

Implementation of Smart School System by Combining Multiple Systems to Improve the Administrative Services using Packet Tracer 7.2

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Abstract

The smart system is an emerging technology in this century. This paper proposed smart systems for the education field. The proposed system based on a combination of Security system, Lightning system, Ventilation system, Irrigation systems, Remote-control system, and Fire detector system, to achieved smart school, to facilitate monitored and controlled smart devices through the smartphone, Server and microcontroller. Using IOT devices in the Education environment offer time, increase security, and production. The proposed Smart school system achieved the ability to monitor the school remotely and less effort and protected school from unauthorized people and risk of high temperature that lead to fires School employees were exposed to great danger.

Key words:

IOT, Smart, Gateway, Microcontroller, Server.

1. Introduction

The world began to change rapidly since the advent of the Internet, where the emergence of this technology constituted a major shift in the human lifestyle, and the Internet became a necessary and integral part of an individual's life. The Internet has made the world like a small village, whose people communicate with each other easily and quickly. And make the completion of many scientific and practical tasks easier.[1] Internet of Things technology enables monitoring and control using the Internet [2]. The IoT started in the year 1998, and the term internet of Things was first coined by Kevin Ashton in 1999[3] The Internet of Things (IoT) refers to an advanced connection to various devices and systems, making these devices accessible to the user anytime and anywhere. The IoT is associated with many fields, such as education, industry, security and protection, healthcare, military, and agriculture systems, and reduced the time, efforts, and offers many benefits for the user [4][5]. The smart school system consists of smart objects to improve

school activities in advance. The smart school system consists of things that improve school the .activities in advance. It can be automating activities of the school as monitoring environment conditions by various sensors (Temperature, Humidity, smoke, wind, sound). The smart school system makes the principal manage the school, monitor, and remotely control the school [6]. The motivation of this work is to make a school smartly as there is rapid advance in technologies. Smart schools can achieve using different technologies [7]. aimed at improving the safety, efficiency, and comfort. The paper consists of the following: Next section presents the related work on Smart Systems Section 3 describes the methodology used to Design smart school. Section 4 presents the results of the proposed smart system. Finally, section 5 represents the conclusion.

2. Related Work

In [8], the authors present an overview of the components of the intelligent energy control in buildings for smart cities. The IoT architecture model described in which things, people, and cloud services combined to facilitate application tasks

In [9] the author presents a case application of a socio-technical framework to assess and predict the development of the Internet of Things (IoT). A clear understanding of how the IoT will evolve and stabilize in a smart environment has been presented. The study has also provided insights into the challenges and opportunities of the case application.

In [10], the authors proposed a simulation model to provide communication with remote sites at the Pabna University of Science and Technology network. The model was called UNAS and; was simulated using Cisco Packet Tracer. Moreover, the model covered multiple aspects such as the configuration of the IP address, the network

topology, the approach of sending data in a single network, and how the traffic of different departments can be separated using a virtual Local Area Network.

In [11], the authors used Cisco Packet Tracer on two levels. The first level, to identify the issues of the network of the National Open University Sokoto Study Center. The second one, to introduce a solution for security issues, network performance, and bandwidth.

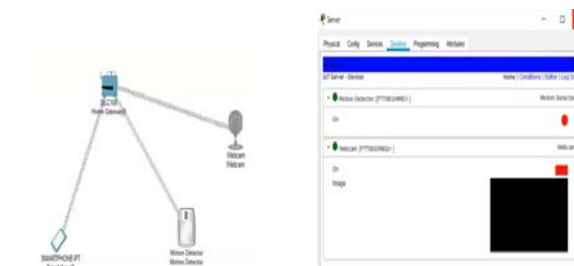
In [12], the authors implemented an integrated university network design using Cisco Packet Tracer. The proposed network used wired and wireless topology. It applied several services such as VLANs, DNS, DHCP, and Email. The configurations of routers and switches also was identified. Moreover, they took into consideration the cost; and the security services such as firewalls, backup, and virtual switch.

3. Methodology

The proposed Smart system consists of six subsystems involved security system, Lightning system, Ventilation system, Irrigation system, Remote-control system, and fire detector system as follow:

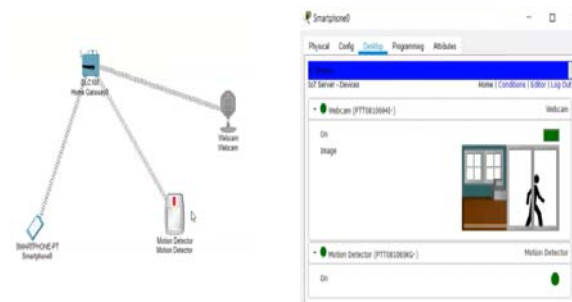
3.1 Security system

The Security system designed using Web camera and Motion Detection to detect the movement of people outside the school throw smartphone application shown in figure1, the response of smartphones when the Motion detection unauthorized person.



(a) Security system Passive

(b) Smartphone response interface



(c) Security system Active

(d) Smartphone response

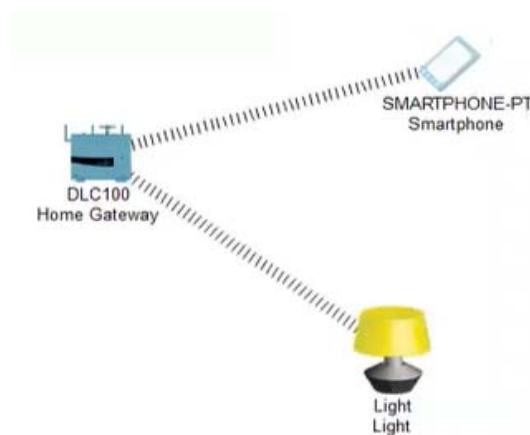
Fig 1. Proposed smart school security system

3.2 Lightning system

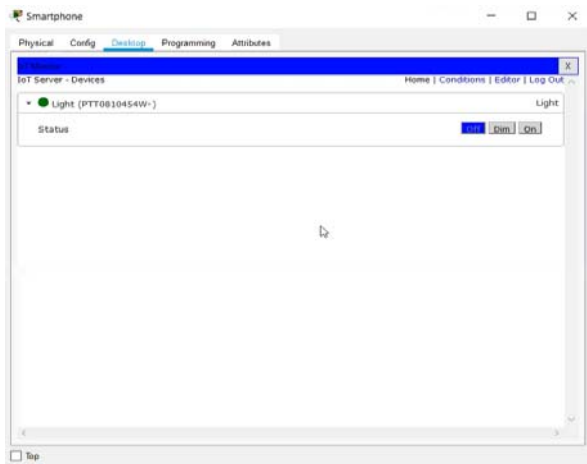
The lightning systems classified into two categories:

3.2.1 Lightning system using a smartphone

It enabled the response to control the opening and closing of the lamp remotely throw the smartphone, which saves effort, time and knows the status of lighting devices through the smartphone, that provide protection for the building as well as in Figure2



(a) Lightning smart system using smartphone



(b) Smartphone lightning system interface

Fig. 2 Smartphone lightning using smart phone

3.2.2 Lightning system using MUC:

It used Microcontroller to control the lamb. The MUC was programable as shown in figure 3 to closed and open the light depend on the specific time the figure 4 shown the lightning automatic system status.

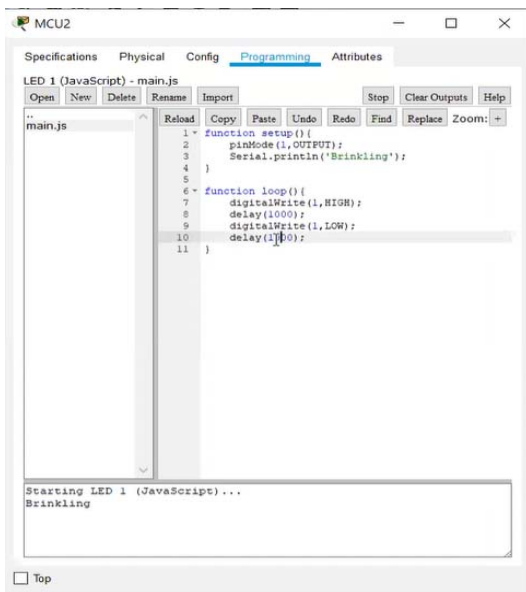


Fig3.Programing window for Microcontroller



(a) Lightning smart system on



(b) Lightning smart system off

Fig 4. Proposed Automatic Lightning system

3.3 Ventilation system

The ventilation system in Figure 5, using a smartphone in figure 6.

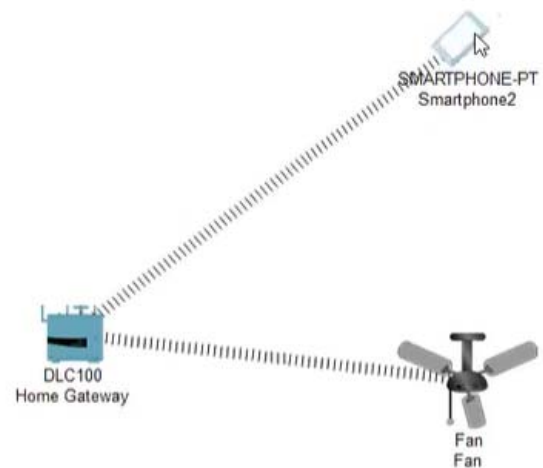


Fig 5. Proposed ventilation system



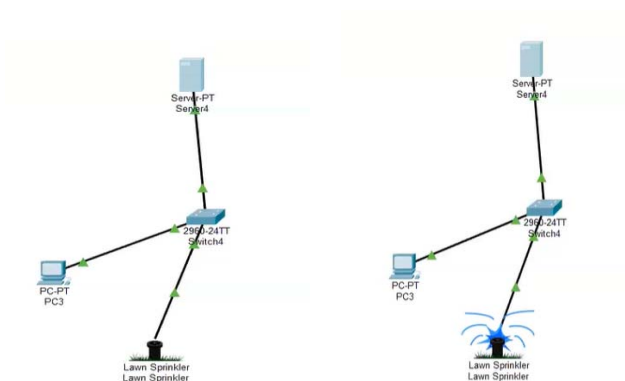
Fig 6 Smartphone ventilation system interface

3.4 Irrigation systems

The irrigation systems classified into two subsystems as Follow:

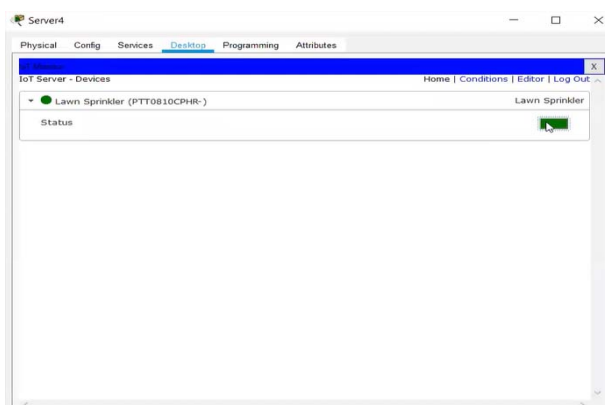
3.4.1 Irrigation system using server

Using a server inside the school is shown in figure 7, to control the school garden irrigation.



(a)Irrigation system switch off

(b)Irrigation system switch on

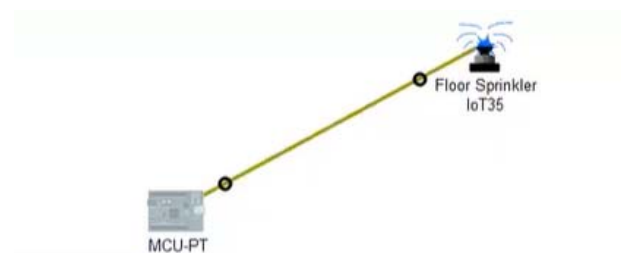


(c) Server irrigation system interface

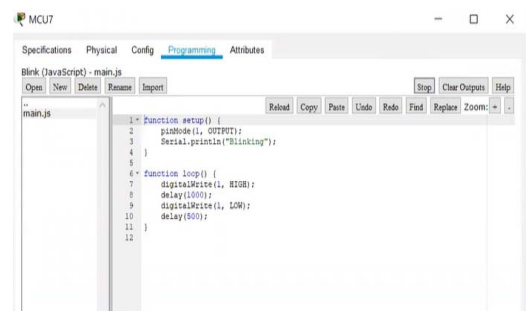
Fig 7. Proposed Irrigation system using Server

3.4.2 Irrigation system using MUC

Using a microcontroller inside the school is shown in figure 8, to control the school garden irrigation.



(a)Automatic Irrigation system using MUC

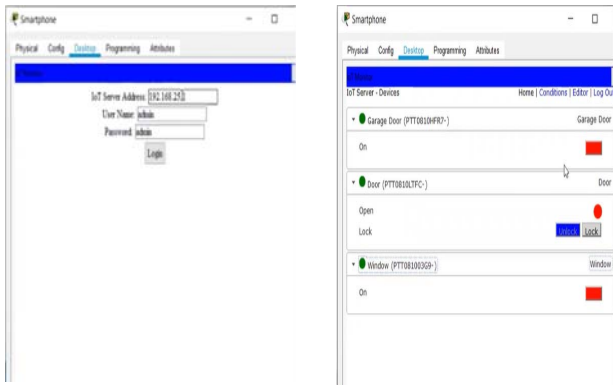


(b) MUC irrigation system Programming

Fig 8. Proposed Irrigation system using MUC

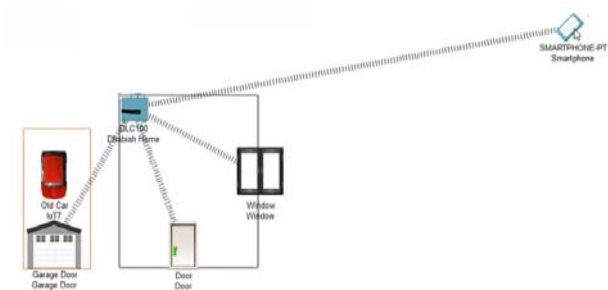
3.5 Remote-control system

It remotely controls the opening, closing of the door, and windows. It allows monitored as well as detecting their status if they were closed or open, which enhances safety as well using different components, and remote-control system designed through the smartphone interface in figure 9.



(b) Access smartphone u

(c) Smartphone remote control system interface



(a). Proposed remote control system

Fig 9. Proposed remote control system

3.6 Fire detector system

The fire detection system is a significant subsystem in a smart school, protects children and safe their life. The proposed fire detector system figure10., and figure 11 illustrate fire detector system status A and B.

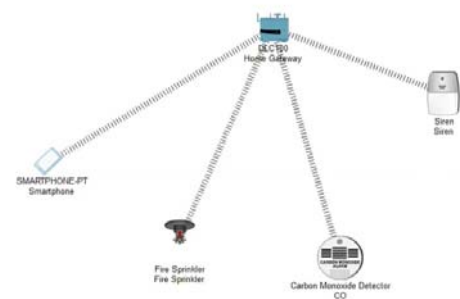
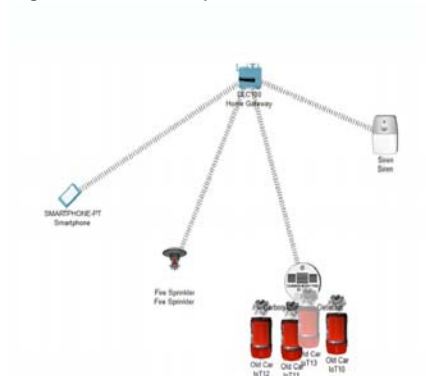
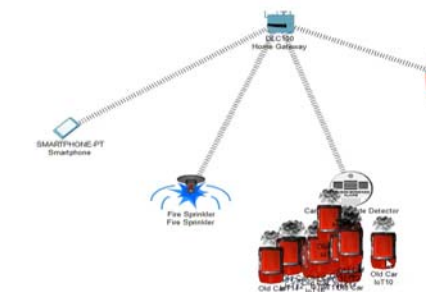


Fig 10. Proposed Fire detector system



(a) Fire detector system status A



(b) Fire detector system status B

Fig 11. Fire detector system States

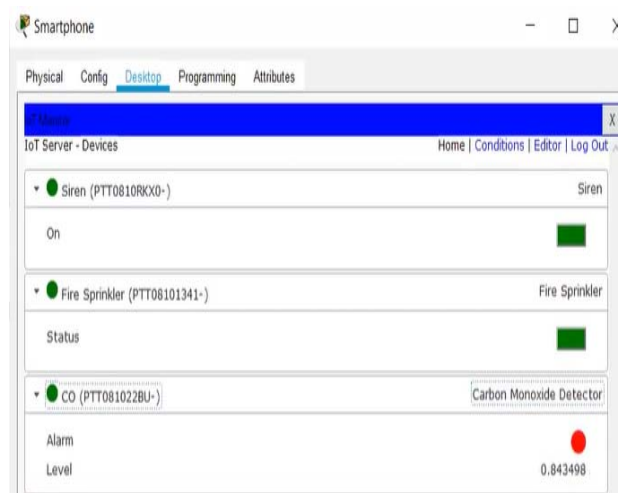


Fig 12. Smartphone interface for Fire detector system

4 Result and discussion

We proposed a smart system for the school by design integrated systems, that contains multiple systems securities, lighting, ventilation, irrigation, and remote-control system for closing and opening doors and windows. It designs a smart school system using a simulation program Packet Tracer 7.2 [13][14], the Smart school system used as a set of components shown in table 1. The system designed for smart school is shown in figure 13 through smartphone figure 14 and server figure 7.

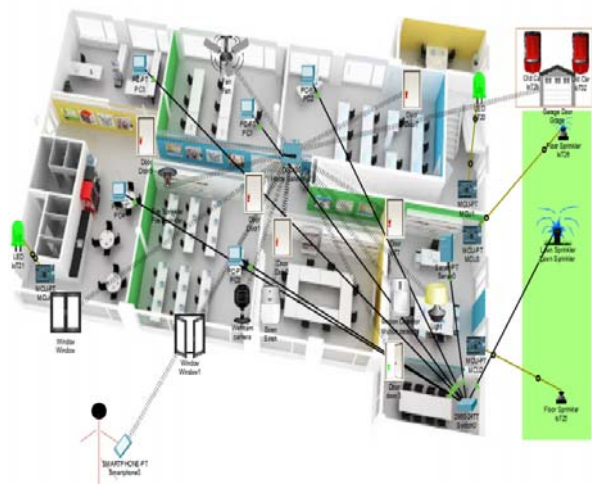


Fig 13. Proposed smart school system

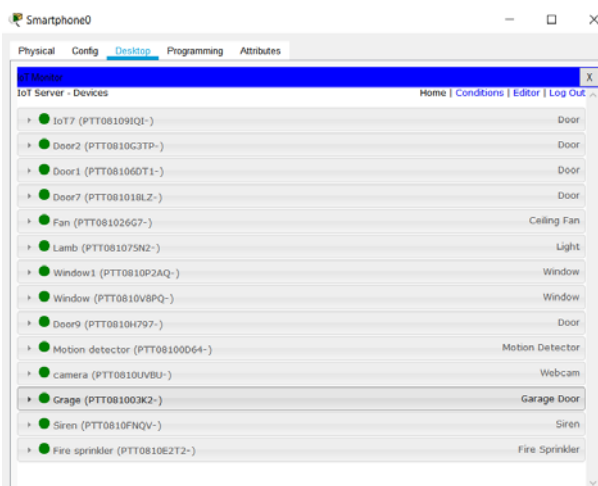



















Fig. Smartphone interface

Table 1. School smart system components

NO	Devise (Thing)	Name of things
1		Lamb
2		Window
3		Door
4		Garage
5		Ceiling Fan
6		Fire Sprinkler
7		Smart Car
8		Server
9		Lawn Sprinkler
10		LED
11		Smart Phone
12		Personal Computer
13		Microcontroller
14		Home gateway
15		Webcam
16		Motion detection
17		Siren

5 Conclusion

The design proposed smart school system using packet tracer 7.2 and Control the system remotely using a smartphone to Reducing time and effort and protection from unauthorized persons and from the risk of fires by connecting the system to the mobile phone and the central device so that the official can observe and manage the school from inside and from far distance.

References

- [1] Gaikwad, P. P., Gabhane, J. P., & Golait, S. S. (2015). A survey based on smart homes system using internet-of-Things. 2015 International Conference on Computation of Power, Energy, Information and Communication (ICCPEIC). doi:10.1109/iccpeic.2015.7259486
- [2] Li, S., Xu, L. D., & Zhao, S. (2014). The Internet of things: A survey. *Information Systems Frontiers*, 17(2), 243-259. doi:10.1007/s10796-014-9492-7
- [3] Akmal, H., & Coulton, P. (2019). The Internet of things game: Illuminating data interactions within the Internet of things. *Living in the Internet of Things (IoT 2019)*. doi:10.1049/cp.2019.0156
- [4] Moser, K., Harder, J., & Koo, S. G. (2014). Internet of things in home automation and energy efficient smart home technologies. 2014 IEEE International Conference on Systems, Man, and Cybernetics (SMC). doi:10.1109/smc.2014.6974087
- [5] Hernández-Muñoz, J. M., Vercher, J. B., Muñoz, L., Galache, J. A., Presser, M., Hernández Gómez, L. A., & Pettersson, J. (2011). Smart cities at the forefront of the future internet. *The Future Internet*, 447-462. doi:10.1007/978-3-642-20898-0_32
- [6] Gubbi, J., Buyya, R., Marusic, S., & Palaniswami, M. (2013). Internet of things (IoT): A vision, architectural elements, and future directions. *Future Generation Computer Systems*, 29(7), 1645-1660. doi:10.1016/j.future.2013.01.010
- [7] Vinod, M., Vinay, H. S., & Prathap, M. (2017). Smart school. 2017 International Conference On Smart Technologies For Smart Nation (SmartTechCon). doi:10.1109/smarttechcon.2017.8358599
- [8] Khajenasiri, I., Estebasari, A., Verhelst, M., & Gielen, G. (2017). A review on Internet of things solutions for intelligent energy control in buildings for smart city applications. *Energy Procedia*, 111, 770-779. doi:10.1016/j.egypro.2017.03.239
- [9] Shin, D. (2014). A socio-technical framework for internet-of-Things design: A human-centered design for the Internet of things. *Telematics and Informatics*, 31(4), 519-531. doi:10.1016/j.tele.2014.02.003
- [10] Hossain, M. A., & Zannat, M. (2019). Simulation and design of University area network Scenario(UANS) using Cisco Packet Tracer. *Global Journal of Computer Science and Technology*, 7-11. doi:10.34257/gjcsstgvol19is3pg7
- [11] M. Bello, Z., A. Buhari, B., & Shehu, S. (2020). Design of a virtual area network for national Open University Sokoto study center. *International Journal of Wireless and Microwave Technologies*, 10(1), 26-37. doi:10.5815/ijwmt.2020.01.03
- [12] Pandey, J., Kazmi, S. I., Hayat, M. S., & Ahmed, I. (2017). A study on implementation of smart library systems using IoT. 2017 International Conference on Infocom Technologies and Unmanned Systems (Trends and Future Directions) (ICTUS). doi:10.1109/ictus.2017.828600
- [13] Muniasamy, V., Ejlani, I. M., & Anadhavalli, M. (2019). Student's performance assessment and learning skill towards wireless network simulation tool – Cisco Packet Tracer. *International Journal of Emerging Technologies in Learning iJET*, 14(07), 196. doi:10.3991/ijet.v14i07.10351
- [14] Woungang, I., Dhurandher, S. K., & Visconti, A. (2020). Internet of things design, architectures and protocols. *Internet of Things*, 100267. doi:10.1016/j.iot.2020.100267