



## Towards the development of an Rfid-Based System for Monitoring Students Attendance on Campus.

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### ABSTRACT

The worrisome nature of the high rate of absenteeism and class truancy among students is brought to the fore by the number of conventional methods that Higher Education Institutions (HEIs) have taken over the years to mitigate same. A current effort at automating class attendance and monitoring students on campus using RFID systems is presented in this paper. The goal is to be able to eventually develop a system that can scale to the demands presented by an ever evolving problem in HEIs. Caleb University Nigeria is used as a Case Study.

**Keywords:** Radio Frequency Identification, Monitoring, Attendance.

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### **ISTEAMS Cross-Border Conference Proceedings Paper Citation Format**

Ajiboye, A.A. & Longe, O.B. (2017): Towards the development of an Rfid-Based System for Monitoring Students Attendance on Campus.. Proceedings of the 9th iSTEAMS Multidisciplinary Conference, University of Ghana, Legon, Accra Ghana. Pp 333-340

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### 1. BACKGROUND TO THE STUDY

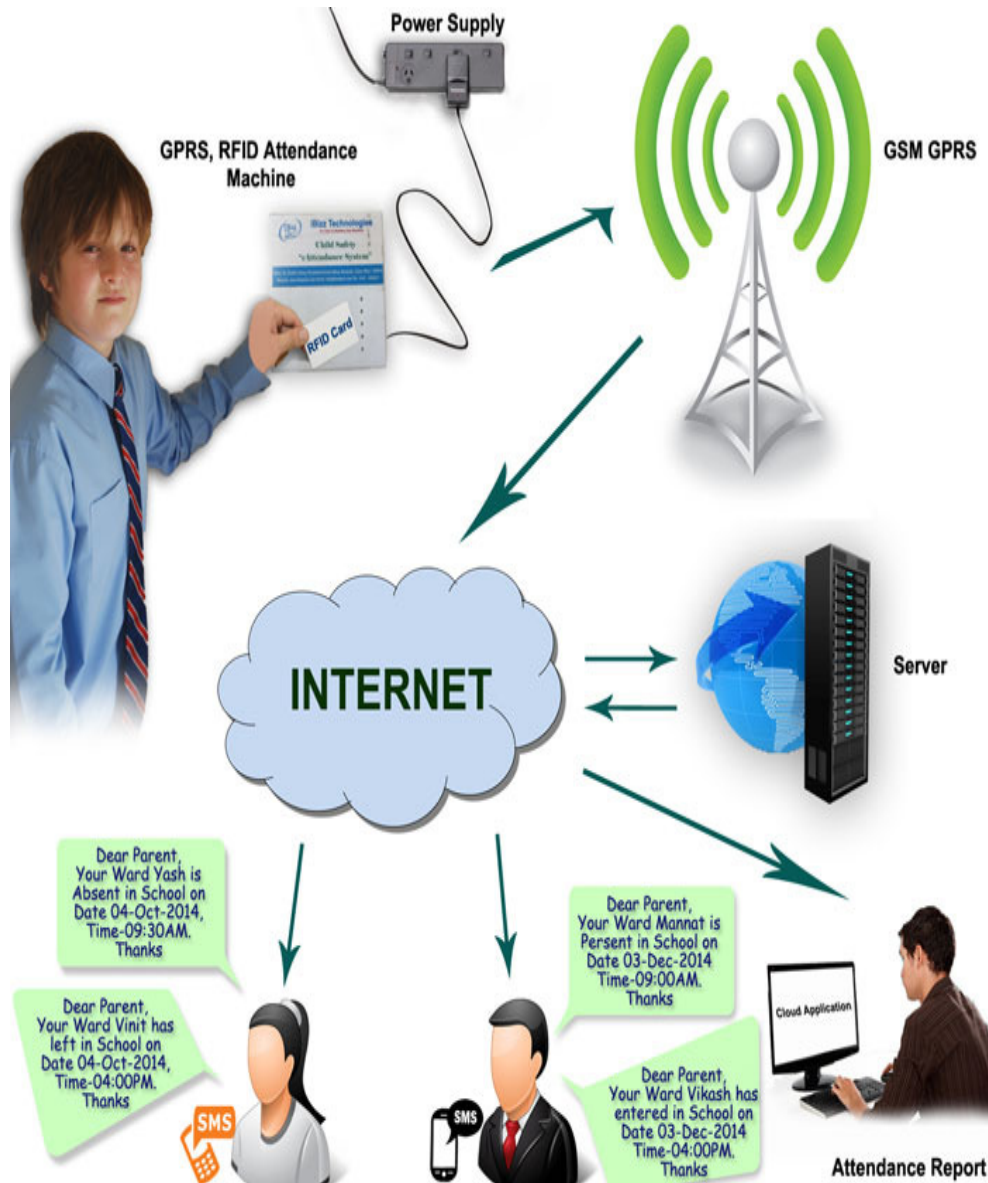
Students do not attend classes for whatever reasons. In a fully residential campus, students prefer to stay in their halls of occupancy rather than come to class and this has affected their performance in examinations. Students are expected to have 75% attendance in any course before they are eligible to write the course examination. To achieve 75% attendance, it means every course lecturer must take attendance for every lecture which may lead to time wastage, lecturer misplacing attendance register and as a result may not be able to ascertain students' presence in class for that particular lecture. To eradicate this obvious deficiencies, Radio Frequency Identification technology can be implemented.

RFID is a technology that incorporates the use of electromagnetic coupling in the radio frequency portion of the electromagnetic spectrum to uniquely identify an object, animal or person. It requires a wireless non-contact system that uses radio-frequency electromagnetic fields to transfer data from a tag attached to an object for automatic identification and tracking (Adewole B.A et al, 2016). An RFID system includes tags, readers, and an application system. Information is exchanged wirelessly between a tagged object and a reader when they are tuned to the same radio frequency. Tags are small items with various shapes, attached/imprinted on papers and attached to larger items for identification. When an RFID tag attached to a person/object passes through an electromagnetic field generated by a reader and detects a signal from the reader, it identifies itself. A reader picks up the radio frequencies of tags to communicate. An application system is the main workhorse of an RFID system, and makes sense of the data read from tags. (Yang Xiao et al, 2006).



The components of RFID includes

1. **Tag (Transponder):** The tag is a wireless communication, monitoring or control device that picks up and automatically responds to an incoming signal. RFID tag is a small object that can be attached to or incorporated into a product. It contains antennas to enable them to receive and transmit radio frequencies to and from transceivers. There are two basic types of RFID tags: passive, and active. Passive tags require no internal power source, and are commonly used with issues relating to security. In contrast, active tags require a power source, and are more expensive.
2. **Active RFID systems** use battery-powered RFID tags that continuously broadcast their own signal. Active RFID tags are commonly used as “beacons” to accurately track the real-time location of assets or in high-speed environments such as tolling. Active tags provide a much longer read range than passive tags, but they are also much more expensive. In addition, there is another type of tag which is called Semi-passive RFID which is similar to passive tags except for the addition of a very small battery allowing it to have a small amount of constant power (Herdawitie, A.et al, 2010).
3. **Reader (Transceiver):** RFID reader is a device that is used to interrogate an RFID tag. The reader has an antenna that emits radio waves; the tag responds by sending back its data. A number of factors can affect the distance at which a tag can be read (the read range). The frequency used for identification, the antenna gain, the orientation and polarization of the reader antenna and the transponder antenna, as well as the placement of the tag on the object to be identified will all have an impact on the RFID system’s read range (Herdawitie, A.et al, 2010). RFID reader have various characteristics based on classification. There is the read only, which can only read the data stored on the tag and there’s also the read and write readers which apart from reading the data stored on the tag can also write and modify the data on the tag.
4. **Antenna:** The antenna is a specialized transducer that converts RF fields into alternating current and vice versa. There are two types of antenna, the receiving antenna, which intercepts RF signals and delivers AC to electronic equipment and a transmitting antenna which is fed AC from electronic equipment and generates RF field.



Framework of an RFID System

Source: ibizztech.com

### 1.1 The Research Problem & Objective.

In recent times, students' absenteeism from class have been the bane of poor academic performance. Breaking of exeat procedures have posed serious security risk to students of private institutions. Our research objective is to develop an RFID-Based system that can be used to curb these challenges. The proposed study is limited to attendance taking and to also evaluate students' eligibility to write examination.



## 2. LITERATURE REVIEW

Previous studies have been able to lay down many techniques that are very useful for this study. The application of active RFID in a student monitoring system is to improve faculty and university management system to monitor particular group of students' whereabouts. The system called Student Monitoring System Using Active RFID (SMOSA) explains the high-level design of SMOSA, from the RFID tag to the display data on computer screen. SMOSA comprises of two graphical user interface (GUI) developed for stand alone, online user and data storage; database. First, RFID reader detects if there is RFID tag enters its' active range. Then, data from the RFID tag registers and transfers into the database through a stand-alone system as the interface. A list of students were received by the host computer and the data accessed directly by the university management using an online system (Herdawatie et al.2010).

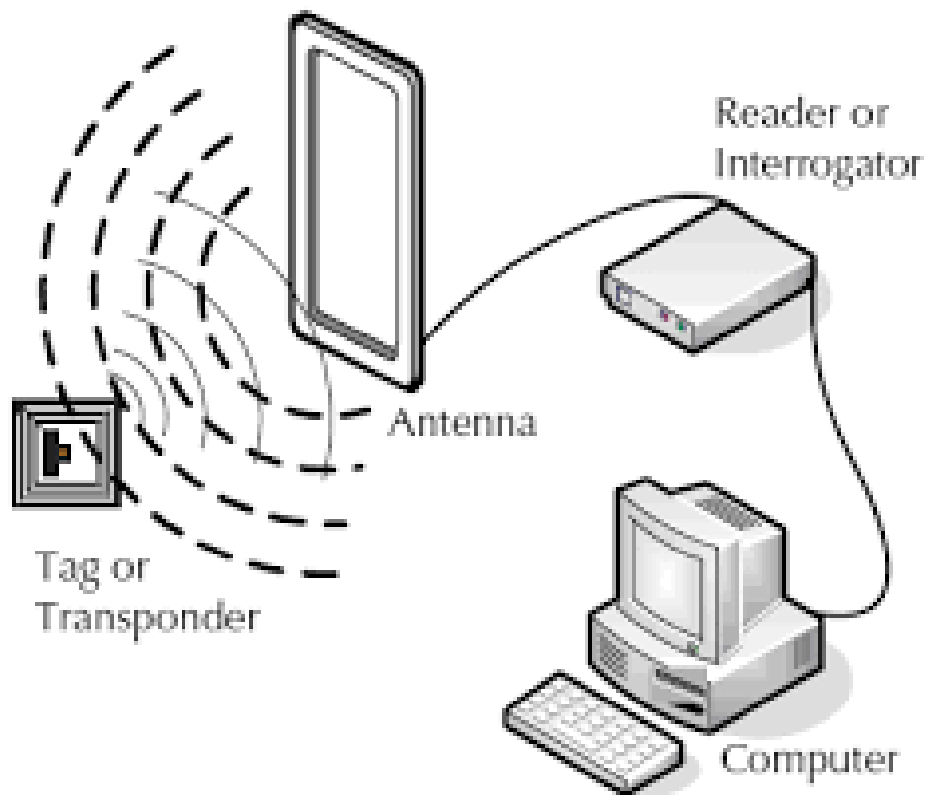
Monitoring and tracking of students itinerary on campus prevents or reduces the risk of kidnapping. Kidnapping of children, which has been in existence for a while has taken a new turn in recent years. Perpetrators of this heinous act have extended their reach to kidnapping children from school premises and this has left a lot of school proprietors and stakeholders in great dilemma. In the quest to forestall such occurrence, security guards are employed but the activities of such security officers are limited as identification and relationship of the guardian to their wards cannot always be easily linked by such personnel. This therefore necessitate the need to incorporate guardian-ward relationship factor in its design using Radio Frequency Identification (Opeyemi E. M & Dayo R.A 2014).

In all the automatic identification, the RFID technology has the essential capacity in different terms to give asset management and tracking solutions to the ever busy environment such as that of a University. The best system for an asset tracking application has to be chosen depending on the requirements for the system itself. In an RFID asset tracking, faculty members and students can instantly and easily determine the general location of tagged assets be it theirs or the University's anywhere within the University environment with the help of a re-writeable high frequency RFID

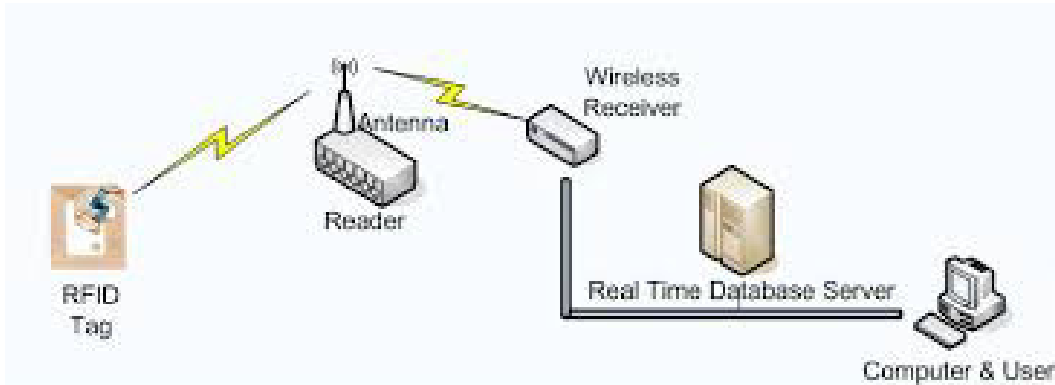


### 3. PROPOSED METHODOLOGY

The RFID system consists of a reader/transceiver and a tag/transponder which is placed on the subject to be identified. The RFID reader consists of a radio frequency module, a control unit and an antenna coil which generates high frequency electromagnetic field. On the other hand, the tag is usually a passive element which consists of an antenna and an electromagnetic chip. When it gets near the electromagnetic field of the transceiver, due to induction, a voltage is generated in its antenna coil and this voltage serves as power for the microchip. As the tag is powered, it can extract the transmitted message from the reader and for sending the message back to the reader, it uses a definite coil load manipulation. Switching on and off a load at the antenna of the tag will affect the power consumption of the readers antenna which can be measured as voltage drop.



**Fig. 2: The RFID Tagging Process**  
Source : Image-Googlesearch



**Communication Line Between Different RFID System Components**

Source : Image-Googlesearch

For this proposed work, the tag will be embedded in every students' identity card. An identity card will be given to every student. Readers will be placed in strategic locations such as the gate house, halls of residence and classrooms. The RFID reader in any of these locations send out electromagnetic wave in the radio frequency spectrum. When a student enters the radio frequency area, the tag is powered. It then sends the signal back to the reader in an encoded form. The reader converts the received signal into digitized information and sends it to a middleware application. The middleware application houses the server, control and database systems through a gateway that connects the readers together.

Whenever a tag is read, the reader sends the tag ID to the server and the server uses this ID that is unique to each tag to query the database. The information gotten from the database is sent back to the reader. The information includes the name of student, course of study, matriculation number, level of study and hall of residence. The system not only takes attendance of students but also evaluates students' eligibility to sit for examinations.



#### **4. CONCLUDING REMARKS**

The proposed system of RFID-based system for monitoring students' attendance on campus will provide an effective and more convenient way of attendance taking. Data will be more organized, efficient, secure and cost effective. We intend to also make the developed system GPRS –ready to cater for possible tracking of movement outside and within the university premises.



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