International Journal of Ethics in Engineering & Management Education
Website: www.ijeee.in (ISSN: 2348-4748, Volume 2, Issue 8, August 2015)

Environment Monitoring and Device Control Using Arm Based Embedded Controlled Sensor Network

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Abstract: - **Environment monitoring and device control allows new level of comfort in homes and it can also manage the energy consumption efficiently which in turns promotes the saving. Remote controlling of the devices offers many advantages to senior citizens and people with disabilities which helps them in being more autonomous and increasing quality of life. In addition to remote control, monitoring temperature, flood and carbon monoxide in homes is also a major concern. There is a severe need to monitor temperature or gases as they can be costly and deadly. A monitored low temperature sensor warns about freezing temperatures inside house. Also if the boiler, washer or pipes leaks in the home, it can cause considerable damage. Researchers have worked on home automation and environmental monitoring system in the past but in the existing systems cost is high, size is an issue and they are difficult to maintain. The proposed system is cost effective and controlled by user friendly embedded systems.**

Keywords:- **e-Environment monitoring, ARM based embedded network, Wireless network & RCV.**

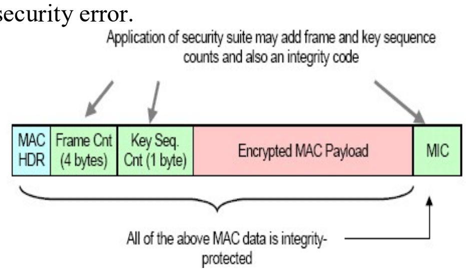
1. INTRODUCTION

When security of MAC layer frames is desired, ZigBee uses MAC layer security to secure MAC command, beacon and acknowledgement frames. ZigBee may secure messages transmitted over a single hop using secured MAC data frames, but for multi-hop messaging ZigBee relies upon upper layers (such as the NWK layer) for security.

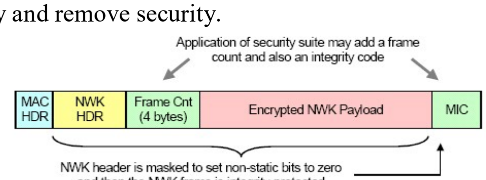
The MAC layer uses the Advanced Encryption Standard (AES) as its core cryptographic algorithm and describes a variety of security suites that use the AES algorithm. These suites can protect the confidentiality, integrity and authenticity of MAC frames. The MAC layer does the security processing, but the upper layers, which set up the keys and determine the security levels to use, control this processing.

When the MAC layer transmits (receives) a frame with security enabled, it looks at the destination (source) of the frame, retrieves the key associated with that destination (source) and then uses this key to process the frame according to the security suite designated for the key being used. Each key is associated with a single security suite and the MAC frame header has a bit that specifies whether security for a frame is enabled or disabled.

When transmitting a frame, if integrity is required, the MAC header and payload data are used in calculations to create a Message Integrity Code (MIC) consisting of 4, 8, or 16 octets. The MIC is right appended to the MAC payload. If confidentiality is required, the MAC frame payload is also left appended with frame and sequence counts (data used to form a nonce). The nonce is used when encrypting the payload and also ensures freshness to prevent replay attacks. Upon receipt of a frame, if a MIC is present, it is verified and if the payload is encrypted, it is decrypted. Sending devices will increase the frame count with every message sent and receiving devices will keep track of the last received count from each sending device. If a message with an old count is detected, it is flagged with a security error.



When the NWK layer transmits (receives) a frame using a particular security suite it uses the Security Services Provider (SSP) to process the frame. The SSP looks at the destination (source) of the frame, retrieves the key associated with that destination (source), and then applies the security suite to the frame. The SSP provides the NWK layer with a primitive to apply security to outgoing frames and a primitive to verify and remove security.



An embedded sensor network is a network of embedded computers placed in the physical world that interacts with the environment. These embedded computers, or sensor nodes, are often physically small, relatively inexpensive computers, each with some set of sensors or actuators. These sensor nodes are deployed in situ, physically placed in the environment near the

objects they are sensing. Sensor nodes are networked, allowing them to communicate and cooperate with each other to monitor the environment and (possibly) effect changes to it. Current sensor networks are usually stationary, although sensors may be attached to moving objects or may even be capable of independent movement. These characteristics: being embedded, and being capable of sensing, actuation, and the ability to communicate, define the field of sensor networking and differentiate it from remote sensing, mobile computing with laptop computers, and traditional centralized sensing systems. Although research in sensor networks dates back to the 1990s or earlier, the field exploded around the year 2000 with the availability of relatively inexpensive (sub-$1000) nodes, sensors, and radios. As of 2004, sensor networking is a very active research area with well-established hardware platforms, a growing body of software, and increasing commercial interest. Sensor networks are seeing broader research and commercial deployments in military, scientific, and commercial applications including monitoring of biological habitats, agriculture, and industrial processes. Sensor networks present challenges in three key areas. First, energy consumption is a common problem in sensor network design. Sensors are often battery operated and placed in remote locations, so any activity drains the sensor battery, and bringing the node closer to death [54]. Second, how sensors.
The sensor network community is investigating several disciplines in which sensor networks might be applicable for various purposes.

The following paragraphs discuss these potential applications briefly, sketching applications in the military, the sciences and environmental monitoring, and civil and industrial areas. For many of these applications, sensor networks will enable in situ sensing at unprecedented spatial scales. Military applications Military applications supported much early work in sensor networks. Securing an area to detect intruders and monitoring vehicle traffic on a road or in open terrain were a focus of the DARPA SensIT program. More recently researchers have demonstrated a sensor-network-based sniper localization system [66]. Environmental monitoring applications many current applications for sensor networks are in areas of biology and life sciences, where a common theme is the ability of sensors to take observations in much more detail and for much longer than is possible today. We briefly evaluate habitat monitoring, marine microorganism monitoring, contaminant transport, and precision farming. Habitat monitoring has been the focus of great interest in the sensor network community [71]. Examples include micro-climate monitoring at James Reserve [11], nest monitoring at Great Duck Island [46]. These applications provide an ideal testing ground for sensor networks because they require fairly simple monitoring (light, temperature, sound, perhaps presence or absence of an animal) at tens of stations. This level of monitoring is not possible without sensor networks because human observations would be too invasive to the environment and centralized or wired monitors cannot span the physical area. Marine biologists envision using sensor networks to obtain data at fine spatial scales (a few meters to tens of meters). There is a need for such data in their application domain, and current instrumentation technology is inadequate or too expensive to fulfill this need. The time evolution of red tides (rapidly formed colonies of algae that are harmful to fish and birds) is poorly understood, and appears to be triggered by small scale temperature, light, and nutrient variations. Sensor networks can be deployed at this scale, and have been used in a laboratory setting to gather data. An interesting twist is the addition of limited actuation to such networks, where the sensors may move (e.g., in a small boat) a little in order to obtain better quality data or to vary spatial coverage. A similar use is envisioned by environmental engineers, who see sensor networks helping them build accurate models of contaminant seepage in soil. Data at fine spatial scales can be used to more precisely model contaminant flow [27] and thus predict contamination of scarce groundwater resources. In the longer term, such networks can be used for monitoring the compliance of industries to regulations that govern the release of contaminants into the soil. A closely related area is precision farming, where detailed monitoring enabled by dense sensor deployment could allow more effective use of fertilizers.

Civil and commercial applications Finally, there is growing interest in sensor networks in civil engineering and industrial applications. Seismologists envision using sensor networks to understand the propagation of earthquakes at fine spatial scales. This propagation is critically affected by soil conditions, and can impact how much earthquakes affect buildings and other structures. A related application is structural monitoring [9]: sensor networks can be used to measure the response of a building to vibrations, and the variation of these responses over time can be used to detect and localize damage in a variety of structures (buildings, bridges, ships). Transportation networks are an important economic part of all cities, and it is not surprising that there is a fairly large investment in traditional fixed sensors and centralized traffic monitoring systems. Researchers are exploring how sensor networks can augment this infrastructure in two different ways. Rapidly deployable sensor networks for traffic monitoring may be useful to temporarily collect data for development or pollution-related traffic studies in areas that do not warrant long-term monitoring [25]. More radically, several research groups have proposed a future where each car has its own sensors that can communicate with nearby cars, avoiding centralized management and enabling new applications. Finally, there is growing interest in industrial applications of sensor networks to closely monitor manufacturing and safety conditions. Although these applications are just now emerging, promising areas include industrial monitoring in the oil industry (Ember), environmental monitoring in semiconductor processing facilities (Intel), and even monitoring of art in museums.

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CONCLUSION

This paper has surveyed embedded sensor networks. With recent hardware advances for small, inexpensive, networked sensors, a growing body of software components to link them together into a whole, and applications in many areas, embedded sensor networks are an active and growing area of embedded computing.

REFERENCES

[1]. H. Abrach, S. Bhatti, J. Carlson, H. Dai, J. Rose, A. Sheth, B. Shucker, J. Deng, and R. Han. MANTIS: System support for MultimodAl NeTworks of In-situ Sensors. In Proceedings of the 2nd ACM Workshop on Sensor Networks and Applications, pages 50–59, San Diego, CA, USA, Sept. 2003. ACM.
[2]. P. Bahl and V. N. Padmanabhan. RADAR: An in-building RF-based user location and tracking system. In Proceedings of the IEEE Infocom, pages 775– 784, Tel Aviv, Israel, Mar. 2000. IEEE.
[3]. P. Bose, P. Morin, I. Stojmenovic, and J. Urrutia. Routing with guaranteed delivery in ad hoc wireless networks. In Proceedings of the Third ACM International Workshop on Discrete Algorithms and Methods for Mobile Computing and Communications (Dial M), pages 48–55, Seattle, WA, USA, Aug. 1999. ACM.
[4]. A. Boulis, C.-C. Han, and M. B. Srivastava. Design and implementation of a framework for efficient and programmable sensor networks. In Proceedings of the ACM/Usenix International Conference on Mobile Systems, Applications, and Services (MobiSys), pages 187–200, San Francisco, CA, USA, May 2003. ACM.
[5]. L. Breslau, D. Estrin, K. Fall, S. Floyd, J. Heidemann, A. Helmy, P. Huang, S. McCanne, K. Varadhan, Y. Xu, and H. Yu. Advances in network simulation. IEEE Computer, 33(5):59–67, May 2000. (An expanded version is available as USC CSD TR 99-702b.).
[6]. J. Broch, D. A. Maltz, D. B. Johnson, Y.-C. Hu, and J. Jetcheva. A performance comparision of multi-hop wireless ad hoc network routing protocols. In Proceedings of the ACM International Conference on Mobile Computing and Networking, pages 85–97, Dallas, Texas, USA, Oct. 1998. ACM.
[7]. N. Bulusu, J. Heidemann, and D. Estrin. GPS-less low cost outdoor localization for very small devices. IEEE Personal Communications Magazine, 7(5):28–34, Oct. 2000.
[8]. N. Bulusu, J. Heidemann, D. Estrin, and T. Tran. Self-configuring localization systems: Design and experimental evaluation. ACM Transactions on Embedded Computing Systems, 3(1):24–60, Feb. 2004.
[9]. J. Caffrey, R. Govindan, E. Johnson, B. Krishnamachari, S. Masri, and G. Sukhatme. Networked Sensing for Structural Health Monitoring. In Proceedings of the Fourth International Workshop on Structural Monitoring and Control, June 2004.
[10]. S. Capkun, M. Hamdi, and J. P. Hubaux. GPS-Free Positioning in Mobile Ad-Hoc Networks. Cluster Computing, 5(2), April 2002. 16 John Heidemann and Ramesh Govindan
[11]. A. Cerpa, J. Elson, D. Estrin, L. Girod, M. Hamilton, and J. Zhao. Habitat monitoring: Application driver for wireless communications technology. In Proceedings of the ACM SIGCOMM Workshop on Data Communications in Latin America and the Caribbean, San Jose, Costa Rica, Apr. 2001. ACM.
[12]. J. Chen, L. Yip, J. Elson, H. Wang, D. M. R. Hudson, K. Yao, and D. Estrin. Coherent Acoustic Array Processing and Localization in Wireless Sensor Networks. Proceedings of the IEEE, 2003.
[13]. K. Chintalapudi and R. Govindan. Localized Edge Detection in Sensor Fields. Ad-hoc Networks Journal, 2003.
[14]. W. S. Conner, J. Chhabra, M. Yarvis, and L. Krishnamurthy. Experimental evaluation of synchronization and topology control for in-building sensor network applications. In Proceedings of the Second ACM Workshop on Sensor Networks and Applications, pages 38–49, San Diego, CA, USA, Sept. 2003. ACM. Crossbow Technologies. http://www.xbow.com/.
[15]. L. Doherty, K. S. J. Pister, and L. E. Ghaoui. Convex position estimation in wireless sensor networks. In Proceedings of the IEEE Infocom, pages 1655–1663, Anchorage, Alaska, USA, Apr. 2001. IEEE. Dust Networks. http://www.dust-inc.com/.
[16]. J. Elson and D. Estrin. Time synchronization for wireless sensor networks. In Proceedings of the 15th IEEE International Parallel and Distributed Processing Symposium, pages 1965–1970, San Francisco, CA, USA, Apr. 2001. IEEE.
[17]. J. Elson, L. Girod, and D. Estrin. Fine-grained network time synchronization using reference broadcasts. In Proceedings of the Fifth Symposium on Operating Systems Design and Implementation (OSDI 2002), Boston, MA, December 2002. Ember. http://www.ember.com/.
[18]. S. Ganeriwal, R. Kumar, and M. B. Srivastava. Timing-sync protocol for sensor networks. In Proceedings of the First International Conference on Embedded Networked Sensor Systems, pages 138–149. ACM Press, 2003.
[19]. D. Ganesan, D. Estrin, and J. Heidemann. DIMENSIONS: Why do we need a new data handling architecture for sensor networks? In Proceedings of the ACM Workshop on Hot Topics in Networks, pages 143–148, Princeton, NJ, USA, Oct. 2002. ACM.