



## An Efficient Design Framework for Building Alerting Systems to Make Regular tags Intelligent

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**Abstract:** Many tags exist for identifying the valuable assets of the individuals. Many events takes places in and around the tags including issues such as tampering, change of location of the object, power dissipation etc that need to be monitored and controlled either through human intervention or through a remote management system using handheld devices. The main issue is to alert the user who is either remote or local through beeps, alarms, messages, buzzing etc. Ability of a tag to communicate with remote devices for alerting using communication protocols that works on either side of the HOST and the TAG through a challenge. Existing alerting system doesn't have the intelligence to identify the environmental changes and communicate to the user. Intelligent alerting system within a tag is necessary to alert either local or a remote user about environmental changes taking place in and around the TAG. . Various types of mechanisms and methods that can be built into a Tag to make it to be intelligent enough to communicate environmental changes either to a local user or remote user are proposed in this paper.

**Keywords:** Beeping, Buzzing, Alerting, Intelligent Tags, SMS messaging, embedded systems

### I. INTRODUCTION

The growth of technology nowadays became the most significance to people around the world. People today rely on technology and communication because the communication is important in daily life. Technology enables people to communicate in many ways. and methods not only using telephone and letters but using the mobile phone, electronic mail, video conferencing and others. By advancements in technology, different automated alerting systems came into existence. These systems are becoming increasingly pervasive in time and safety critical operations, with applications spanning aerospace, automobile, power control stations, air traffic control and medical monitoring systems.

Alert systems are used around the world to provide real time warning to the people. An alert system is characterized by its real time nature, accomplished by instantaneous transmission of events primarily by radio transmission. During an emergency, a person may be rendered unconscious or speechless, following which he may not be able to contact emergency services and state his condition. Medical alert system can provide the much required help in these situations. During disasters' like earthquakes, cyclones, major calamities these systems play a vital role. Alerting system gives alerts to the end user under different

conditions. These systems are now a part in today's mechanical life.

Various conditions like indication of its own location, non-availability of a HOST in its neighborhood, power status, indicating the presence of the hackers disturbing the communication between the TAG and the HOST, loss of communication between the HOST and the TAG, logical tampering of the Tags etc should be in the first place be recognized and then inform to the HOST through different kinds of alerts.

Many techniques exists for communicating the changes taking place at the target location which include email, SMS, beeping, flashing etc. to help the user control the adversities. The type of mechanism to be used is very much dependant on the local situation and the type of alert required. The Tags must be built with various mechanisms and methods to make them more intelligent to be able to communicate with either remote or local users regarding the changes taking place in the local environment.

In this paper three alerting mechanisms which include SMS, beeping and light emission are presented that are built into the tags to make them more intelligent to sense and control a local environment at which the changes are taking place.

## II. BACKGROUND DETAILS

A significant body of research has focused on the design and use of alerting system [1]. As applications are pushed toward higher safety and capability, new alerting systems have been introduced to provide additional protection from hazards. Accordingly, there has generally been an evolutionary, incremental addition of alerting systems to these applications over the time. Because it is costly to completely redesign, new alerting systems are typically independent enhancements that do not directly affect the operation of existing subsystems. The addition of alerting systems to an already complex operation carries several liabilities. Figure I show general flow that takes place in any of the Alerting system.

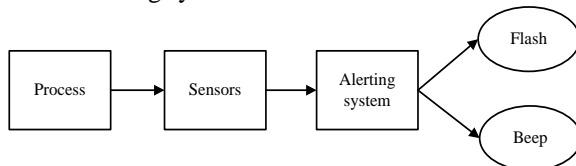


Figure 1: Schematic of alerting system

All alerting systems [1] generally perform four functions: monitoring, situation assessment, attention-getting, and problem resolution. First, information about the process under control and relevant hazard states must be monitored through a set of sensors. Each alerting system may use a different set of sensors, and thus may form a different view of what is truly occurring in the process and environment. Based on this observable information, the alerting system assesses and categorizes the situation into one of several threat levels or alert stages. If the alert stage is sufficiently high, the human operator is alerted to the problem.

This attention-getting function can range from a simple aural or visual cue (e.g., a tone or illuminated light), to displays that indicate the cause for the alert (e.g., a textual or verbal readout such as “Generator Failure”), to displays that also indicate how to correct the problem. The attention-getting signal also provides an indication of the urgency of the problem. This urgency may be conveyed implicitly through the general type of hazard that is being encountered, or it may be more explicitly conveyed by the structure of the alarm signal. For example, a chime sound is often used for low-urgency alerts, whereas a buzzer or wailing alarm may be used in more threatening situations. Alerting systems can be easily embedded into any of the fields like military, medical, agriculture.

Object locator [2] is used to trace the misplaced assets either in-house or in working place and alert the user through beeping and flashing. A locator contains an interrogator with several buttons of different colors and a tag of the color matching the color of each button. By attaching a tag to an object to be tracked, the user can look for the object by pressing the button of matching color on the interrogator.

The tag attached to the object beeps and flashes in response and thus enables the user to find the object. An object locator requires only three operations: Add Delete and Query. Three designs of object locators exists that include Room – level Agents (Interrogator and Tags (RAIT)), Desk – level Agents(Interrogator and Tags (DAIT)), Desk – level and Room – level Agents,

(Interrogator and Tags (DRAIT)). Each locator consists of tags, agents and at least one interrogator. When the user invokes Query operation from the interrogator, it sends a query message containing the TID of the queried tag to agents. The tag with id matching the TID beeps and flashes upon receiving a read request. The corresponding agent will send message.

Another way of alerting system is through SMS which can be implemented in medical, security, agriculture areas. Ren-Guey Lee, *et al* [3] presented a role – based intelligent diabetes mobile care system with alert mechanism using SMS. Diabetes mellitus is a kind of chronic disease which can be effectively prevented and controlled only if the blood glucose level of the patient is constantly monitored, and the health education and professional medicine care is fully supported. The system provides alert management by using an automatic urgency strategy to assure the information correctness and notification completeness so as to improve the quality of diabetes care. This system provides various intelligent care services. Two scenarios are described. The first scenario is, if the patient doesn’t upload the data of blood glucose in schedule time, then care centre sends alert notification to the patient. Second scenario is that the care centre sends the alert to notify the patient should go back to the hospital for subsequent consultation.

In agriculture field factors such as temperature and humidity should be set at certain standard for development of good cultures [4]. So these should be monitored continuously and must be controlled. An alert system is linked to the monitoring system for the user’s notification through SMS and email if the temperature or humidity within the growth room or the vessel is out of the normal range. User will receive an instant notification about the parameter data and the current reading, hence the authorized person can monitor the room and the vessel conditions for further action.

Home security can be done through alerting system [5]. Location tracking and control system that is based on a GSM mobile, the global-positioning system (GPS), and the embedded system [6]. Android application liaises between the user and the location tracking equipment. It can request the present location of the tracking device, work with the Google Map, and set the values for co-working with the device. The communication is based on SMS as the main protocol.

By using the advanced technology visually impaired people can locate their items. FETCH (Finding Everything using Technology Convenient and Handy) [7] is a system using Bluetooth tags, which allow visually impaired people to track and locate the lost items. The tags emit an audible beep and work within a range of 30 meters, a range large enough to find an object anywhere within a house, apartment, or office. In vehicle tracking to find the location or for finding the theft cars also SMS alerting helps a lot [8].

In general, tags are used to trace the misplaced objects. Tags are two types, active tags and passive tags. Active tags have their own power source, a battery, which gives the ability to respond to a weaker signal from the reader. Passive tags are tags which are powered by the RFID reader. When the tag is within range of the radio frequency field, the reader sends out electromagnetic waves which power the microchip on the tag. These tags attached to valuable assets

can be easily traced and intimidated to the user using different alerting mechanisms.

### III. DESIGNING AN ALERT SYSTEM FOR TAG

Existing tags are mainly used to track and locate the misplaced objects. When the object is tracked it beeps and flashes in response. It does not have any intelligence to monitor the environmental conditions or the events occurring in the neighborhood of the Tag. The usage of the Tags is much more if some intelligence is built into the TAG. Tags can be used for many purposes that just locating them when more of intelligence is built into it. Intelligent TAGS can be used for effectively monitoring and controlling the environment in which the TAGS are situated.

Intelligence into the TAGs can be built by using a Micro controller and building logic into it. The Micro controller can be attached to peripheral devices for sensing the environment changes & events and activating various kinds of alerts either by Beeping, Buzzing or by sending SMS messages which is possible only by building the communication interface with which a TAG can communicate with the HOST. Issues like tampering the TAG can be alerted by building the Hardware that when broken will be able to buzz.

Intelligence in the tag has to be built for alerting its own location, non-availability of a HOST in its neighborhood, power status, indicating the presence of the hackers disturbing the communication between the TAG and the HOST, loss of communication between the HOST and the TAG, logical tampering of the Tags etc.. Changes observed are to be alerted to the LOCAL user through buzzing, and beeping or to the remote user through transmission of SMS messages.

Fig II shows a general design framework for building an intelligent TAG and Mobile phone to which the intelligent TAG can communicate with SMS messages.

The TAG is built with different functional modules which include tamper proofing, location identification, power management, security etc. which all work together and gets executed within a Micro controller. The Microcontroller is also interfaced with the devices that are used for alerting. The communication modules Wi-Fi, and Bluetooth are interfaced with Micro controller for effecting the alerting through SMS messages to a remote Mobile devices. The buzzer, beeper and LED are interfaced to the micro controller for affecting the altering to the Local user.

The sensing devices which are interfaced with the microcontroller (Tamper sensor, GPS Transmitter and receiver, power sensor, Society sensor and TAG identification sensor) are used for sensing the changes taking place in the environment.

HOST (mobile phone) Applications are built using Android operating system. The intelligent tag application is embedded into the mobile phone which runs in parallel with the resident applications. The application resident on the Mobile Phone tries to establish communication with the remote tag using the details of the tag stored within the Mobile phone. Once communication is established the remote user can get notifications about the changes in the target system.

#### A. Alerting Mechanisms:

Alerts (or warnings) can be raised when inconsistencies are detected, in the system. When an inconsistency is found, the system alerts the user so that appropriate measures are taken. The user can be situated either locally or remotely from the target. Local user gets the alerts through beeping or buzzing and remote user gets alerts through transmission of SMS messages.

SMS is a method by which messages can be sent to a cell phone via another cell phone, a computer connected to the Internet or through regular mobile device. SMS is a communication service component of the GSM (Global System for Mobile Communications) system, using standardized communications protocols that allow the exchange of short text messages between mobile phone devices.

Buzzer and beeper are used for alerting the local user. Various environmental changes and events are monitored and different kinds of alerts are sent to the local user or remote user.

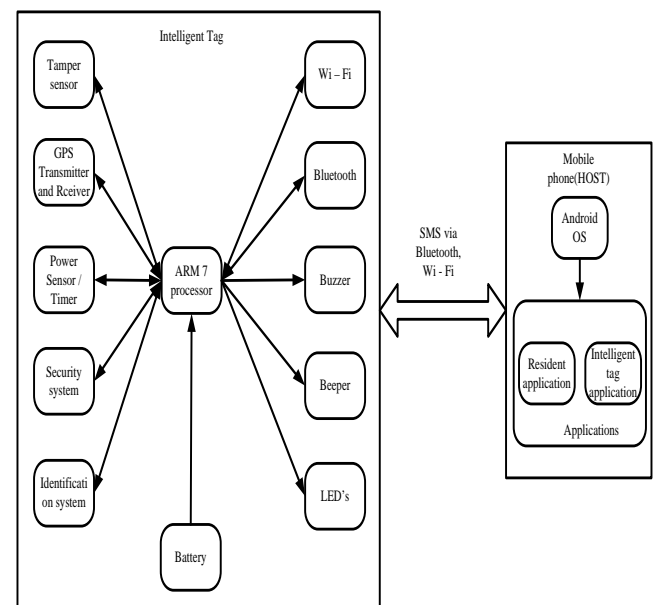


Figure 2. Design Framework for design of Intelligent TAGS

#### B. Monitoring the Environmental Changes:

Various conditions like indication of its own location, non-availability of a HOST in its neighborhood, power status, indicating the presence of the hackers disturbing the communication between the TAG and the HOST, loss of communication between the HOST and the TAG, logical tampering of the Tags etc should be recognized and then informed to the local user or remote HOST through different kinds of alerts.

Tags are battery powered. In existing tags batteries are not rechargeable. Once the lifetime of the battery is completed, we have to replace the tag. But intelligent tag is inbuilt with rechargeable Lithium – ion battery. When the power level drops to the minimum power level, then tag sends an alert through beeping or buzzing or by sending an SMS.

Tags are placed remotely from the HOST. A tag can be located with reference to longitude and latitude, angle and distance from a reference point with a xy plane, geometrical distances using co – ordinates within the xy plane. The most

relevant way of locating an intelligent tag is through angle and distance from the reference point. Several technologies are available using which the angle and distance can be measured. Once the object is tracked the user gets the alert and can easily locate the object. Whenever tag is crossing the vicinity range of the remote HOST, i.e. either because the user misplaced the things or if anyone stolen the things then an alert SMS is send to the mobile phone. When an intruder tampers the tag i.e., tries to open the tag, a high alert is send to the local user or remote user indicating the physical attack on the Tag.

The design framework shown in Fig II takes care of the above mentioned changes that takes place in the environment through usage of the sensors and alters the local user and the remote user by using most suitable alerting mechanism. Most appropriate technologies are used for beeping, buzzing, light emission and for transmission of SMS messages.

#### IV. CONCLUSION

Intelligent alerting system within a tag is necessary to alert the local or remote user about the environmental changes or events taking place in and around the TAG. A design framework is necessary that help building intelligence into Tags for alerting the environmental changes taking place to either or both the Local and remote user. The framework that considers various types of mechanisms and methods that can be built into a Tag to make it to be intelligent enough to communicate environmental changes either to a local user or remote user are presented in this paper

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