A Proposal for

NETWORKED KNOWLEDGE ENGINE

Remote Farm Monitoring, CO2 Emission Capture, Business and Education Portal

by

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Advisory, Research, Training, Contracting

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THIS PROPOSAL WAS SUBMITTED TO A NIGERIAN STATE. SO, YOU MAY NOTICE OUR REFERENCE TO 'STATE'. CONTACT FASMICRO FOR A CUSTOMIZED ONE FOR YOUR MINISTRY, STATE, SCHOOL, AGENCY, COMPANY, ETC.

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(Clients can choose Farm monitoring or CO2 capture or both)

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Executive Summary

In this proposal, we present two Networked Knowledge Engines; one for farm monitoring and CO2 emission capture, the other for portal that captures business and educational institutions data in the state. The former is based on Fasmicro FA1050X data logger that captures pertinent data from farms and cities and wirelessly transmits the results to central stations. A patented technology, it provides ways for farmers to make farming science, instead of guesswork. From farm moisture content, temperature to wind speed, this technology provides data that any farmer can use to farm in the state. Besides, the technology can be used to collect CO2 emission in the state and the impacts analyzed over a period of time. Clients can decide to use only the farm monitoring or CO2 capture modules, or both. It is engineered with a proprietary Flexible Automation Engine developed. It has a cellphone interface and farmers can understand their farm conditions from their homes without going to the farms.

The second section of the proposal is a web portal that will put all academic theses, working papers, whitepapers, class projects, and make them searchable in a well organized way. Through this, the innovations in schools, from primary to university, in the state will be made available to the world. It will bring recognition to the progress made by the state in both the business and academic sectors. Also, this portal will help professors, companies, students, and researchers seamlessly co-create and co-publish, free.

The cost is broken down as follows:
Section I – (contact us)
Section II – (contact us)

Our Company

First Atlantic Semiconductors and Microelectronics Ltd (Fasmicro) is a fully incorporated knowledge company with Nigeria's Corporate Affairs Commission (RC908703). Visit www.fasmicro.com for more about us.

SECTION 1: REMOTE FARM MONITORING AND CO2 CAPTURE

1. Purpose of this Proposal

This section of the proposal will implement an embedded microelectronics system that will enable farmers to have accurate and reliable data about their farms. The motivation is to remove guess work out of farming in the state. This data will include amount of moisture in the farm, the type of nutrients, the wind direction, wind speed and other pertinent data that will help farmers to improve their productivities, by accurately understanding their farms.

Also, this technology is useful for CO2 data capture by cities. This will help to know the total CO2 emitted over a period of time.

2. The Technology

This proposal is based on a new technology developed by Fasmicro, FA1050X (Figure 1). FA1050X is a rugged, high-performance embedded microelectronics system with broad range of applications. It is engineered for complex measurements and control functions. It incorporates intelligent control engines that guarantee reliability under extreme conditions, and remote sensing.

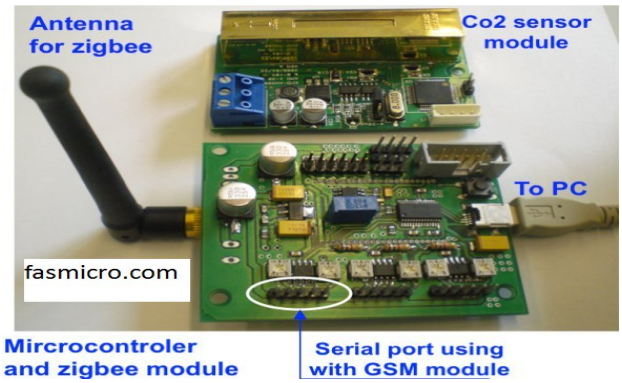

Figure 1: FA1050X

Light weight, GSM interface, and easy operation make FA1050X an ideal data-acquisition system, for gas, temperature, humidity, light, and wind. The core is a proprietary Flexible Arithmetic Engine implemented as an embedded microelectronics system. It is reconfigurable and adaptive, with interface to computers and cellphones. It is protected, partly, by US Patent No. 60/922,260 (held by Dr Ndubuisi Ekekwe).

FA1050X detects and captures any type of gas. For example, it has the capacity to capture and provide real time amount of carbon dioxide (CO2) in a city. For energy companies or city governments interested in estimating the amount of CO2 in the air, our technology is developed for such a need. We help you collect CO2 over a period of time, using our distributed CO2-sensors, across your villages or cities. We will help you analyze the data and quantify impacts on human health. With these results, policymakers can make decisions and appropriate steps taken. Our technology is very robust to cover a state, for instance.

For farmers, FA1050X will remove the guess work out of farming. Our technology will help you estimate the necessary nutrients in the soil and in the farm environment. By incorporating wind vanes and anemometers, we gather data over a long period of time on wind direction and speed. This could be useful for university researchers. When we incorporate the right sensors in the soil, we can provide up to minute data on the nutrient contents of soil. With cellphone interface, you do not have to leave your house to know if it rained in the farm, separated by 100 miles, from your home.

Design: The general architecture of the system is shown below.

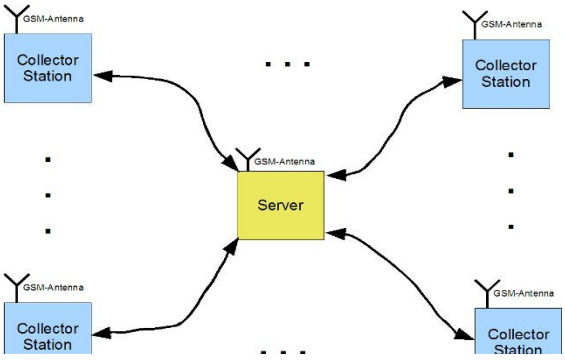

Figure 2: Overall System Architecture

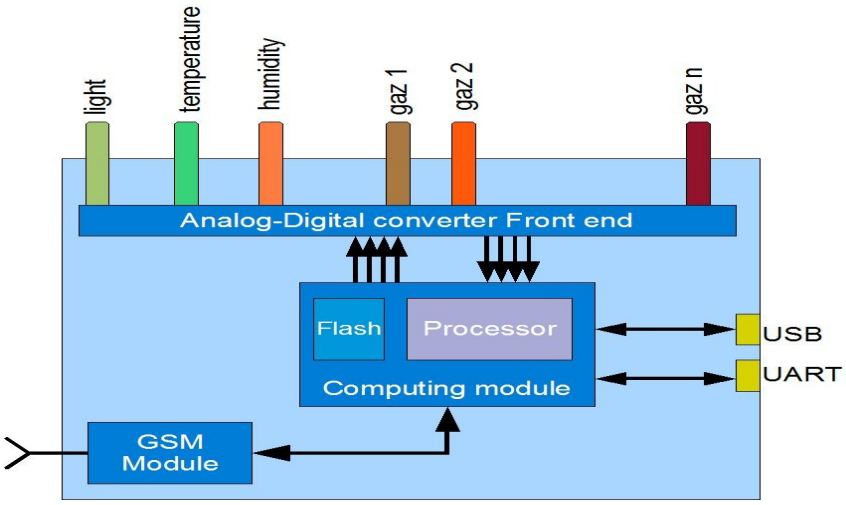

Figure 3: Internal architecture of a collector station

A set of collector stations installed in a town will be used to capture the data, which will periodically be sent to a central server for inclusion in the database. The collected data are locally saved for fault tolerance purposes. If the network connection is not available, then saved data can be read from the collector stations by an operator. In case of a network failure, the collector stations will be read once a day, which means that they should be able to store the data locally at least for 24 hours. Also for sake of fault tolerance, data will be read once a day to provide comparison between transmitted data and possible transmission errors.

As shown in the Figures 2and 3 above, a collector station consists of:

- A set of sensors, each of which is used to detect the presence of a given gas as well as its density. This is applicable to farms and CO2 emission capture.
- A central computing module in charge of the management of the collector station. Data collected from the sensor are first processed in the computing module and packetized for transmission via the GSM-module. Also the same data are copied to the non volatile memory on the collector.
- A non volatile flash memory for temporally storing the data. This can store data for years.
- A communication module, GSM Module, directly connected to the computing module.
- A USB interface is provided for communication with the external world. In case of network failure, an operator should be able to collect the data from the platform. A

hermetic plastic box (see Figure 4) is used to protect the components from water and dust.

- A battery for non interruption of operation upon power failure.

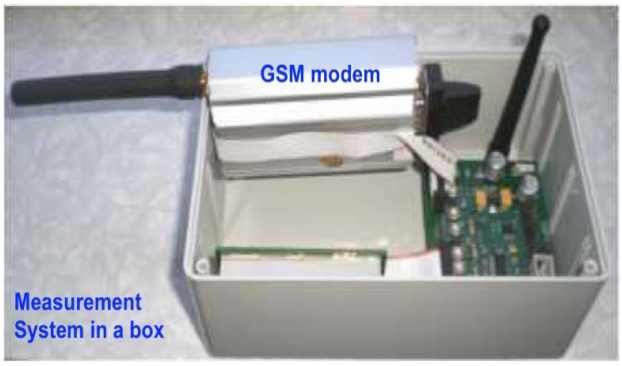

Figure 4: Final design of FA1050X in a hermetic plastic package

FA1050X consists of three main modules.

- **The GAS sensor** module produces an analog output signal, whose strength is related to the amount of gas in the air, for example, CO2. This signal is digitized and computed by the **computing module.**
- Thereafter, the computing module sends the digitized data in three different ways to the main station.
    - **GSM modem:** Data are packed in small messages and sent over the GSM network using the GSM-Modem. Figure below shows an example of message received on a mobile phone from our CO2 module.
    - **Zigbee Network:** The Zigbee network provides the possibility to build mesh networks in a given area. The messages are then sent from system to system to a central system featuring a GSM modem. From this central system, data will be packed and send over the GSM network.
    - **USART to USB communication** to send data by using a USB cable between computing module and the main station. This is only used for maintenance, or in regions where no GSM network is available, as in faraway farms.

3. **Farm Monitoring**

The state will identify the farms where the technologies will be installed. They would be carefully installed and networked so that data can be accessed via cellphone just by dialing

the technology. For instance, instance of farmers trekking hundred miles to check if it rained, a simple dial with cellphone to FA1050X will provide that data; that will save them the time and provide data to make decision if to go to the farm and plant.

The technology will cover large acres of land since the composition of the soil and nature of the environment will not change, dramatically. Even in the land tenure system, a village can share the technology with each person accessing the technology as when needed to make decisions, using cellphones.

The state can also decide to hire someone that will gather the data and send the information to farmers through radio or SMS communications. There are many things that can be done with FA1050X. This is the first technology of its kind in Africa.

4. **CO2 Emission capture**

Similarly, state can capture the amount of CO2 in the air using FA1050X. And summary of the data can be sent to cellphone. For instance, you may want to know how much CO2 has been released in the air over the last one week, you just dial into the system and the result is available on your cellphone. Figure 5 shows a cellphone capture of the CO2.

Figure 5: CO2 data, received on Cellphone

5. **Execution Steps for Farm monitoring or CO2 capture or both**

We will follow these steps to execute this proposal, if approved and funded by the government.

Activity 1: Site Assessment

We will access the site for farm monitoring or CO2 capture or both. Based on the data, we will develop the right database structure.

Activity 2: Database Development

We will develop the database for data archiving and storage, for both farm monitoring or CO2 capture or both.

Activity 3: Installation of Collector and Central Stations

We will configure the FA1050X and install them in collector stations and then integrate them to the central station.

Activity 4: Operation and Testing

Systems will be deployed and tested.

Activity 5: Training of staff

We will train staff on the use and operation of the system

Progress Indicators

Table 1 presents the indicators of this proposal, for Section I.

Table 1: Progress Indicators for Section I

Activity 1: Site Assessment			
Progress Indicators	Phase One	Phase Two	Final Phase (Milestone 1)
	Access site (M1)	Categorize site (M1)	Map site (M1)
Activity 2: Database Development			
Progress Indicators	Phase One	Phase Two	Final Phase (Milestone 1)
	Design database (M2)	Develop database (M2)	Populate database (M3)
Activity 3: Installation of Collector and Central Stations			
Progress Indicators	Phase One	Phase Two	Final Phase (Milestone 1)

	Design stations (M4)	Install stations (M5)	Complete stations (M5)
Activity 4: Operation and Testing			
Progress Indicators	Phase One	Phase Two	Final Phase (Milestone 1)
	Deploy (M6)	Testing (M6)	Testing (M6)
Activity 5: Training of staff			
Progress Indicators	Phase One	Phase Two	Final Phase (Milestone 1)
	Training (M6)	Training (M6)	Full control by staff (M6)

*Phase is used here to describe a stage/segment of an activity with a time dimension.

** M is month; M1 is Month 1 after award and upon signing grant agreement and funding

** *This assumes immediate and on-time payment by the state

6. Sustainability and Management

This technology does not require any major support after installation. It is rugged and very reliable. However, it requires constant backup of the data and when power goes off, a manual collection of data is needed at the collector stations (the GSM module needs power to work). A low level staff of the government can be trained on this routine.

7. Section I Finance and Budgets

Total budget for Section I of this proposal is provided below, Table 2.

Table 2: Finance and Budgets for section I of this proposal

Activity	**Number**	**Unit cost (USD)**	**Total (USD)**
Site assessment			
Backup/Storage devices			
Servers/Database design			
FA1050X/Collector station design			
Shipping and Transportation			
Professional fees			
Trainings (hours)			
Total			
Grand Total			

* The state can provide the Servers if we provide the specs ** Quotes are valid for six months from date of this proposal ***50% Mobilization payment and balance 50% at completion of 50% of the assignment. **** The final units of FA1050X will be based on site assessment; the more, the better.

SECTION II: BUSINESS AND EDUCATION PORTAL

This section deals with developing an advanced web portal that will enable all schools in The state to collaborate, co-create and share. This will cover all primary, secondary and tertiary institutions in the state. They can post their theses, class projects, seminars, etc online. This will certainly improve the clout of the state in Nigeria as more people come to learn about the knowledge being created in the state.

Similarly, companies can post their working papers, white papers, etc as they seem necessary, provided they operate in The state. The portal will be a repository of companies in the state and will give all firms access to have a solid web profile. The site will be designed that any firm or school, in the state, can easily add itself. Also, students can post their theses and academic works, provided they are done in the state on the portal. Also, this portal will have a publishing engine that will enable people to publish, using Rhaptos where up to hundred people can concurrently publish a book, real-time, free. A design format of the portal is shown in Figure 6.

Categories of materials to be posted on this site:

Theses or Dissertations
Working Papers
Seminars and Class Projects
Professional, Legal or Whitepapers
African Technology Techniques (e.g. farming, fishing, herbal medicine, etc)

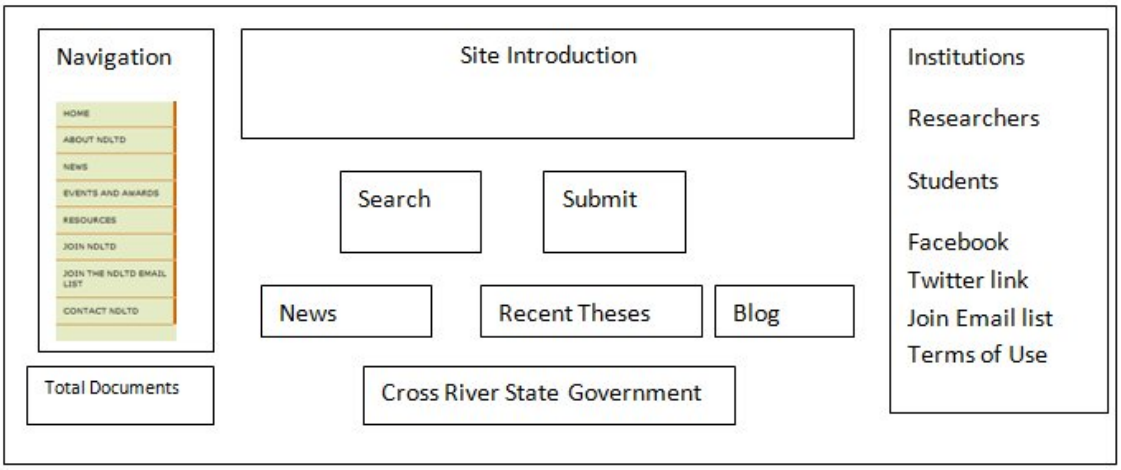

Figure 6: The plan of the portal

This portal will be searchable with a proprietary search engine.

1. **Implementation Phases**

   Phase 1 (Administrator)

   =>University and college management

   =>Institution management

   =>Professor management

   =>Student management

   =>Content Management

   Phase 2 (Administrator)

   =>General settings

   =>Student thesis work listing according the university/college

   =>Announcement management according the university/college

   =>Professor schedule management like class schedules, class notes etc.

   Phase 3 (Front-end)

   =>Design implementation on front end

   =>University/college, professor and student login, registration, forgot password, profile etc.

   =>University/college announcements

   =>University/college listing, Search

   Phase 4 (Front-end and Training)

   =>Google and Scirus Search

=> Rhaptos integration for multi-platform publication

=>Thesis management by student

=>University/college Area tasks after login like:- manage professors, create professor profile, announcements

=>Professor Area tasks after login like:- Create student profile, schedules, class notes etc.

=>Student area tasks after login like:- Upload thesis, profile, see notes etc.

=>Testing

2. Progress Indicators

Table 3 presents the progress indicators for section II of this proposal.

Table 3: Progress Indicators for Section II of this proposal

Phase 1			
Progress Indicators	Phase One	Phase Two	Final Phase (Milestone 1)
	University management (M1)	Professor management (M1)	Content Management (M1)
Phase 2			
Progress Indicators	Phase One	Phase Two	Final Phase (Milestone 1)
	General settings (M2)	Listing (M2)	Structure(M3)
Phase 3			
Progress Indicators	Phase One	Phase Two	Final Phase (Milestone 1)
	Front end (M3)	Front end (M3)	Search(M4)
Phase 4			
Progress Indicators	Phase One	Phase Two	Final Phase (Milestone 1)
	Publish engine (M4)	Upload engine (M4)	Testing (M4)

*Phase is used here to describe a stage/segment of an activity with a time dimension.

** M is month; M1 means one month after approval of proposal and funding

3. Section II Finance and Budgets

Table 4 presents the Finance and Budgets for section II of this proposal.

Table 4: Finance and Budgets for section I of this proposal

Activity	Number	Unit cost (USD)	Total
Statewide research for schools and firms			
Servers/Database design			
Professional fees			
Trainings (hours)			
Total			

* Quotes are valid for six months from date of this proposal **50% Mobilization payment and balance 50% at completion of 50% of the assignment.

Sample of our work: http://www.afritedia.org/