# Enabling Internet of Things to Rejuvenate Survival Guidance using SHOS

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***Abstract*-In the 21st era, people need everything to be operated in their hands. People are in search of some technologies that help them to interact with everything at anytime and anywhere. The Internet of Things focus on this and it aims at establishing the interconnection of living things, non-living things and also some times the environment. The work focuses on developing smart home operating system is to make the user to interact with everything in and around the home through any network with a proper authentication. This paper proposes a smart home operating system which is coupled with IoT to make the concept of smart home as more efficient, comfortable and secured. This will leads to reduce the effort of developers in smart home development.**

***Keywords: SHOS, IoT, Objects, Manager, Sensors, Care givers.***

## I. INTRODUCTION

Modern people want to simplify their day-to-day work and they like to do anything from anywhere at any time. Many technologies are evolving to achieve this goal but still something remains non-supportive to fulfill the people needs. Internet remains to be the medium through which the activities can be triggered. But, still human interaction seems to be the baseline for this. With proper human monitoring and human interaction everything seems to be alive. Internet of things is an intelligence computing provides the privilege to communicate with anybody, anything and anywhere across the globe.

Fig.1 clearly shows the objectives of SHOS that connects everything from anywhere at any time through any network. This paper propose a novel architecture called Smart Home Operating System (SHOS) which is combined with Internet of Things drives any service from anywhere in the world. Proposed architecture aims to provide three major services such as

- Resource usage (water conservation and energy consumption etc)
- Security
- Comfort (For caregivers and disabled persons)

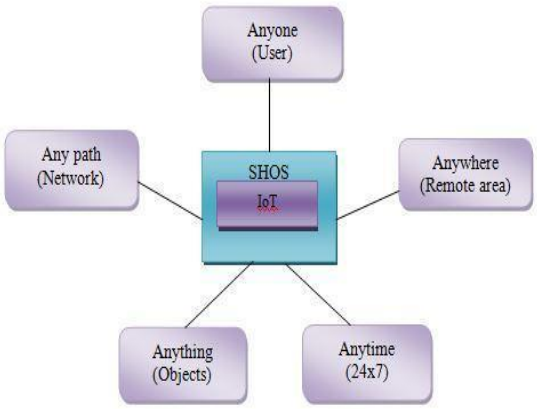


Fig.1. Objectives of Smart Home Operating System

This architecture mainly focuses on these three features. An authorized user can check and control the objects within the building, can provide time bound services to the caregivers and they can enable or disable the security options. The user commands are captured and processed by SHOS. As per the user command the objects are triggered by the SHOS. This system takes control over all the objects in and around the building. It is a centralized system which interconnects all the objects and the authorized users who are belonging to the home. It provides comfortable access to the authorized user through any network (For example the user can access the objects through Bluetooth when they inside the home and they can access the objects through internet or GSM network when they are outside the home). On the other hand this system helps the smart home developer to avoid implementing lower level functionalities at every time because this system implements all the lower level functionalities as inbuilt features. The developer can invoke the functionalities for further development or modifications.

## II. RELATED WORKS

Currently various research where identified in smart home development with very few being handled. Barriers such as high cost of owner ship, inflexibility, poor manageability and security are considered and are being tackled to the certain architecture limit.

The Internet of Things is a new era of intelligence computing and it‘s providing a privilege to communicate around the world. The objective of IoT is Anything, Anyone, Anytime, Anyplace, Anyservice and Anynetwork .

Alberto M.C et al. proposed an architecture for accessing smart home devices through web clients. The paper uses LinkSmart Middleware layer to create interface between web server and embedded system unit. The embedded system physically connects with web server and act as a gateway to the devices [2].

Ming Wang et al. [3] developed smart central controller to set up a radio frequency 433 MHz wireless sensor and actuator network (WSAN). A series of control modules, such as switch modules, radio frequency control modules, have been developed in the WSAN to control all kinds of home appliances directly. Application servers, client computers, tablets or smart phones can communicate with the smart central controller through a wireless router via a Wi-Fi interface.

Yepeng Ni and Sun Yi et al. [4], [5] introduced lightweight Wi- Fi–ZigBee wireless home gateway to access smart home devices. ZigBee technology used to transmit the data collected from the node network to the embedded gateway, and then communicates with the monitoring PC by Wi-Fi network. Wi-Fi module used to send commands from monitoring PC to ZigBee network, and then control home device.

According to Ala Al-Fuqaha [6] ,IoT devices can be classified into two major categories; namely: resource-constrained and resource-rich devices. We define resource-rich devices as those that have the hardware and software capability to support the TCP/IP protocol suite. On de- vices that support the TCP/IP protocol suite, IoT applications are implemented on top of a variety of application level protocols and frameworks including REST, CoAP, MQTT, MQTT-SN, AMQP and others. On the other hand, devices that do not have the required resources to support TCP/IP cannot inter operate easily with resource-rich devices that support the TCP/IP suite.

In contrast to Weiser‘s Calm computing approach,

Rogers proposes a human centric ubicomp which makes use of human creativity in exploiting the environment and extending their capabilities. He proposes a domain specific ubicomp solution when he says—‗In terms of who should benefit, it is useful to think of how ubicomp technologies can be developed not for the Sal‘s of the world, but for particular domains that can be set up and customized by an individual firm or organization, such as for agricultural production, environmental restoration or retailing‘‘ [7].

From the hardware point of view, [8] the Internet of Things is composed of heterogeneous hardware - even more than in the traditional Internet. IoT devices can be classified in two categories, based on their capability and performance. The first category consists in high-end IoT devices, which includes single-board computers such as the Rasberry Pi, and smartphones. High-end IoT devices have enough resources and adequate characteristics to run software based on traditional Operating Systems (OSs) such as Linux or BSD.

In general IoT [9] can be described as a combination of Sensors, Connectivity and People & Processes. IoT combines smart devices with smart services to create compound applications for example intelligent transportation, smart cities, smart healthcare, smart home, smart building, digital farm, smart agricultural etc. IoT delivers on demand real-time services and assists in saving time, resources and even manpower. This comprehensive literature review explores the impact of IoT technology in several fields.

Tuhin Borgohain [10] describes that OS available for the resource constraint IoT environment along with the various platforms each OS supports, the software development kits available for the development of applications in the respective OS‘es along with the various protocols implemented in these OS‘es for the purpose of communication and networking.

## III. STRUCTURE OF SMART HOME OPERATING SYSTEM

The proposed architecture uses layer of abstraction among different services. Here each layer contains several functionalities as modules which are combined to achieve the needed services from remote area. This architecture incorporates six basic layers namely,

1. Object manager
2. Network manager
3. Security manager
4. Time manager
5. Process manager
6. Resource manager

The proposed work enables the user to communicate with all non-living things in the environment through the SHOS. The authorized users can control and monitor various objects and resources from anywhere at any time through any network. SHOS introduces the agents called sensors which senses the environmental status in and around the building and sends the report to the user. IoT is a convergence of various technologies such as artificial intelligence, pervasive computing, ubiquitous computing which gives a way to communicate with the non-living world. Sensors and embedded devices are the physical components which provide direct interaction with the objects. Internet protocols act as a communication platform.

SHOS manages objects through object manager. This layer contains the drivers for all the objects in and around the home. It defines the lower level activities of all the objects. This layer tracks all objects continuously. It decides

which process gets the object when and how much time. It allocates the object in efficient way and more secured. The program responsible for these tasks is called object driver. Each object has a separate object driver. SHOS interprets the user request and send it as a lower level command to the object driver. The driver will make changes in object status like ON and OFF.

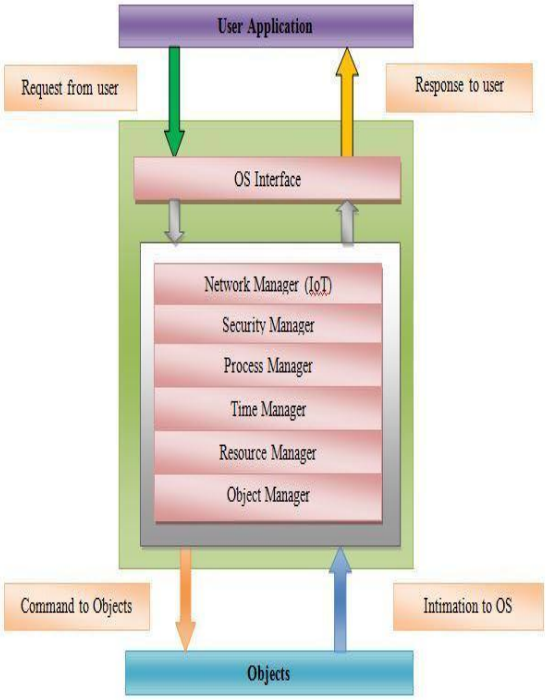


Fig.2. Architecture of Smart Home Operating System

### A. *Object Manager*

The objects like sensors and camera are used to secure the system. These objects always keep track the environment and send the environment status in the home to SHOS; this layer also defines the input formats of those objects. This layer is responsible to intimate the status of environment to the security manager and other layers in the SHOS.

### B. *Network Manager*

SHOS establishes the interconnection between objects and user through the network manager. This layer defines the Internet protocols and all other network communication protocols. It is implemented with Internet of Things (IoT) to provide access to the user through various available networks. This supports both wired and wireless technology that enables the communication between the objects.

### C. *Security Manager*

Smart home is a secured environment that quickly senses the entry of third party inside the building and protects the objects in the home from the access of unauthorized users through the network. At the backend, the repository holds the biometric information of the authenticated occupants for providing security. The agents like sensors keenly investigate visitors by comparing the information in the database which is defined by the security manager. The major goal of security manager could be viewed in three aspects namely,

- Restricts the unauthorized users
- Safety measure against fire and electrical disaster
- Various level of security to children and caregivers

The user can enable or disable the security options which are defined by the SHOS and they can add new security features to the security manager.

### D. *Time Manager*

Remote users need a technology to drive time bound services for children and caregivers. The proposed architecture provides the way to achieve these services through this time manager layer. This layer is intended to provide the below services as modules,

- Automatic trigger to initiate a service for caregivers and children
- Remainder to the objects and users
- Performs the tasks as per the time schedule

### E. *Process Manager*

A process in terms of smart home is performing user service and continuous monitoring of environment by the agents like sensors. Process manager the paves the way for establishing multitasking/multiprocessing environment. This layer decides the services with respect to time and priority. It handles the overhead of the incoming request for the services. Since priority scheduling is considered for security the process can be preempted to provide better time bound service on request.

### F. *Resource Manager*

The various resources in the home are water, electricity and other energy resources. These resources can be utilized in efficient manner and could not be wasted. This resource manager ensures the environmental protection against usage of conventional energy resources. It is mainly focused on electricity and water. In terms of water this resource manager will keep track on available water source and maintain it. It is responsible to intimate the level of water in the tank and leakage of water in the pipelines by this manager. In terms of electricity, all the objects like appliances are driven through electricity. This layer can act as a brain of electrical circuits inside the home. It has the responsibility to handle the fluctuation in voltage and notifies the changes. It finds the current leakage in the circuit. It automatically use alternate power source in case of power cut.

## IV. FUTURE ENHANCEMENT

The proposed SHOS architecture derives the entire activity within home to be remotely operated. The same work can be enhanced to support the development of smart cities which would be a demand in the upcoming digital era. All the manual work could be automated and are remotely controllable. Thus the developed architecture seems to be the frame work over which much additional functionality can be added.

## REFERENCES

[1] White Paper: ―Internet of Things Strategic Research Roadmap‖, Antoine de Saint- Exupery , 15 sep 2009.
[2] Souza, Alberto M.C. Amazonas, Jose R.A. ―A Novel Smart Home Application Using an Internet of Things Middleware‖, Proceedings of 2013 European Conference on Smart Objects, Systems and Technologies (SmartSysTech), pp. 1 – 7, June 2013.
[3] Ming Wang, Guiqing Zhang, Chenghui Zhang, Jianbin Zhang, Chengdong Li. ―An IoT-based appliance control system for smart homes‖, Fourth International Conference on Intelligent Control and Information Processing (ICICIP), pp. 744 – 747, June 2013.
[4] Yepeng Ni, Fang Miao, Jianbo Liu, Jianping Chai. ―Implementation of Wireless Gateway for Smart Home‖, Communications and Network, pp. 16-20, 2013.
[5] Sun Yi, Xu Chengwen, ―The research of Bridge state monitoring system based on IOT technology‖, IEEE International Conference on Advanced Management Science (ICAMS), Vol.3, pp. 87 – 90, July 2010.
[6] Internet of Things: A Survey on Enabling Technologies, Protocols, and Applications Ala Al-Fuqaha, Senior Member, IEEE, Mohsen Guizani, Fellow, IEEE, Mehdi Mohammadi, Student Member, IEEE, Mohammed Aledhari, Student Member, IEEE, and Moussa Ayyash, Senior Member, IEEE
[7] Internet of Things (IoT): A vision, architectural elements, and future directions Jayavardhana Gubbi, Slaven Marusic , Marimuthu Palaniswami , Department of Computing and Information Systems, The University of Melbourne, Vic - 3010, Australia, Rajkumar Buyya, Department of Electrical and Electronic Engineering, The University of Melbourne, Vic - 3010, Australia
[8] Oliver Hahm, Emmanuel Baccelli, Hauke Petersen, Nicolas Tsiftes. Operating Systems for Low-End Devices in the Internet of Things: a Survey. IEEE Internet of Things Journal, IEEE, 2015, <10.1109/JIOT.2015.2505901>. <hal-01245551>
[9] Volume 5, Issue 8, August 2015 ISSN: 2277 128X International Journal of Advanced Research in Computer Science and Software Engineering Research Paper- Harnessing the Internet of Things (IoT): A Review- Timothy Malche, JCCC, Jabalpur, MP, India, PritiMaheshwaryAisect University, Bhopal, MP, India
[10] Int. J. Advanced Networking and Applications Volume: 6 Issue: 5 Pages: 2479-2483 (2015) ISSN: 0975-0290 2479 Survey of Operating Systems for the IoT Environment Tuhin Borgohain Department of Instrumentation Engineering, Assam Engineering College, Guwahati, India, Uday Kumar Tech Mahindra Limited, Chennai, India, Sugata Sanyal Corporate Technology Office, Tata Consultancy Services, Mumbai, India.