founded, and the village will have an appropriate group managing the computer labs. The IT club will be repairing computers, controlling the number of students permitted into the lab, opening and closing the lab, and answering any questions from students regarding usage of computers. The club will also be operating a help desk to provide technical support within the village. Therefore, the village will have a source that helps provide answers to any computer related problems. Lastly, the students in the club will have learned various aspects of computers, including network, hardware, software, and web development.

Task 3. Give presentations and workshops to different groups of the community

On average, three computers are brought to the student consultants daily for technical support. Usually a problem is solved within 10 minutes, but some computers that need to have the operating system reinstalled take a day. Approximately 70% of the problems are not related to hardware. Some of the common problems include connecting to a wireless network, lacking anti-virus software, lacking drivers, finding a file, computers hibernating, wrong file extension name, and wrong input language. The vast majority of the problems were results

of the lack of knowledge on basic computer usage or being unaware of available software.

The village has also a need for internal communication improvement. The most common method of internal communication is by word of mouth. Many times some of the staff members are uninformed about events or meetings. All staff members have an email account that ends in "asyv.org," powered by Google Email Service Gmail. However, more than 50% do not know their usernames. Most staff members have individual emails, but because the internet connection is slow, the majority does not check them frequently.

Many questions asked to the student consultants are about Microsoft Word and Excel. The staff members use these programs on their work every day, and some are not familiar with basic functions. For example, many of the house mothers are not familiar with saving and opening documents.

Giving the community presentations about basic computing will help them avoid many of the issues that their computers are facing. Through the presentations, they can know that certain programs and drivers are available to them. There is a network folder containing all the freeware software and donated software, such as Microsoft Office Enterprise 2007, Microsoft Windows XP Professional, Avira Antivir Personal, AVG Free, VLC Media Player, and so on. There are also drivers for many of the laptops used in the village. Presentations and workshops on how to access these network drives will allow them to download the files they need. Further, to improve internal communication within the village, presentations and workshops on email will also help. Given the slow internet environment, Microsoft Outlook can help staff access email more easily. Finally, presentations on Microsoft Office applications will help them work more efficiently, since Microsoft Office is used by all staff for their work.

Although many staff members could be considered to give the presentations, it would be crucial to be able to answer any computer related question to be credible to the audience. The student consultants collectively have years of experience in addressing problems of hundreds of computers, emails, and Microsoft Office applications. They can answer any problems the villagers may have, and with much experience in presentations, they can deliver them effectively.

The student consultants will have five weekly meetings with different groups of the community. The audiences will be divided into house mothers, counselors, and formal education teachers; the division is made because within each group, people have similar usage of computers and similar level of understanding computers. The topics the student consultants will present include: basic functions of Microsoft Windows, Office, Outlook, emails, how to surf the web safely, how to access the network drive, how to access the internet using wireless network, and how to use the ticketing system for the help desk. When the student consultants give presentations about Microsoft Office, the content will focus on the specific need of the particular audience.

As a result of this task, the staff members will have enough information to avoid 70% of the current computer related problems. Specifically, they will know how to get Microsoft Office and install anti-virus software. They will have learned how to safely surf the web and know how to avoid downloading viruses. They will have learned to use basic functions of emails, such as sending, receiving, attaching files, and downloading attached files. Further, they will

be able to use Microsoft Outlook to help them access emails more easily, which will improve internal communication. Finally, they will have learned more about Microsoft Office, and they will be more efficient in producing documents for their work.

Task 4. Gather requirements for the Student Information System and configure Rediker to meet the requirements

Rediker is the software application that ASYV uses to manage student data. Rediker was donated to ASYV; therefore, functional and business requirements for a Student Information System (SIS) were never gathered. Rediker is marketed as a K-12 SIS for the US and 110 countries. However, the Rwandan educational system is not integrated into Rediker.

In Rwanda, the education system is composed of Primary School (6 years), Junior Secondary (3 years), and Senior Secondary (3 years). ASYV offers an Enrichment year in addition to Senior Secondary. The Enrichment year serves as a catch-up year for newly admitted students. Once the students successfully complete the Enrichment year, they go to Senior Secondary.

There are significant needs for an SIS at ASYV. Most of the information about students, such as informal education evaluations, is on paper or electronic files of different formats (e.g. doc, xls, etc…). Furthermore, the electronic files are on different computers, and more than 70 percent of those computers are owned by the staff even though they are used for work.

An SIS like Rediker allows ASYV to keep all the information about students on a server that can be accessed on the local area network (LAN). Presently, 3 years worth of school data only (test scores and grades for formal education) is stored into Rediker. Data pertaining to informal education has not been stored. Rediker has system features that let users define custom fields for data input, but it is not known yet what new fields need to be defined and how to define these new fields. Moreover, since formal education is different from informal education, ASYV wants the data not to be mixed. The administration would like to generate two distinct reports for each student: one for formal education and one for informal education. It is also not known if Rediker has that capability.

The consulting task consists of eliciting requirements in order to understand the many needs for an SIS at ASYV, and consequently, configure Rediker to satisfy the requirements and improve how it is currently being used. The requirements that will be gathered will also help determine whether or not Rediker is a suitable long term solution for ASYV.

Task 5. Identify Wi-Fi dead spots in the residential area and design a plan that will improve the wireless signal coverage

A wireless local area network (WLAN) was deployed in the residential area of the village two years ago because it was cost-effective and the most applicable option. Over the two year period, new houses were built, and new staff and students moved in. Now, the residence area has a high-density of users and a broad range of Wi-Fi enabled devices such as netbooks and laptops. In addition, the new houses became physical obstacles because of their locations. So, in some parts of the residential area, they have created zones with no signal coverage, and in other parts, they have reduced the signal coverage.

In the third week of the project, Dr. Alex Hills, who is the advisor to the consulting project, spent some time at ASYV with the student consultants. Dr. Hills founded the Wireless Andrew Project – the first campus wide WLAN [v]. The student consultants gain some invaluable insight about fundamental wireless concepts and technologies from his visit. Dr. Hills also assisted the student consultants in scoping out the wireless assessment and addressing design issues that were observed.

The consulting task is to perform a wireless assessment by identifying the locations with no or reduced coverage and measuring attenuation caused by the different physical obstacles. Once the assessment is completed, it will be used to design a new wireless network plan that will improve the Wi-Fi coverage. ASYV is in its final phase of construction. Volunteer and village club houses are currently being built, and when they are done, the construction of buildings at ASYV will be achieved. So, the design objective of the new plan is to improve signal coverage, performance, and roaming. This plan will take into consideration all the new physical obstacles and signal interferences in the residential area that were not present when the previous plan was designed.

III. Outcomes and Recommendations

Task 1. Build computer labs and install computers in the school administration building and library

The student consultants identified lack of computers for students and staff to use for school work in ASYV. There were only 32 computers in the school computer lab, and 16 in the Science Learning Center. There were 200 computers donated from South Korea, and 10 computers donated from the United States stored in boxes. The student consultants decided to utilize these computers by building more computer labs for the students. Also, the computers in the school computer lab were connected to the network via wireless network, and they were very slow and unreliable. The student consultants have noticed that many students lose connection to the server while working on their assignments, and they could not save their work to the server. To solve these kinds of issues, the student consultants decided to rebuild a wired lab for the existing computer lab.

New computer lab 1

New computer lab 2

The Science Learning Center computer lab has been built completely, and it now has 26 computers installed. There are also two new wired computer labs built in the school. The computers in the school lab have been moved to the wired computer lab. Further, together with the IT volunteer Mike Liese, the student consultants have implemented a better design for the labs to suit the needs of the school. Currently, the computers are fast in connecting to the network and have a very stable connection to the server. The other wired lab has 36 computers donated from South Korea. The lab is completely wired, and the computers are in place; however, due to the lack of electricity sockets, only 16 computers have electricity. Mike Liese said the electricity sockets may be ready in August 2011.

In preparation for building these labs, the student consultants have tested 77 donated computers, and documented which ones are not working or need RAM upgrades (see Appendix A). The organization that donated the computers is planning on sending a team to fix and upgrade these computers, and the document created by the student consultants would be useful.

The new computer labs have given ASYV greater IT capacity, and they provide students with enough computers for all classes and academic work. Further, all the computers have a reliable and fast connection to the server computer. Therefore, the students no longer lose their work due to lack of connection. For further capacity building, the student consultants worked with students from the IT club in building the lab, and the club members learned how computers are installed and connected to a network. They have a better understanding of computers and learned practical skills for using and managing them. A few students including the president of the club are capable of performing every step required to building computer labs.

The computer labs will be maintained and operated by the IT Volunteer, and the IT club will assist. If Mike Liese has a successor, the students will be able to help the successor

understand how the labs were set up. Thus, these computer labs will be sustainable. Further, using the experience in building these labs, Mike Liese and the students plan to build another lab in the school in the next academic term. ASYV also has a plan to install two computers per house in the residential area.

The student consultants did not install computers in administration offices or the library. To install computers in those areas, equipments such as the voltage regulators, power strips, and Ethernet cables are needed. However, ASYV provided the budget for the computer labs, and Mike Liese could not purchase the materials for the administration offices or the library.

Task 2. Structure and organize an IT club

The student consultants identified that ASYV is looking for ways to improve students' skills regarding computers and IT. They also noticed that the network infrastructure in ASYV is growing rapidly, and IT volunteer Mike Liese needs support in maintaining it. The student consultants decided that having an IT club of students would solve both these issues effectively. The club members will be involved in assisting Mike Liese in maintaining the network infrastructure as well as providing technical support that many of the staff members at ASYV seek. As a result, the students will gain knowledge and develop marketable skills in areas of computers and IT.

IT club meeting

The IT club has been formed with 16 students. The student consultants decided that the first step to structure the club is to elect leadership positions and to arrange regular meeting times. Therefore, the student consultants led the first meeting of the IT club and assisted the club in electing a president, vice-president, and a secretary, and further assisted the students on deciding meeting times for the club. They had bi-weekly meetings every week for the past five weeks. They have come up with a policy for the computer labs and a schedule for when the computer labs will be open. Currently, they are only managing the Science Learning Center computer lab. When the lab is open, a member of the IT club is present at all times as the monitor of the lab.

Explaining the ticketing system

The ticketing system for technical support at ASYV has been set up in one of the IT club computers (see Appendix B). The system has been explained thoroughly by the student consultants, and the IT club members are fully capable of operating the system. This system will be used to log all the technology issues that are brought up in the village and their solutions. Further, it will contain all the contacts of who raised the issue and who solved them. Therefore, if there are any questions about a certain issue, the students are able to contact the right person.

The ticketing system has been used twice to solve computer related problems. A Family Mother brought a laptop infected with a computer virus, and the IT club students followed the procedure of logging the problem as introduced by the student consultants. The student consultants supervised the IT club students solving the first problem. The Family Mother brought in another laptop with a similar problem, and the students managed to log and solve the problem by themselves without the student consultants' supervision. The Family Mother was reluctant to provide her first laptop to the students to fix because she was doubtful of

their abilities. However, after she looked at how capable the IT club students were, she provided her second laptop to the students with more confidence.

In addition to structuring the club and introducing the ticketing system, the student consultants provided lectures on computer related topics that the students of the IT club were interested in, such as HTML and Web development. The students showed much interest in learning them and said that they will continue to investigate and learn more.

The Informal Education Department has approved the forming of IT club, and the department will support the activity to continue in the future.   Further, the club will continue to have two staff members supervising and maintaining the club activities.   Therefore, the IT club will be sustainable at ASYV.

Task 3. Give presentations and workshops to different groups of the community

During the student consultants' stay at ASYV, they have been requested for help regarding various computer related issues from the staff for approximately 200 times. The common issues were virus infections, connecting to the network, and utilizing Microsoft Office Applications. To effectively improve the population's usage of computers in their work at ASYV, the student consultants decided to have weekly presentations and workshops for different groups of the community.

The student consultants offered five presentations to different groups of the community.   The topics that they covered are the following:
- Basic functions of Microsoft Windows
- Basic functions of Microsoft Word
- How to connect to Internet
- How to configure Microsoft Outlook
- Basic functions of Microsoft Outlook
- How to safely surf the web
- Virus and antivirus
- History of computers
- Basic and advanced functions of Microsoft Excel
- How to utilize local network drives
- How the local network works

Presentation

First presentation was on June 21st for Family Mothers on topics of basic functions of Microsoft Windows, Microsoft Office, and how to connect to the Internet. Second presentation was on June 28th for Formal Education teachers on topics of how to utilize network drives, how to safely surf the web, and virus and antivirus. The student consultants also explained how to access Microsoft Office tutorial documents that are available to them.   Third presentation was on July 11th for informal education staff on topics of utilizing local network drives, how to safely surf the web, and how to configure Microsoft Outlook. Fourth presentation was on July 13th for informal education staff, volunteers, and Directors on topics of history of computers, utilizing local network drives, virus and antivirus, basic functions of Microsoft Outlook, and how the

local network works. Fifth presentation was on July 20th for informal education counselors on topics of basic and advanced functions of Microsoft Excel.

Before the presentations, about 70% of the Family Mothers could save and open a document from a specified folder. Staff members other than Family Mothers did not have a problem with saving and opening a document. About 20% of all staff knew about the common methods that viruses enter the computer; 30% were aware of the antivirus software available at ASYV; 10% were utilizing Microsoft Outlook; 20% were utilizing local network drives.

Staff attending presentation

After the presentation, at least 90% of the Family Mothers could save and open a document from a specified folder. 80% of all staff learned the common methods of computer virus infections and how to effectively avoid them; 100% are aware of the antivirus software available in ASYV; 80% currently utilize Microsoft Outlook and local network drives. There have been more than 40 requests for help in accessing the available software, utilizing Microsoft Outlook, and utilizing local network drives. The student consultants provided help for all the requests. Further, there was a general increase of interest in computer and technology, and staff members said that they realize the importance in learning computers, especially Microsoft Excel.

The student consultants made the presentation slides available to all staff members to view. Further, Mike Liese either participated in the presentation or was given an explanation about the materials presented. Therefore, if staff members ask for help, Mike Liese would be able to help them.

Task 4. Gather requirements for the Student Information System and configure Rediker to meet the requirements

The student consultants met with Sika Somberg multiple times. Sika is responsible for Rediker, and she is also the one with the most expertise at ASYV in using it. Last year, she participated with Mike Liese and Jean Claude Parisien in a 3-day training course given by a Rediker representative. After the system was initially installed on the server, she configured it for the school (formal education) and entered academic data for the previous year.

The configuration of Rediker was discussed during the meetings with Sika. She explained in detail how the system was set up and what modifications were made. For example, in the student administration panel in Rediker there is a special field for home room information, and information about the student's combination is stored in that field rather than the home room number. The student consultants also met with Jean Claude Parisien, the program coordinator for informal education. During the meetings with Jean Claude, the student consultants inquired about the informal education activities and enrichment programs (EP), the specific data that must be stored in the Student Information System for informal education, and the objectives. An evaluation form, which is used by the informal education counselors, was given to the student consultants. The counselors use the form to evaluate each student's performance in five characteristics. These characteristics are: motivation, participation, leadership, skill level, and team work. The evaluations are recorded after each activity or EP. The objective was to store the evaluations in Rediker and also have the capability of printing an informal education report card for each student.

Once all the critical information was gathered from the interviews, the student consultants installed the Rediker client application on their computers in order to further investigate the Rediker installation and the existing configuration on one of the servers. They also set up a testing environment, loaded sample data, and extensively reviewed the manuals that were published on Rediker's website. A solution that uses some of the core features of the system was found by the student consultants. Rediker offers a special module called Skills, and the module let users create abilities and linked them to courses so that each student can be evaluated on the particular ability. The solution was tested by creating sample data and printing a report card that satisfied the requirements (see Appendix C).

Meeting with Sika

The solution was presented to Sika and Jean Claude in a meeting, and they both concluded that it meets the requirements. Furthermore, the procedure that led to the solution was fully demonstrated to Sika since she is the one who will be configuring the system for the informal education. Jean Claude and Sika plan to implement the solution at the beginning of the third school term which is the last week of August; therefore, the student consultants created a step-by-step tutorial for reference (see Appendix D).

While working on Rediker, the student consultants noticed that it was very unstable and slow over the wireless network during peak hours. The system would frequently display error messages. This is a long-term sustainability risk because almost all staff members access the network through wireless. Teachers and informal education staff members who are planning to use it might be reluctant to adopt the system if it cannot be accessed. Hence, it will be imperative in the long-term to set up a separate wireless network link to the server running Rediker. This exclusive link between the server and Rediker clients could mitigate the issue.

Task 5. Identify Wi-Fi dead spots in the residential area and design a plan that will improve the wireless signal coverage

In the early phase of the consulting project, the student consultants produced a comprehensive whitelist of wireless access points (see Technology Infrastructure). The whitelist contains the following information for each access points: IP address, Host name, Location, Hardware, Station mode, SSID, and Channel. This information was subsequently used to identify the access points in the residential area. The student consultants also made use of two other elements to assess the existing wireless network, which are: a detailed map of the residential area and a Wi-Fi enabled Android phone with a wireless signal analyzer tool. The signal analyzer tool provided a signal meter which displayed the exact dBm value of the signal.

The first test performed as part of the assessment was a penetration test to figure out the degree of attenuation caused by the walls of the houses in the residential area. All the family houses have similar floor plans and wall thickness, and all the walls have the same thickness. The club and staff houses, which are still in construction, were also inspected. These houses have different floor plans but similar walls as the family houses. Several measurements were taken in two of the family houses, and the results show that on average 7 dB are lost when the Wi-Fi signal penetrates through one wall. For example, if the measurement right outside the house was -60 dBm then the measurement inside, just passed the first wall, would be -67 dBm. It was induced from this assessment that the 7 dB reduction was valid for all the 38 houses in the residential area because they all have walls with the same thickness.

An access point device that was not being used for the wireless network was also tested as part of the assessment. The test allowed the student consultants to perform a thorough evaluation of the signal strength at 100 ft. and various angles (see Appendix E for results) and obtain a full understanding of signal propagation from the Wi-Fi devices used at ASYV. The experiment showed that when the device is set at the maximum transmit power of 26 dBm with a directional antenna, the signal strength is significantly high.

Checking the antenna

A complete site survey of the residential area was finally conducted to identify the zones with no or minimal wireless coverage. A series of signal strength measurements at various distances were taken for each working access point and the average was recorded (see Appendix F for details). The student consultants observed the following during the survey:

- At the time of the survey, 2 access points were not producing any signals.

- At least half of the antennas were tilted due to strong wind and heavy rain.

- A few antennas were adjacent to their support.

- A couple were producing very weak signal.

- All access points had a good line of sight to the water tower, which is the sending end.

- Antenna types varied.

- The metal from the water tower was considerably affecting the signal produced from the residence AP antenna.

A map showing dead zones and low coverage area was created as a result of the survey (see Appendix G).

The information collected was consequently used to propose a design that will improve the wireless signal coverage. The student consultants worked closely with Mike Liese, the long-term IT volunteer, throughout this process. In the design plan, all of the following were taken into consideration: attenuation, direction of the antenna, location, new and existing physical obstacles, signal propagation, and clear line of sight to the water tower antenna. A detailed map was created (see Appendix H). The map shows where new access points and antennas

Meeting with Mike

need to be mounted, where new mounts need to be installed, and the area that will be covered by each access point. Channels were not assigned to the new access points in the design. Nonetheless the student consultants discussed it extensively with Mike. He plans to implement the design during the last quarter of the year, and he will ensure that access points located near each other will operate on different channels by using one of the approaches described in the "Large-Scale Wireless LAN Design" article authored by Dr. Alex Hills. Mike has also put in a request for new access point and antenna mounts to be built by the village metallurgists.

Additional steps were also taken as a result of this task. For instance, the student consultants and Mike pushed the antennas that were adjacent to their support higher and set the antennas that were tilted vertically. The access points that were not set at the maximum transmit power were all adjusted to the maximum transmit power. Afterwards, coverage improved in those zones and signal measurements were taken to confirm it. Furthermore, Mike plans to use the findings in this wireless network assessment as a basis for creating a troubleshooting manual for the

Measuring signal strength

next IT volunteer who will come after he leaves.

Recommendation 1. Install Moodle for the school

Presently, the only way for teachers to share lecture materials with the students is by uploading them to shared folders located in one of the servers. Managing permissions and read and write access to these different shared folders is very time consuming and requires knowledge of server administration and group policy. Moreover, the IT volunteer and the computer science teachers are the only individuals with that expertise at ASYV; so it creates dependencies. For the students, the process of accessing the documents is very complicated. Most of the times, they are required to go through multiple folders. Teachers often do not know if the students were able to download the documents because they have no way of tracking it.

Moodle is a course management system that can be a viable solution to these problems. It has many features such as:

- Course management for creating courses

- User management for assigning roles (administrator, teacher, student, etc.) and setting permissions

- File management for uploading, downloading, and organizing files by course

- Lesson module which allows teachers to create pages with lecture content

- Assignment module which allows students to upload class work

- Quiz module for creating questionnaires that can be graded automatically

- Forum module for discussions

Moodle can also provide other benefits to ASYV. If it is implemented, it will give the students an opportunity to interact more with computers for educational purposes and consequently become familiar with technology. The amount of paperwork for assignments, tests, and quizzes could be significantly decreased with the use of the Assignment and Quiz modules offered by Moodle. Students would also have the ability to ask questions to the teachers even after classes by using the Moodle forum, and the answers could be shared with the entire class.

Moodle software is free and open source. It is available for download at www.moodle.org. It requires PHP installed on a server. PHP is a server side scripting language that is also freely available at php.net. All the three servers at ASYV meet the minimum technical requirements for running Moodle. Therefore, Moodle can be deployed at the school at no cost.

Recommendation 2. Hire a local Information Technology expert for full-time

The student consultants recommend hiring a local Information Technology expert. ASYV has a network infrastructure that is growing rapidly. Within the ten weeks that the student consultants worked, the number of computer labs has increased from two to three, and the number of computers installed in computer labs has increased from 48 to 94. ASYV has plans to build another computer lab with 36 computers, install two computers per house, and

add nine more access points in the residential area. With much more equipment for the IT volunteer to manage, it is hard for one person to manage everything. The IT club students are knowledgeable in various aspects of the infrastructure within the village. However, the students cannot commit to repairing and maintaining the infrastructure, because their priority is in school work. Therefore, an additional staff to maintain the network infrastructure is necessary.

Hiring a local staff would reduce the dependency of outside help, such as volunteers from the United States. Further, a long term local worker would be working for years and have complete knowledge about how the network infrastructure works in the village. Unlike volunteers who change every year, the local staff will not need the time to learn about the infrastructure or to adjust to the environment. Also, the local staff can work with the volunteers and assist them in learning about the network infrastructure of ASYV faster.

The local staff would also be able to provide technical support in Kinyarwanda language. Some of the staff members, especially Family Mothers, do not speak fluent English. Many of them have trouble clearly stating the problems they are facing or understanding the solutions given. A local staff can deliver effective support to all staff by using the Kinyarwanda language.

It is recommended that the local staff is hired before the current IT volunteer Mike Liese leaves ASYV. He has a complete understanding of the network infrastructure and would provide all necessary knowledge to a new staff member regarding network at ASYV.

The student consultants recommend an IT expert with the following skills:
- Wireless/Wired networking
- Domain environment administration
- Internet access administration and troubleshooting
- Microsoft Windows operating system troubleshooting
- Virus prevention, detection, removal

Recommendation 3. Create a partnership with Digital Divide Data or Samasource

During one of the meetings, the student consultants learned that ASYV was exploring different possibilities in order to offer professional skills classes or vocational training programs, which are separate from the school. ASYV would like the students to acquire marketable and practical skills, especially in IT, before they graduate. The organization hopes that these programs provide the students opportunities to apply their general technology knowledge learned in school.

Digital Divide Data (DDD) and Samasource are two international non-profit organizations with interesting business models. Both organizations are driven by a social mission and operate in Africa. DDD and Samasource hire promising young individuals from developing countries and provide them with IT work from clients around the world. DDD and Samasource clients include: Siemens, Kaplan, World Vision, International Finance Corporations, Intuit, Benetech, and many more. They provide to the client services such as data entry, audio and video transcription, digitization, and content moderation. A partnership with any of these two non-profits will give ASYV students the opportunity to learn and

practice at the same time. It would also allow them to earn an income that could be very useful when they graduate and leave the village.

The following are the websites of the two organizations, and they offer more information:

- DDD – www.digitaldividedata.org
- Samasource – www.samasource.com and www.samasource.org

About the Consultants

Alimou Bah was born in Conakry, Guinea. He graduated from Morehouse College (Atlanta, GA) in May 2010 with a bachelor of Computer Science. He is currently pursuing a master of Information Systems Management at Carnegie Mellon University (Pittsburgh, PA). He will graduate in December 2011.

Jin Seop Kim is a South Korean and has lived in many places in the world, including more than ten years in Korea, three years in India, four years in China, and three years in United States. He is an undergraduate student pursuing a major in Computer Science and a minor in Chinese in Carnegie Mellon University. He will be graduating in May 2012. Upon graduation, he hopes to work in the Information Technology Consulting field.

Appendix A: Documentation of 77 donated computers

Brand	S/N	Computer Name	Mouse	Keyboard	RAM	Service Pack	MS Office
SAMBO	50053 564 00156		Y	Y	COMPUTER NOT WORKING		
SAMSUNG	931092ET300633	SCHOOL09	Y	Y	512MB	SP3	2003
SAMBO	N/A XP: X17-06937, 00044-324747384		Y	Y	COMPUTER NOT WORKING		
HP	CNG533OB5X	SCHOOL36	Y	Y	1.00GB	SP3	2003
SAMSUNG	556B98DY200500X	SCHOOL61	Y	Y	760MB	SP3	2003
SAMSUNG	B99592FT901746	SCHOOL11	Y	Y	1.00GB	SP3	2003
SAMSUNG	X84492DX600286P	SCHOOL37	Y	Y	1.00GB	SP2	2003
SAMSUNG	556B98DY200459A		Y	Y	COMPUTER NOT WORKING		
SAMSUNG	D14892DTC02324	SCHOOL31	Y	Y	1.00GB	SP3	2003
SAMSUNG	B28092FT700271		Y	Y	COMPUTER NOT WORKING		
SAMSUNG	984792JT500019	SCHOOL53	Y	Y	512MB	SP3	2003
SAMBO	5004365300025	SCHOOL54	Y	Y	512MB	SP3	2003
SAMSUNG	B390192FT800134	SCHOOL58	Y	Y	1.00GB	SP3	2003
SAMBO	N/A XP: 00044-324-747-468	SCHOOL59	Y	Y	1.00GB	SP3	2003
SAMBO	5005533400037		Y	Y	COMPUTER NOT WORKING		
SAMBO	N/A XP: 00044-324-747-363	SCHOOL48	Y	Y	512MB	SP3	2003
SAMBO	5004651500022	SCHOOL46	Y	Y	512MB	SP3	2003
SAMBO	5008238800073	SCHOOL44	Y	Y	1.00GB	SP2	2003
SAMBO	5004402500067	SCHOOL35	Y	Y	512MB	SP3	2003
SAMBO	5009350500086	SCHOOL30	Y	Y	1.00GB	SP3	2003
SAMBO	5004149600522		Y	Y	COMPUTER NOT WORKING		
SAMSUNG	783892GR900020	SCHOOL27	Y	Y	512MB	SP3	2003
SAMBO	5008792500021		Y	Y	NO HARDDRIVE DETECTED		
SAMSUNG	I92798AW801173	SCHOOL22	Y	Y	1.00GB	SP3	2003
SAMSUNG	812292ERC00331	SCHOOL20	Y	Y	512MB	SP3	2003
SAMSUNG	831492DRB00544	SCHOOL15	Y	Y	512MB	SP3	2003
SAMSUNG	K73698AWC03111	SCHOOL03	Y	Y	1 GB	SP 3	2003
PCMADANG	44029841	SCHOOL40	Y	Y	960MB	SP3	2003
SAMBO	5004349500944		Y	Y	COMPUTER NOT WORKING		
SAMSUNG	950692FT401182		Y	Y	No Operating System		
SAMSUNG	92939DT101289	SCHOOL16	Y	Y	512 MB	SP3	2003

SAMBO	500527030002	SCHOOL06	Y	Y	1 GB		SP 3	2003
SAMBO	5007639400063	SCHOOL01	Y	Y	1.00GB		SP2	NONE
SAMBO	5005297600081	SCHOOL13	Y	Y	1.00GB		SP3	2003
SAMBO	50092 262 00059		Y	Y	COMPUTER NOT WORKING			
SAMSUNG	853092DT200016	SCHOOL12	Y	Y	512 MB		SP3	2003
SAMSUNG	891092FT500884	SCHOOL08	Y	Y	1.00GB		SP3	2003
SAMBO	50053 372 00005		Y	Y	COMPUTER NOT WORKING			
SAMSUNG	XP Pro - PP3PC-R3JD9-2YCJH-JJVXM-PGRRD	SCHOOL52	Y	Y	1.00GB		SP3	2003
SAMSUNG	I92798AW800120		Y	Y	NOT WORKING (GRAPHIC CARD)			
SAMSUNG	812392ERA00177	SCHOOL55	Y	Y	512MB		SP3	2003
SAMBO	50057 455 00047	SCHOOL57	Y	Y	1.00GB		SP3	2003
HYUNJU	XP Pro - GXV4P-P73GJ-KQJYC-KVJW7-CPG6J	SCHOOL56	Y	Y	1.00GB		SP3	2003
HP	CNG5420GN5	SCHOOL33	Y	Y	1.00GB		SP3	2003
SAMSUNG	862692DT506197	SCHOOL29	Y	Y	1.00GB		SP3	2003
SAMSUNG	829492FRB01555	SCHOOL51	Y	Y	512MB		SP3	2003
SAMBO	50093 505 00065	SCHOOL50	Y	Y	1.00GB		SP2	2003
SAMBO	50043 890 00120	SCHOOL49	Y	Y	512MB		SP3	2003
SAMBO	50041 410 00146	SCHOOL47	Y	Y	512MB		SP3	2003
SAMBO	50044 112 00006	SCHOOL45	Y	Y	512MB		SP3	2003
SAMSUNG	XP Pro - BGXK3-H4739-CPKKR-K7M8M-YKFGM	SCHOOL21	Y	Y	1.00GB		SP3	2003
SAMSUNG	XP Pro - K9DRC-47FK6-FG26H-J9T94-QYBWB	SCHOOL23	Y	Y	512MB		SP3	2003
SAMSUNG	556B98DY200537P	SCHOOL17	Y	Y	1.00GB		SP3	2003
PCMADANG	44029893	SCHOOL60	Y	Y	960MB		SP3	2003
SAMBO	50044 538 00031	SCHOOL05	Y	Y	512MB		SP3	2003
SAMBO	50043 653 00136	SCHOOL41	Y	Y	512MB		SP3	2003
PCMADANG	44030018	SCHOOL39	Y	Y	960MB		SP3	2003
SAMBO	50047 431 00027	SCHOOL38	Y	Y	512MB		SP3	2003
SAMBO	50047 208 00055		Y	Y	COMPUTER NOT WORKING			
SAMBO	50088 597 00080	SCHOOL19	Y	Y	1.00GB		SP2	2003
SAMSUNG	J63898AWB03069	SCHOOL45	Y	Y	1.00GB		SP2	2003
SAMBO	50044 209 00234	SCHOOL43	Y	Y	512MB		SP3	2003
SAMBO	50047 533 00131	SCHOOL42	Y	Y	512MB		SP3	2003
SAMBO	50054 393 00389	SCHOOL32	Y	Y	1.00GB		SP3	2003
SAMSUNG	XP Pro - KHRQ7-4M6KC-HPKHD-GJ7T9-R6QVT	SCHOOL28	Y	Y	512MB		SP3	2003
SAMSUNG	K95892GWB00076	SCHOOL07	Y	Y	1.00GB		SP2	2003
SAMBO	50093 505 00096	SCHOOL04	Y	Y	1.00GB		SP3	2003

SAMSUNG	B67292FT700061		Y	Y	COMPUTER NOT WORKING		
SAMBO	50058 382 00026	SCHOOL24	Y	Y	1.00GB	SP3	2003
SAMBO	50053 343 00059	SCHOOL26	Y	Y	1.00GB	SP3	2003
SAMSUNG	821492FT103811	SCHOOL25	Y	Y	512MB	SP3	2003
SAMBO	50043 889 00038	SCHOOL18	Y	Y	512MB	SP3	2003
SAMBO	50053 564 00166	SCHOOL14	Y	Y	1.00GB	SP3	2003
SAMBO	50093 505 00076		Y	Y	DOES NOT TURN ON, POSSIBLE POWER SUPPLY		
SAMBO	50076 535 00047	SCHOOL02	Y	Y	1.00GB	SP2	2003
SAMBO	50089 697 00252		Y	Y	DOES NOT TURN ON		
SAMBO	50051 970 00005	SCHOOL34	Y	Y	1.00GB	SP3	2003

Appendix B: Ticketing system for technical support helpdesk
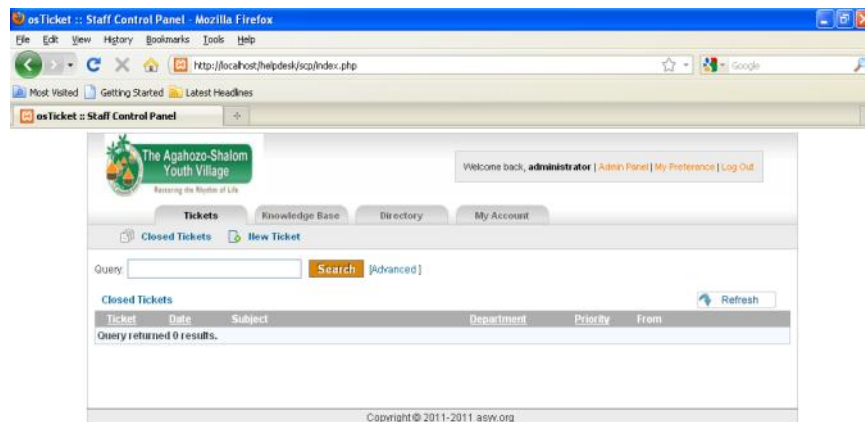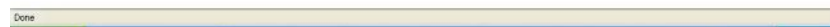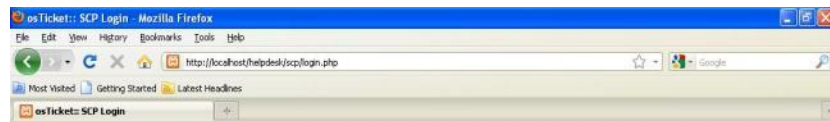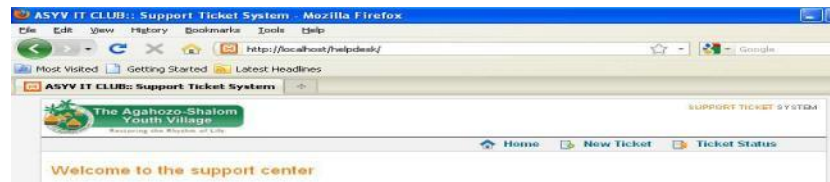
Appendix C: Reports generated by Rediker software

AGAHOZO SHALOM YOUTH VILLAGE   07-11-2011

COURSE & SKILL GRADE VERIFICATION FORM

Term 2 Class Work

COURSE #/SECTION: 011/01   TEACHER   : KUBWIMANA; Longin
NAME   : Basketball   CURRENT SIZE : 1

NAME	GR	#	LEAD	MOTI	PART	SKIL	TEAM
Test; Student	EY	133	3	5	4	5	1
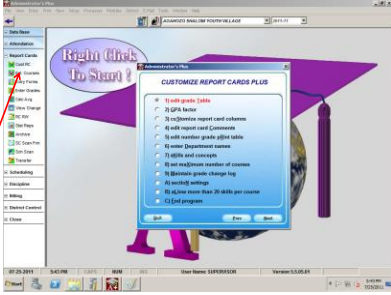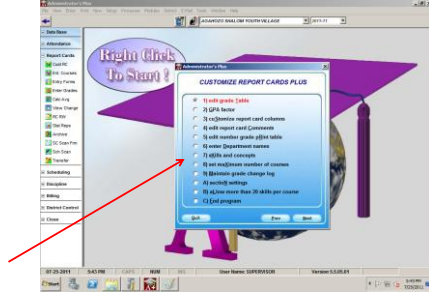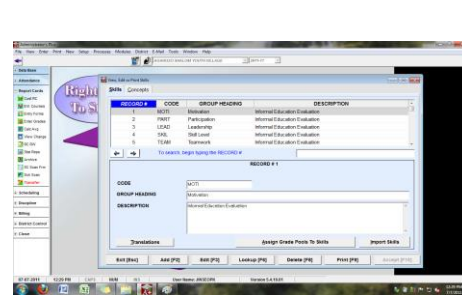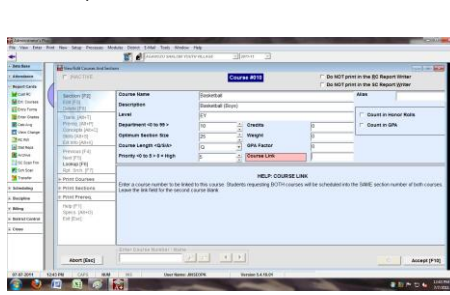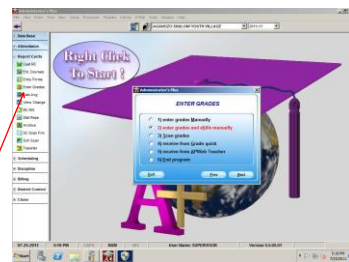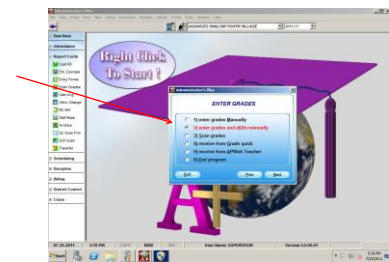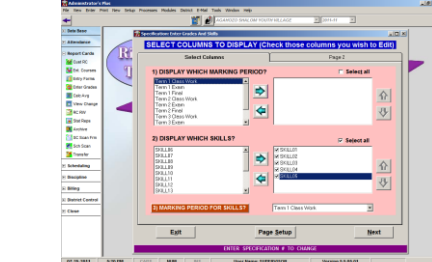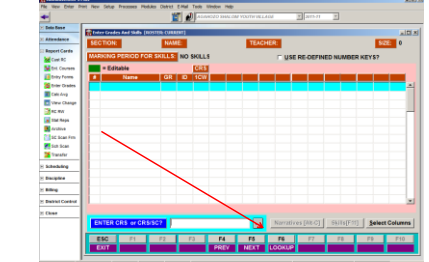
Test, Student   ST.
GRADE EY
TEACHER:

KEY: 5- Very good 4- Good 3-Satisfactory 2-Poor 1-Very poor

Students receive evaluations for each criteria.

Basketball	1FN	C 1
Teacher: KUBWIMANA, L.		
Leadership • Evaluation of student's leadership	3	
Motivation • Evaluation of student's motivation	5	
Participation • Evaluation of student's participation	4	
Skill Level • Evaluation of student's skill level	5	
Teamwork • Evaluation of student's teamwork	1	

Appendix D: Tutorial for Rediker software basics

Technology Consulting in the Global Community

July 25, 2011

Student Consultants
Alimou Bah MISM 2011
Jin Seop Kim CS 2012

Outline

- How Rediker is configured
- How to view/edit evaluation criteria
- How to enter courses
- How to enter grades
- How to print reports

How Rediker is configured

- Created a separate department for Informal Education
  - Department 10
- Made 5 skills for evaluations for Informal Education Courses
  - Motivation
  - Leadership
  - Team Work
  - Skill Level
  - Participation

How Rediker is configured

- Made a sample course for the department
  - Basketball
    - Course number 10, 11
  - Added 1 student named "Test Student" for course 11
  - Gave him random grades for the 5 evaluations

How to view/edit evaluation criteria
— View/Edit Skills

How to view/edit evaluation criteria
— View/Edit Skills

How to view/edit evaluation criteria
— View/Edit Skills

How to enter courses
- View/Edit Course

How to enter grades
- Entering grades

How to enter grades
- Entering grades

How to enter grades
- Entering grades

How to enter grades
- Entering grades

How to enter grades
- Entering grades

How to enter grades
- Entering grades

How to print reports
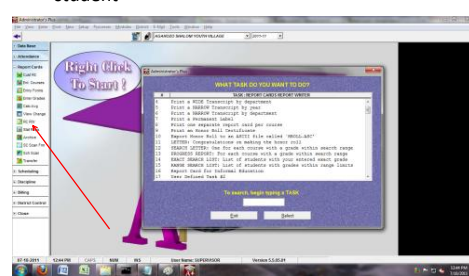- Possible to print grades for all students in a course
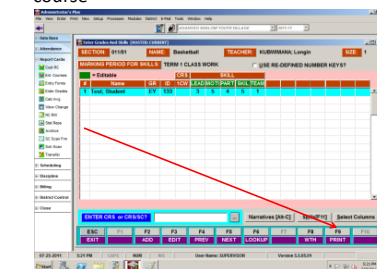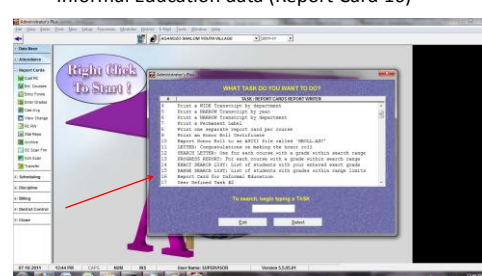
How to print reports
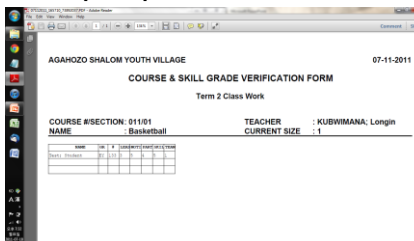
How to print reports
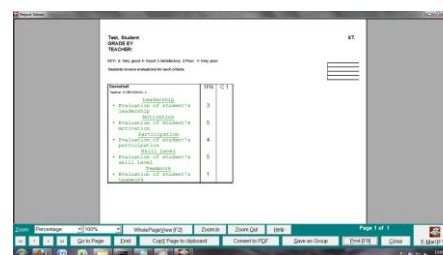- Possible to print a report card specific to a student

How to print reports
- Made a separate report card for printing Informal Education data (Report Card 16)

How to print reports

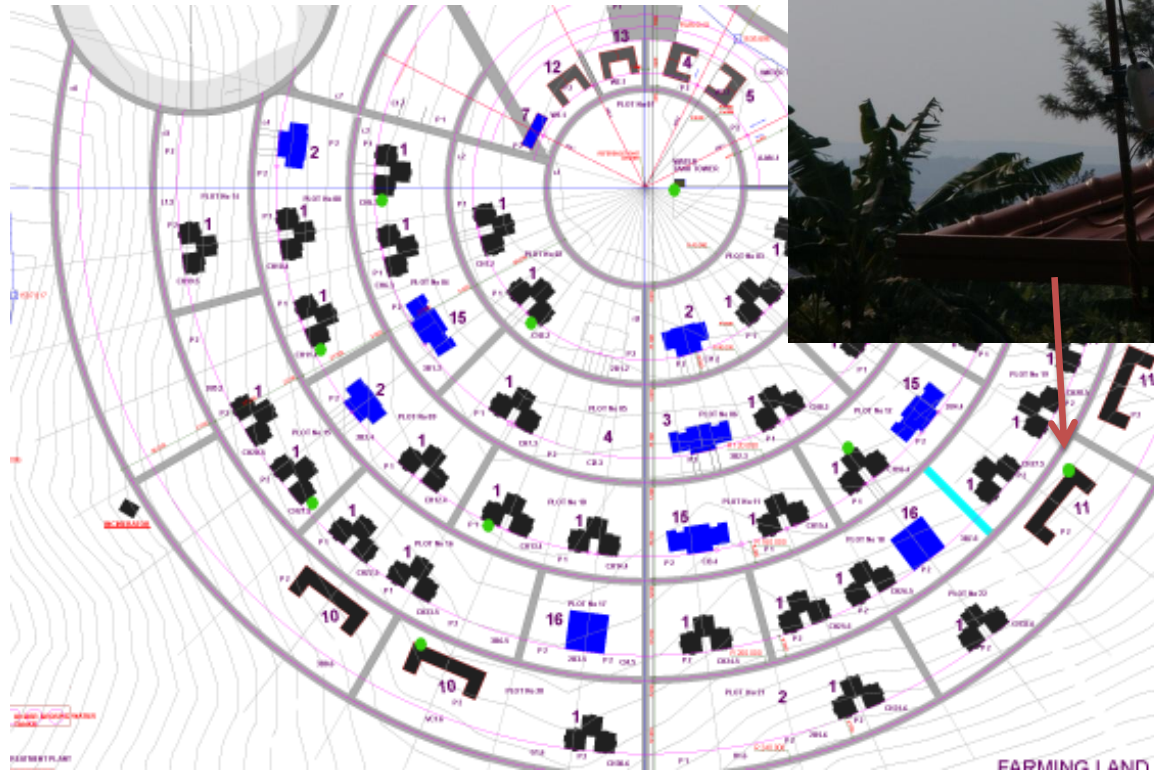## Appendix E: Access point signal measurement (dBm) at 100 ft. and various angles

0	10	20	30	40	50	60	70	80	90
-50	-51	-58	-55	-57	-58	-59	-59	-60	-60

Appendix F: Wireless assessment

IP	10.10.30.46
Mac	00:15:6D:AB:22:72
Manufacturer	Ubiquiti Networks
Channel	11
Frequency (Mhz)	2.4
Antenna	Omnidirectional

Resi-LodgeE

Measurements (dBm)	Average
50 ft.	-50
100 ft.	-63

IP	10.10.30.16
Mac	00:15:6D:AB:22:79
Manufacturer	Ubiquiti Networks
Channel	6
Frequency (Mhz)	2.4
Antenna	Omnidirectional

resi-house16

Measurements (dBm)	Average
50 ft.	-52
100 ft.	-62
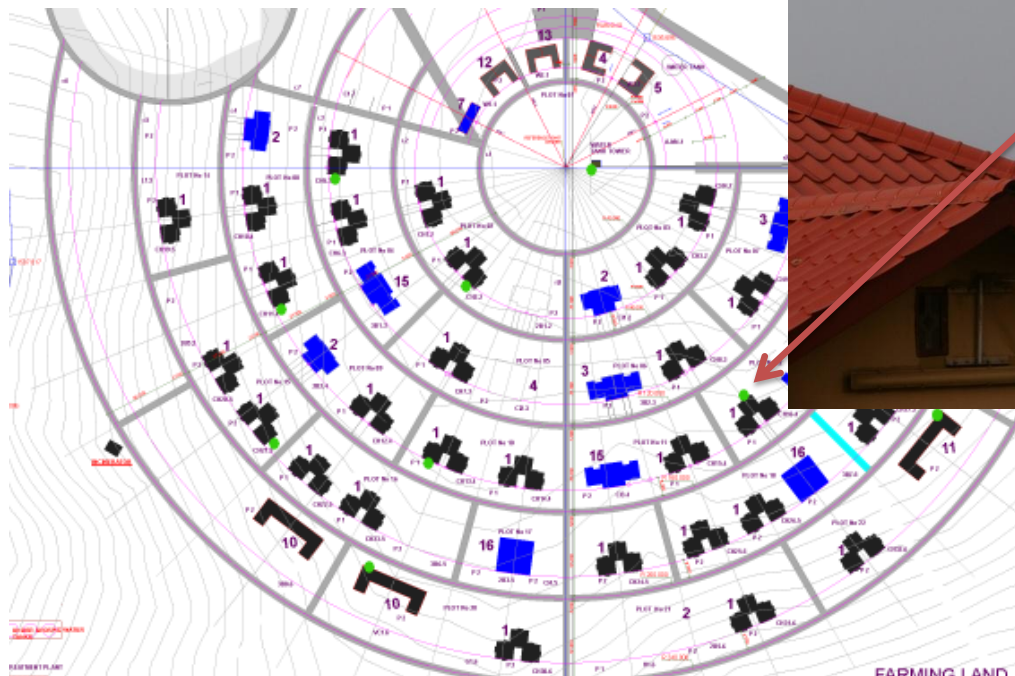
IP	10.10.30.26
Mac	00:15:6D:AB:22:80
Manufacturer	Ubiquiti Networks
Channel	6
Frequency (Mhz)	2.4
Antenna	Omnidirectional

resi-house13

Measurements (dBm)	Average
50 ft.	-55
100 ft.	-67
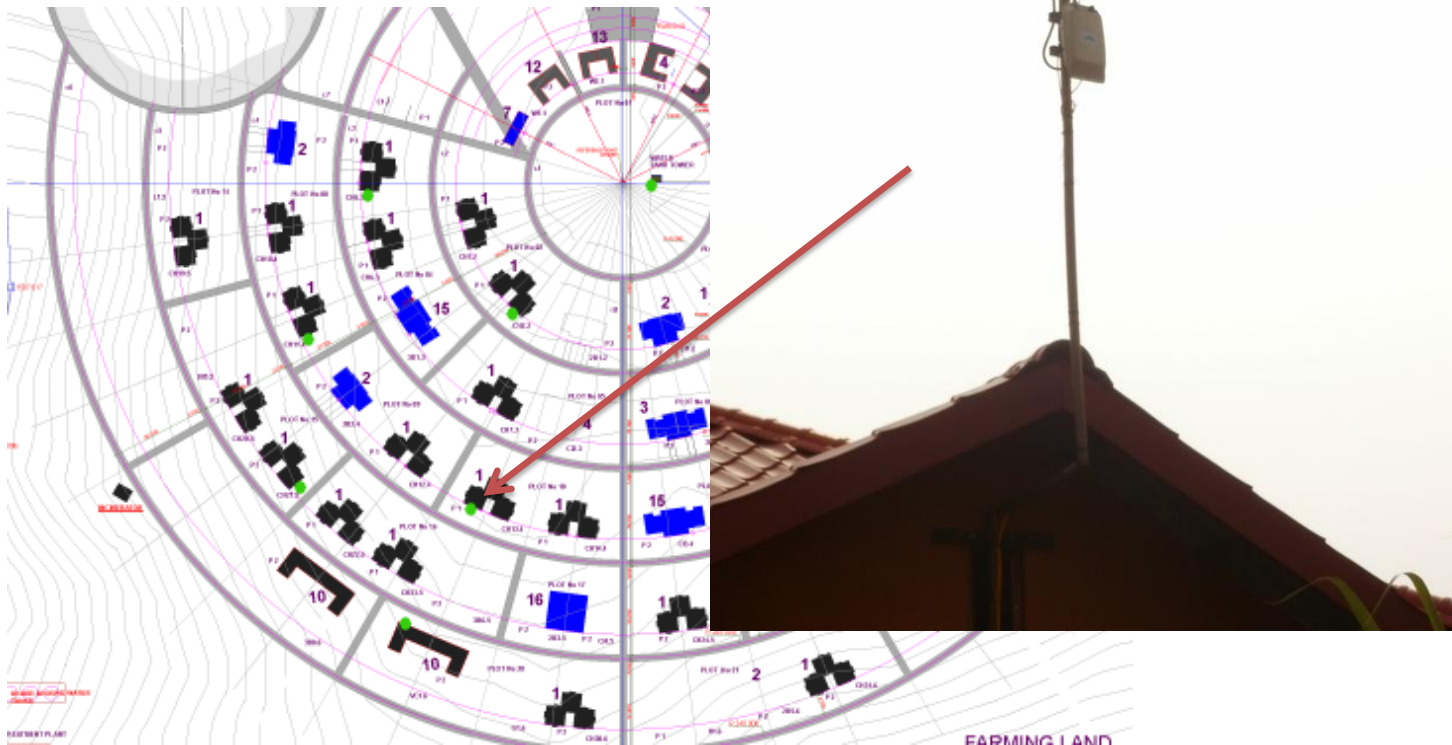
IP	10.10.30.42
Mac	00:15:6D:AB:21:C2
Manufacturer	Ubiquiti Networks
Channel	11
Frequency (Mhz)	2.4
Antenna	Omnidirectional

Measurements (dBm)	Average
50 ft.	-74
100 ft.	-80

Resi-Lodge-W
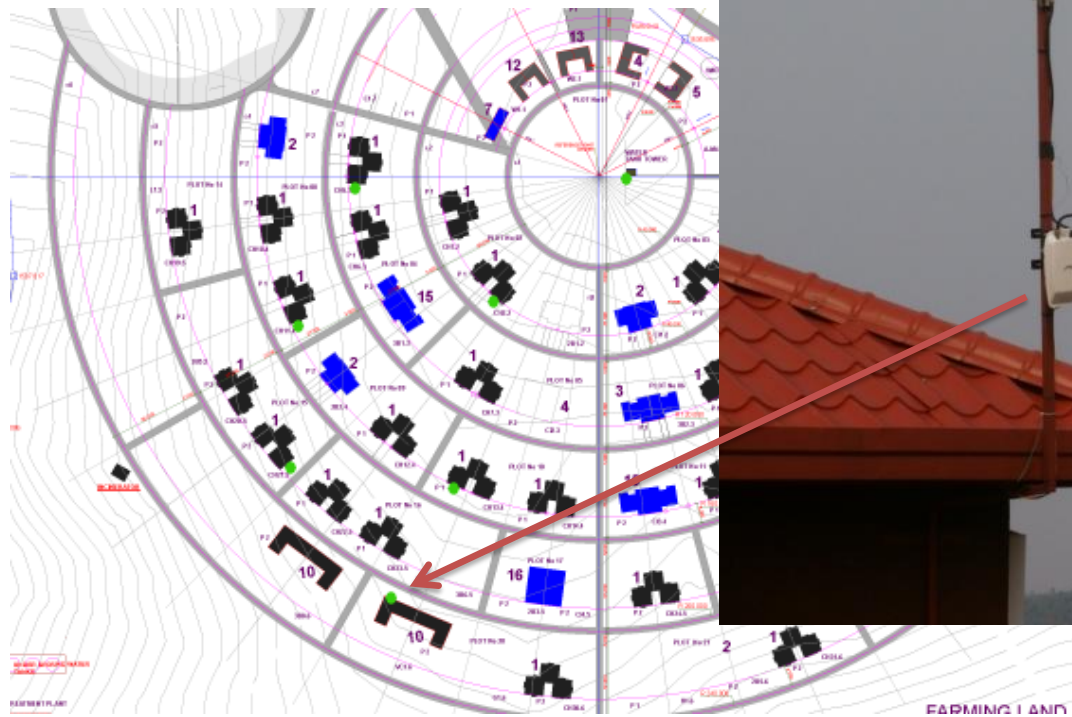
IP	10.10.30.20
Mac	00:15:6D:E8:A0:DA
Manufacturer	Ubiquiti Networks
Channel	6
Frequency (Mhz)	2.4
Antenna	Omnidirectional

resi-wds-l

Measurements (dBm)	Average
50 ft.	-54
100 ft.	-61
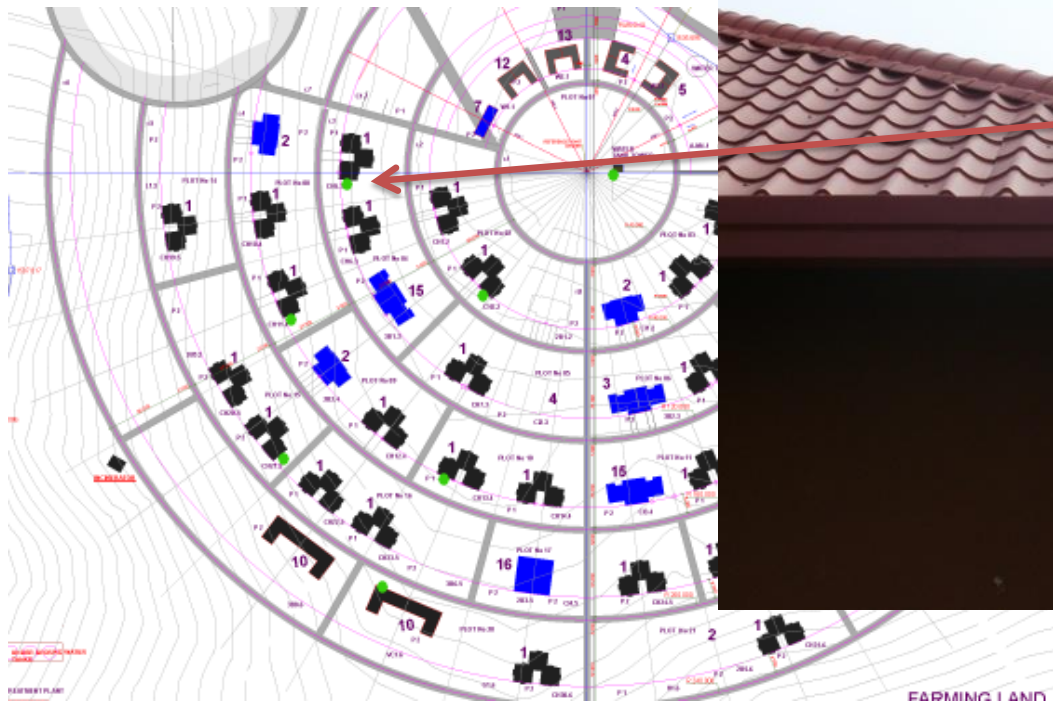
resi-wds-l

IP	10.10.30.21
Mac	00:15:6D:E4:27:4A
Manufacturer	Ubiquiti Networks
Channel	6
Frequency (Mhz)	2.4
Antenna	Omnidirectional

Measurements (dBm)	Average
50 ft.	-71
100 ft.	-76
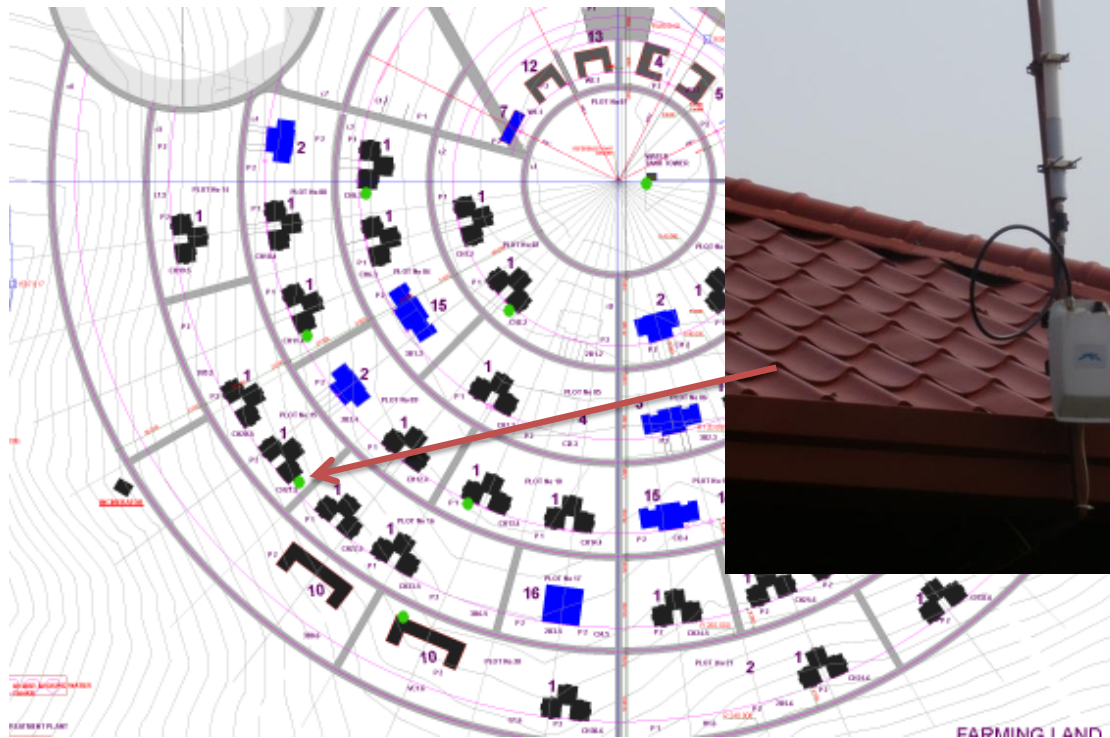
IP	10.10.30.22
Mac	00:15:6D:AB:22:C8
Manufacturer	Ubiquiti Networks
Channel	6
Frequency (Mhz)	2.4
Antenna	Omnidirectional

resi-wds-l

Measurements (dBm)		Average
50 ft.		
100 ft.		

Remarks
No signal from the access point at the time
of wireless assessment.
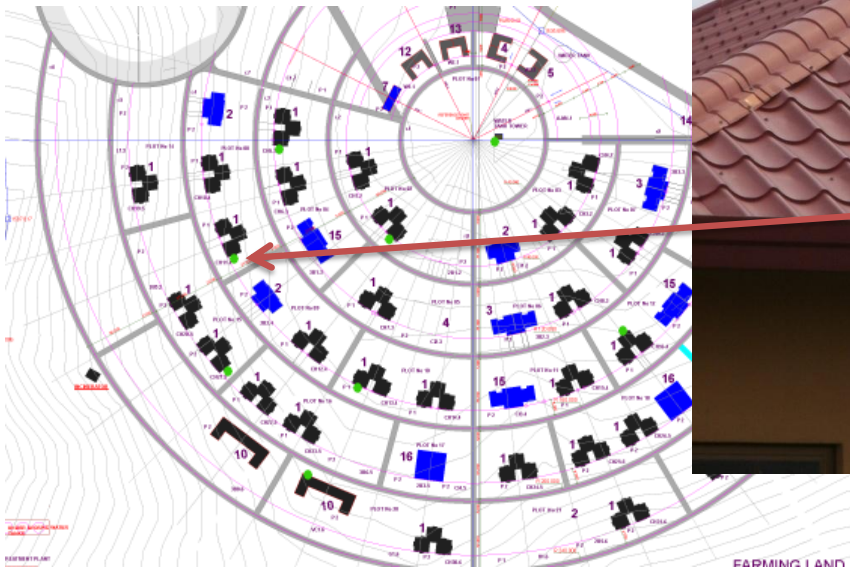
IP	10.10.30.23
Mac	00:15:6D:E4:27:AC
Manufacturer	Ubiquiti Networks
Channel	6
Frequency (Mhz)	2.4
Antenna	Omnidirectional

resi-wds-l

Measurements (dBm)	Average
50 ft.	
100 ft.	

Remarks
No signal from the access point at the time
of wireless assessment.
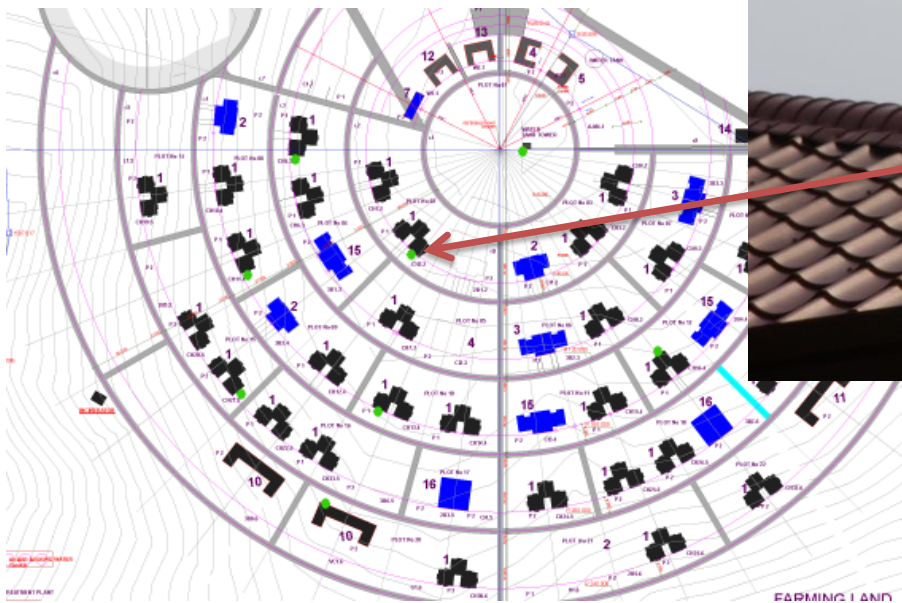
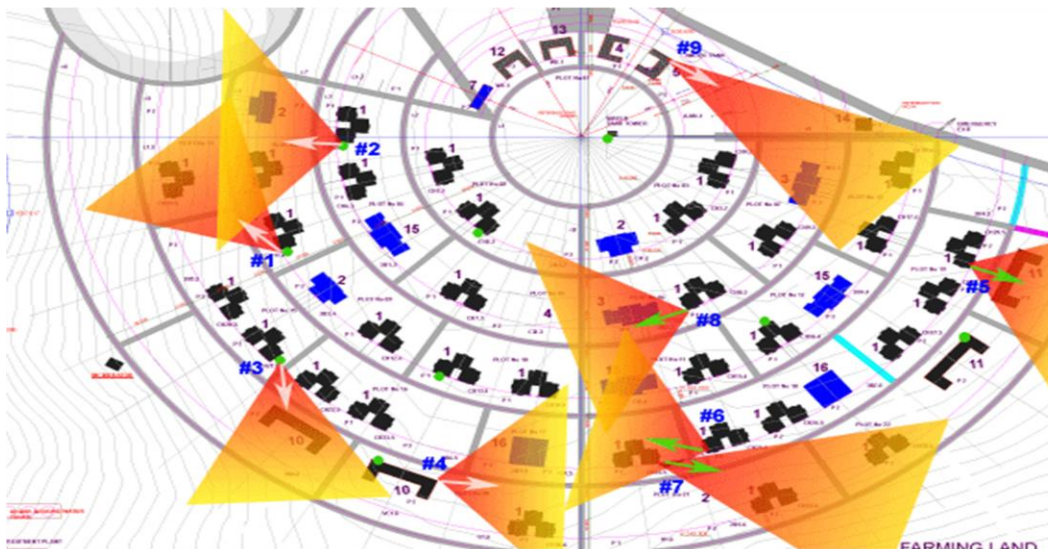| IP	10.10.30.2
Mac	00:15:6D:AB:22:7F
Manufacturer	Ubiquiti Networks
Channel	1
Frequency (Mhz)	2.4
Antenna	Omnidirectional

Residence

Measurements (dBm)	Average
50 ft.	-70
100 ft.	-72
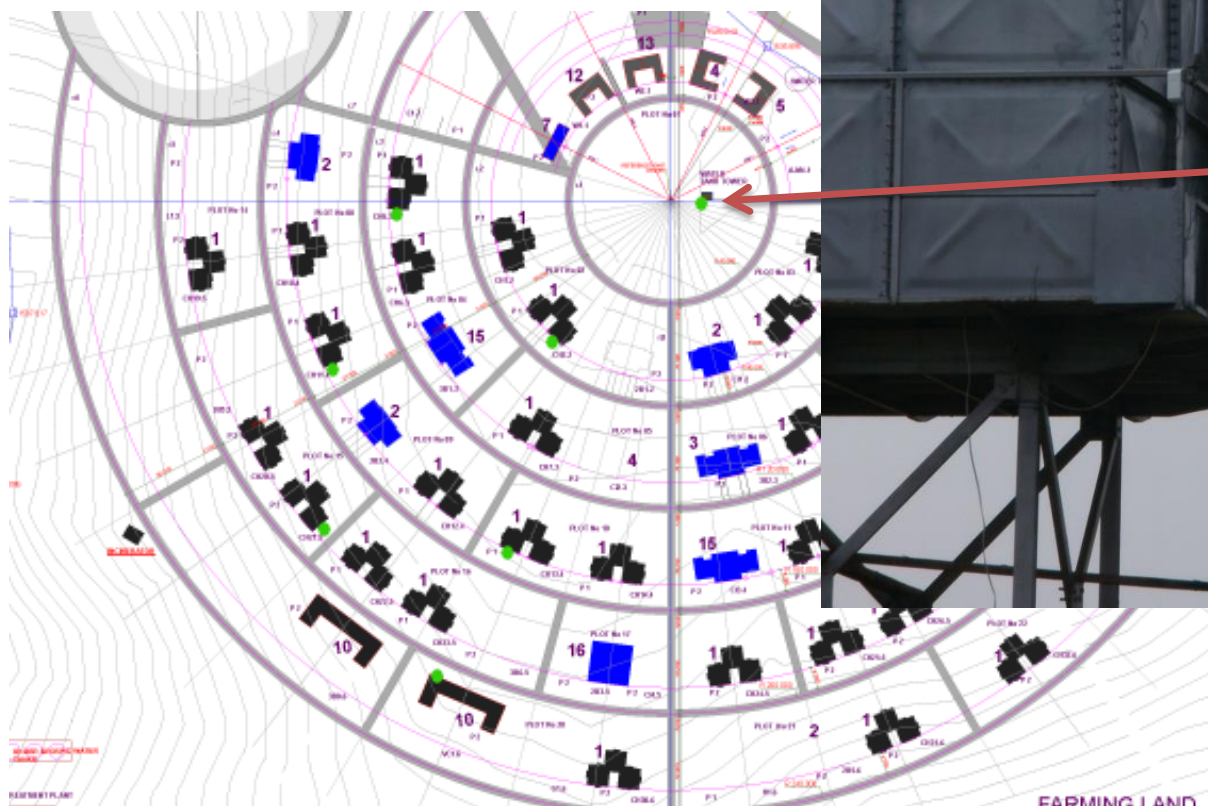
Appendix G: Map showing dead zones and low coverage area
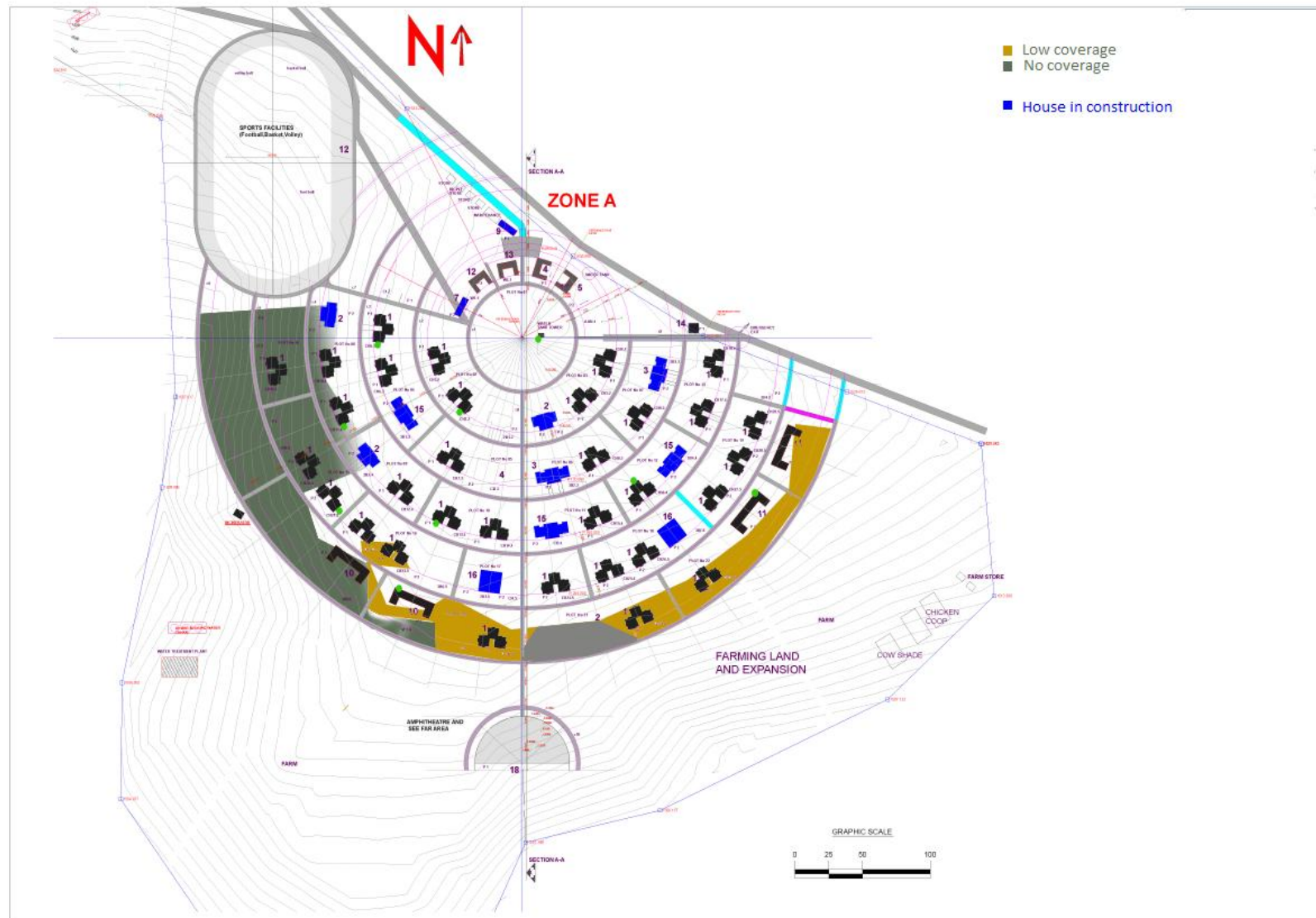
Appendix H: Map with new access points locations and their coverages

#1 Add a directional antenna facing house 19

#2 Add a directional antenna facing house 10

#3 Add a directional antenna facing lodge 4

#4 Add a directional antenna facing house 30

#5 Add a directional antenna facing lodge 1

#6 Add a directional antenna facing house 24

#7 Add a directional antenna facing house 31 and 32

#8 Add a directional antenna facing staff house (staff house)

#9 Add a directional antenna facing house 18

White arrows – mounts already exist

Green arrows – need new mounts

i https://www.cia.gov/library/publications/the-world-factbook/geos/rw.html

ii Des Forges, Alison (1999). *Leave No One to Tell the Story: Genocide in Rwanda*. Human Rights Watch. ISBN 1-56432-171-1. Retrieved January 12, 2007.

iii Volunteer & Visitor Handbook Agahozo-Shalom Youth Village 2011

iv Volunteer & Visitor Handbook Agahozo-Shalom Youth Village 2011

v http://www.cmu.edu/corporate/news/2007/features/wireless_andrew.shtml