Implantable RFID Chips: Security versus Ethics

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Abstract. Implantable RFID chips are being seen as a potential security device in near future with the application oriented availability of these chips in marketplace. The applications are seen in a wide domain from health monitoring to emergency solutions, but there is a darker side with erosion of privacy and breach in the bodily integrity with implantation of such chips. The applications of the implantable RFID chips have been discussed with a look on the concerned technology. The legal and ethical aspects viz. a viz. the high end security offered by such implants has been discussed concerning the sensitive democratic society.

1   Introduction

With the growing need of automatic identification procedures, there has been a tremendous revolution in the applications of RFID technology with RFID tags replacing the Bar-code tags in the fastest growing retail industry [1]. The technology really helped in total management of the supply chain as well as the product outlets with least human support and an unbelievable speed. With a predicted $10-billion market over the next decade, RFID (Radio Frequency Identification) is a booming new wireless technology with an eager new audience ó retailers. The technology is transforming the way retailers receive, distribute, execute and merchandise good to customers. Retailers today are embracing RFID as an enabling technology that will provide them value beyond the supply chain. The focus has become transportation and logistics, healthcare and medical devices, pharmaceuticals, manufacturing, aviation & automotive sectors and food supply chain. Successful implementation

have already been done in cars for moving through the tolls, RFID enabled credit cards (e.g. MasterCardøs Paypass or Shell Oiløs easypay) to speed purchases or RFID-enabled transit passes like Londonøs Oyster card. RFID is used in all areas of automatic data capture allowing contact less identification of objects using RF. From global giant Wal-Mart down, RFID is being adapted to track inventories via microchip-tagged products. With applications ranging from secure internet payment systems to industrial automation and access control, RFID technology solutions are receiving much attention in the research and development departments of large corporations. Technology has seen a major application in auto ID, allowing emergency vehicles to safely trip traffic signals, and providing the technology behind contact less smart cards, "auto piloting" cars, and production automation etc. ,

2   Implantable RFID Chips

Apart from the commercial usage, direct applications of RFID technology to the human body are now being seen as the potential future application with availability of implantable RFID chips in marketplace [2][3]. Implantable RFID chips have already made their presence in the society with their practical usage in hospitals and well as industry. An implantable RFID chip, which is durable and about the size of a grain of rice, can hold or link to information about the identity, physiological characteristics, health, nationality, and security clearances of the person concerned. We can imagine the situations where the proximity of your hand could start your car or unlock your front door or let an emergency room physician know about the characteristics of an unconscious patient. The RFID technology [4][5] works on the principle of radio frequency transmission - reception. An RFID system is made-up of two components:

- o   *Transponder*, which is located on the object to be identified

- o   Detector or *reader* , which, depending upon design and the technology used, may be a read or write/read device

Reader typically contains a high frequency module (transmitter and receiver), a control unit and a coupling element to the transponder. In addition, many readers are fitted with an additional interface to enable it to forward the data received to another system (like personal computer). Transponder, which represents the actual data carrying device of an RFID system, normally consists of a coupling element and an electronic microchip. When the transponder, which does not usually possess its own voltage supply (battery), is not within the response range of a reader it is totally passive. The transponder is only activated when it is within the response range of a reader. The power required to activate the transponder is supplied to the transponder through the coupling unit (contact less) as is the timing pulse and data. The working of RFID technology is shown in Figure1.

3   Applications of Implantable RFID Chips

Human-centric applications of RFID [6] began in 1997 with a US patent for a õPersonal Tracking and Recovery Systemö. The applications are increasing day by day and have been reported well in literature[7-14]. At present the implantable chips are seen as a potential application of being used as a permanent identity card with no need to carry the documents. Once implanted, they will serve as any time, any where identity of the person concern and will be able to serve as a single replacement of a number of identity cards. The chips hass been used all for commercial, military as well as research applications. The VeriChip Corp. [15] is a major company dealing in the implantable chips. They have customized the devices for a number of applications like   (a)   secure patient identification helping at-risk patients get the right treatment when needed most (b)Infant Protection (c)Wander Prevention to keep their wander prone residents safe (d) Assetrac system for locating the assets (e)Tool and Equipment Management System that allows construction, maintenance and repair organizations to gain control of their tools and equipment inventory (f) Vibration Monitoring (g) Emergency Management solutions allow users to accurately manage, track, and inventory remains and evidentiary items associated with small incidents, crime scenes, or mass disasters etc. The company claims a number of successful implementations of the implantable devices. The applications are really wonderful and are a long step towards the world of automation

4 Futuristic Applications

The most important applications of implantable chips are still in the field of security management. These chips can have a potential role in the development of anti-terrorist security tools with automatic identification. For example, they are the most suitable for keeping a watch on the criminals in custody. As an experience, most of the big criminal tends to freed themselves form the custody or prison and this has been seen a number of times in India as well as other countries, so implantable RFID chips may be a great success to keep security watch on them. Also, these may serve to be of good usage for finding any security breach in the personal security of very-very important persons by automatically reporting their presence and activities. So, there are numerous of fruitful applications that can be explored from the RFID implantable chips technology and can be used for the welfare of the society. But the most commonly used technologies, always find a security threat by hackers always following the trends and these security hazards, when applicable to the RFID chips can lead to drastic irreversible implications as sensitivity of the information tend to be very high.

5 Health Effects

Normal RFID readers radiate electromagnetic (EM) field and magnetic (H) fields in the close proximity of the tag. These fields activate circuitry on the tags and the data stored in the tag is retransmitted to the reader. The frequencies used are 13.56 MHz and 915 MHz (UHF). A lot of research work has been carried to see the effect of electromagnetic radiation on human body (even the complete journals have been devoted to this field [16]), but no consistent results have been reported for the radiations in the range of frequencies being used by RFID. Also a study has been made to see the effect of radiation on the drug products having RFID tags for retail marketing. The results [17] show that the energy supplied by these is not sufficient to give rise to a chemical change. Thus presently there is no suitable evidence of the possible health hazards.

6 Ethical Issues

The important and main concerns about the implementation of this technology are the ethical and societal issues concerning the identity of human beings. As a small example with the growing need of identification, some of the educational institutes have installed biometric systems for attendance in India, but professors always a strong view against this concerning the disregard to highest respected profession. In such a sensitive society are we really ready to have the identity cards implanted directly in our body? The situation may be like the 24 hours slaves rather than an employee and the universal law of 8 hours work will not be valid. The personal life of the people may always be at the risk with continuous monitoring. Implantable devices have serious ethical consequences as these devices are accessible via digital networks. This may lead to a situation, where you are always insecure in your own secure home. Subcutaneous RFID implants make people-tracking possible without the need for any correlation of profiling data or misuse of data. Consequently, this threat may cause a direct conflict with individual liberties. Such implants have the potential to be a basis for cyber-racism, they may be used for changing the identity, memory, self perception and perception of others. In worst case, they may be used to enhance capabilities in order to dominate others. Such applications, similar to human cloning may tend to degrade the whole system. Thus the society really needs brainstorming to decide the applications and usability of the technology while maintaining the dignity and integrity of the individuals. As per the opinion of European group on ethics (EGE) [19] the implantation of ICT devices in the human body is governed by the principles that

    (a) The objective is important, like saving lives, restoring health and improving the quality of life.

    (b) Implant is necessary to achieve this objective

    (c) There is no less invasive and more cost effective method of achieving the objective.

The EGE makes a general point that non-medical applications of ICT-implants are a potential threat to the human dignity and democratic society. Therefore such applications should respect in all circumstances the principles of informed consent and proportionality. Such implants are the potential threat to human dignity when they are used for the surveillance purposes as they may be used by stat authorities, individuals and groups to increase their power over others. Hence the surveillance applications of ICT implants may only be permitted if the legislator considers that there is an urgent and justified necessity in a democratic society
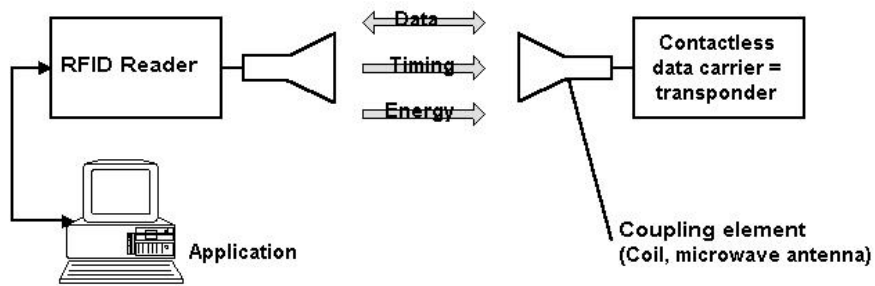
7 Conclusion

Privacy advocates raise in public awareness and aid in ensuring technology is deployed responsibly, but ultimately consumers will drive the use of technology through their behaviors, preferences and demands. The present work summarizes the key and futuristic applications of implantable RFID chips with a closer look on the ethical and legal aspects of such implants concerning the human society. It is concluded that the implantable RFID chip technology certainly has the potential to address the security concerns of present day information society. But at the same time the social and ethical issues (including the privacy and health issues) must be taken care of before the implementation.

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Figure 1 Working of RFID