



## Review and Analysis on Cloud Based IoT Platforms for Home Automation System

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# Review and Analysis on Cloud based IoT platforms for Home Automation System

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**ABSTRACT--** The rise of IoT-based Home Automation Systems (HAS) is proof that the Internet of Things (IoT) has ushered in a transformational age for smart homes. In-depth analysis of the most recent developments in IoT-based home automation systems is provided in this review article, with an emphasis on the incorporation of cloud-based platforms. It addresses important issues including security, privacy, interoperability, and energy efficiency while highlighting the complex effects of these technologies on contemporary living. By providing improved security measures, standardized communication protocols, and efficient energy use through data analysis, cloud-based systems play a crucial part in addressing these issues. The study also emphasizes the critical role of machine learning (ML) and artificial intelligence (AI) in enhancing system intelligence and automation capabilities within the IoT ecosystem. This research article aims to enhance knowledge, foster innovation, and shed light on both the benefits and drawbacks of IoT-based Home Automation Systems as a useful resource for academics, engineers, and enthusiasts in the field of smart home technology. In the end, it emphasizes the possibility for further development and evolution in this dynamic field.

**Keywords--** Home Automation System (HAS), Internet of Things (IoT), Smart Home, Sensors, ESP 8266, Voice Control, Low-Cost

## I) INTRODUCTION

Smart home automation is now going through a significant shift, mostly due to the Internet of Things (IoT) technologies' quick progress. Through the seamless integration of IoT devices and sensors, this transformation promises to make our homes substantially smarter, more efficient, and fundamentally safer. The core of this review article's examination and synthesis of the results and contributions reported in numerous research articles resides in its thoroughness and depth. In order to highlight the significant influence of this technological revolution on the way we live and interact with our living environments, this project intends to throw light on the numerous aspects of IoT-based smart home automation.

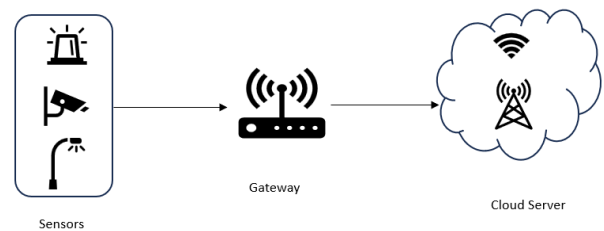


Fig 1. Working principle for IoT System

### A) Motivation

The growing significance of smart home automation in contemporary living is what inspired this evaluation. Automation powered by IoT has the potential to improve our homes' ease, security, energy efficiency, and general quality of life. For academics and practitioners looking to maximize the use of IoT in home automation, grasping the major results and solutions offered in the chosen research articles becomes essential.

### B) Design Goal

The compilation and synthesis of the issue formulations and proposed solutions in the aforementioned research publications is the main objective of our design. We want to provide a comprehensive and informative resource for academics, engineers, and fans in the subject by finding common themes, difficulties, and creative solutions. We want to provide a comprehensive overview of the current status of IoT-based smart home automation through this analysis, enabling well-informed decision-making, future research paths, and the creation of more sophisticated and user-friendly home automation systems.

### C) Problem Statement

The problem statements in these research papers cover a wide range of topics related to smart home automation, such as enhancing security, usability, sustainability, and health monitoring. In order to build houses that are smarter and more responsive, it is crucial to recognize and address these issues. In order to help readers better grasp the possibilities and constraints of IoT-driven smart

home automation, this review study aims to throw light on these issue statements and the associated solutions suggested in the literature.

## II) LITERATURE SURVEY

The emergence of the Internet of Things (IoT) has spurred a paradigm shift in the field of smart home automation. The focus of this study of the literature is on significant research that give insight into various IoT-based smart home automation issues as well as information on current trends, issues, and innovative solutions.

H. Shareef et al. (2018) [1], The article explores residential energy management systems in depth. It discusses demand response tactics, intelligent controllers, and smart technology, offering insightful information on how to optimize energy use in home settings.

H. Singh et al. (2018) [2], This study probably covers the creation of a sensor-based smart home automation system. It may go into detail on the various kinds of sensors employed, their functions in automation (such as occupancy sensors for lighting control), and the advantages of such a system in terms of ease and energy efficiency.

J. Saha et al. (2018) [3], This study examines an IoT system with several facets. It emphasizes features for home automation, alarms, and remote health monitoring. This article presents a comprehensive strategy for enhancing home management and healthcare with IoT technologies.

K. Venkatesh et al. (2018) [4], The author talks about how to use Raspberry Pi to construct home automation systems. This article offers details on a workable implementation while outlining the technical advantages and advantages of utilizing Raspberry Pi for IoT-based home automation.

M. Al-Kuwari (2018) [5], This paper describes the installation of a smart home automation system employing IoT-based sensing and monitoring. The integration of numerous sensors and platforms to enable automation and monitoring of house systems, including temperature control, lighting, and security, is probably covered in the article.

S. Somani et al. (2018) [6], In this paper an IoT-based smart security and home automation system is presented by the authors. They probably talk about how IoT technology improves household duties' general automation while also enabling remote monitoring and management of security equipment like cameras and alarms.

W. A. Jabbar (2018) [7], This study sheds light on how to integrate cellphones as user-friendly and accessible control interfaces for Internet of Things-based smart homes. It supports the expansion of IoT-powered home automation systems.

O. Hamdan et al. (2019) [8], The study probably covers an interactive dual-mode smart home automation system based on the Internet of Things. The system's ability to communicate with users through voice commands or mobile applications, as well as how the system adjusts to their preferences, may be covered in more detail in this article.

K. Agarwal (2019) [9], The performance of wireless smart home and home automation systems with IoT integration is thoroughly reviewed and analyzed by the authors. They give useful perspectives on the performance and dependability of the various wireless technologies used in these systems and provide insights into their advantages and disadvantages. This improves the effectiveness and practicality of home automation. This study assists in comprehending the market for wireless Internet of Things (IoT) solutions for smart homes.

M. S. Mahamud et al. (2019) [10], The study examines the system's capabilities, features, and architecture while emphasizing how it improves inhabitants' comfort and convenience while streamlining domestic chores. Readers may anticipate insights into the use of IoT technology in the real world to build a complete and effective smart home environment.

S. K. Vishwakarma et al. (2019) [11], The author covers an IoT-based smart home automation system that is energy-efficient. They could go into further detail on how IoT technology might improve energy usage by managing HVAC systems and appliances based on occupancy and weather.

T. Chaurasia (2019) [12], This paper offers an improved Internet of Things-based smart home automation solution. They may discuss how this system outperforms current options, perhaps emphasizing user convenience and compatibility with other smart devices.

A. Eleyan (2020) [13], The authors of this study describe a system that uses IoT technology via an Android app for home automation. The creation of the Android app, how it can be used to control different home automation features, and how convenient it is for users are all probable topics covered in the paper. This study provides knowledge on how mobile apps and IoT may be combined to improve home automation, offering a simple and approachable method for managing smart homes.

R. Sivapriyan (2020) [14], The authors of this study present a comprehensive overview of the literature on IoT-based home automation. They most likely provide a complete review of the state of the art in IoT-driven home automation by summarizing significant results, trends, and technologies mentioned in earlier publications. For scholars and practitioners looking for information on the development and growth of smart home technologies, this article is an invaluable resource.

Syed Kashan Ali Shah (2020) [15], This research provides a valuable insight into the development and practical deployment of IoT technologies in enhancing home automation. The paper contributes to the field by demonstrating the feasibility and benefits of IoT-driven smart home solutions.

V.R. Shankar (2020) [16], In a multi-cloud setting, the authors investigate energy-efficient smart home automation systems. Using cloud computing to reduce energy usage in smart homes is presumably the topic of the study, which may also explore its advantages and technical details. Understanding how cloud-based technologies may support energy-efficient smart home automation is a useful takeaway from this research.

B. Pedro (2021) [17], The paper likely explores the integration of IoT technology to enable multifunctional control of devices within a smart home environment. While details are limited, this paper could provide valuable insights into how IoT enhances the versatility and convenience of home automation systems. Further reading may reveal technical specifics and practical implications.

C. Stojescu-Crisan (2021) [18], The authors of the paper "An IoT-based smart home automation system" present such a system. Although specifics are omitted, it is probable that this article outlines the architecture, parts, and features of their IoT-based smart home system. Such study frequently examines how sensors, devices, and platforms might be integrated to improve the practicality and effectiveness of daily operations in a smart home setting. Readers may anticipate learning about the advantages and characteristics of the used IoT technology.

M. S. Hossain Shawon et al. (2021) [19], This study presents a cutting-edge method for home automation utilizing Bluetooth voice control. The technological nuances of speech recognition, its integration with Bluetooth-enabled devices, and the benefits it provides for intuitive and hands-free smart home administration are likely to be covered in this essay. The field of accessible and user-friendly smart home control systems is expanding, and this research contributes to it.

R. Kaur et al. (2021) [20], The study includes a comparative examination of several IoT technologies, gadgets, and protocols utilized in smart homes, outlining the advantages and disadvantages of each strategy. In order to grasp the changing IoT environment in smart home automation and to make well-informed decisions in this quickly developing industry, researchers, developers, and homeowners will find the research to be of great use.

T. Maragatham (2021) [21], This research offers useful suggestions for utilizing the well-liked single-board computer for home automation, placing a focus on affordability and accessibility. By providing a useful implementation strategy for IoT enthusiasts and developers interested in creating smart home systems, this research makes a contribution to the area.

M.S.H Shawon (2022) [22], The construction of a voice-controlled home automation system employing Bluetooth technology is probably covered by the authors. The technical details of speech recognition and its incorporation into smart home gadgets may be covered in this article, providing insights into a practical and hands-free method of controlling numerous parts of home automation.

R. Islam (2022) [23], The study demonstrates a home automation system that makes use of server-based IoT integration and LoRa (Long-Range) technology. The deployment, benefits, and real-world uses of LoRa in linking IoT devices for effective home automation are most likely covered in this article. It provides information on how server-based and LoRa-based solutions may improve the communication and control features of smart homes while supporting a wide range of IoT-enabled products and services.

Z. Wang (2022) [24], An overview of IoT-enabled home automation systems is provided in this survey article, which focuses on potential security flaws, attacks, and countermeasures. It probably offers insights on the changing difficulties and solutions in safeguarding smart homes.

### III) PROPOSED METHOD

The expertise from a thorough literature analysis of IoT-based home automation systems is combined in the recommended strategy. It incorporates key concepts and innovations from several research articles to give a thorough plan for creating efficient and user-friendly smart homes.

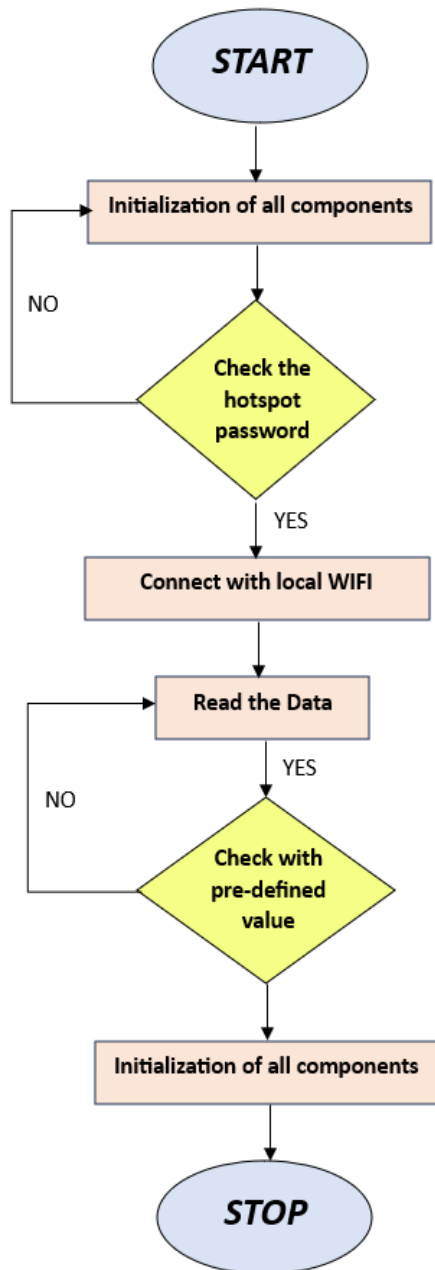


Fig 2. Flow chart of proposed home automation system.

**A) Foundational IoT Integration**

Build a strong Internet of Things (IoT) infrastructure with secure connection and effective data transfer.[5]

**B) Sensor Integration and Data Gathering**

To provide real-time monitoring, use sensor nodes to gather data from various house components.[1]

**C) Comparative Analysis and Continuous Improvement**

Conduct comparison studies often to evaluate the system against standards set by the industry and find areas that need work.[9][20]

**D) Dual-Mode Interactive Automation**

For smooth operation, concentrate on energy efficiency and carry out constant performance optimization.[11][16][22]

**E) Voice Control and User Interface**

Provide a user-friendly interface and voice control for mobile applications.[13][22]

**F) Hardware Versatility**

Use adaptable hardware, like the Raspberry Pi, to provide flexible IoT integration.[4][21]

**G) Low-Cost Implementation and Connectivity**

Investigate cost-effective alternatives and take into account various connectivity possibilities.[7]

A comprehensive foundation for creating IoT-based home automation systems is created by the combined presented methods. In order to construct smart homes that improve convenience and quality of life while tackling the obstacles of IoT adoption, it incorporates features of security, efficiency, creativity, and user-friendliness.

**IV) ANALYSIS AND RESULT EVALUATION**

**A) ANALYSIS**

The examination of a wide range of research articles on IoT-based home automation systems reveals a complex environment replete with guiding principles, technological advancements, and user-centric improvements. Establishing a reliable and secure IoT infrastructure has been underlined repeatedly by researchers [5][6] Real-time monitoring is built on the integration of sensors and data collection, while the idea of dual-mode interactive automation gives users more control over automated operations [2][8]. The improvement in system performance has been largely attributed to innovations like enhanced signal processing and energy optimization [9][11][16]. The user experience is further enhanced with the use of voice control and user-friendly interfaces [13][14]. Implementations that are economical [15] and flexible hardware solutions meet a range of user requirements [4][21]. A thorough understanding of developing smart home technologies is provided through advanced systems and comparative assessments.

**B) EVALUATION**

The examination of the findings and conclusions from the evaluated research articles highlights the important developments and potential difficulties in the IoT-based home automation sector. Numerous studies demonstrate how effective and safe IoT frameworks have been implemented, establishing the groundwork for intelligent home systems. Data gathering and sensor integration have repeatedly been shown to be essential elements for real-

time monitoring, assuring user comfort and safety. Dual-mode interaction is a concept that adds a user-control aspect and increases the versatility of home automation systems [8]. System sustainability and efficiency are improved through developments in energy efficiency and signal processing. The user experience is improved via voice-controlled interfaces and user-friendly programs, meeting the rising need for natural interactions.[19]

Additionally, flexible hardware alternatives and cost-effective implementations accommodate a range of customer preferences and spending levels. The overall assessment of these findings highlights the complexity of IoT-based home automation and provides a window into its sturdiness, flexibility, and potential for further development.[19][17][21]

### **C) SOLUTION OBTAINED**

Collectively, the research articles provide novel approaches and developments for IoT-based smart home automation. These solutions cover a range of smart home technology features:

In order to develop a smart-home automation system that can control lighting, temperature, and other house settings depending on user preferences and environmental factors, they investigate the integration of IoT sensors and monitoring platforms.

They also stress the significance of IoT-based smart security systems that offer both automation functions like smart appliance management and lighting as well as security features like surveillance and intruder detection.[6]

Some studies concentrate on using intelligent, energy-efficient home automation systems to optimize energy use in smart homes. In order to assure energy-efficient operations in the home environment, these systems make use of IoT technology.[1][11][15][22]

Additionally, they emphasize the importance of health monitoring within the context of the smart home ecosystem and provide solutions that combine home automation and health monitoring capabilities for an advanced IoT-based remote health monitoring, home automation, and alarm system.[1][5][8][17]

The study also explores how voice control, voice-controlled smart home automation systems, and multi-cloud environment energy optimization might improve user experience.[11][12]

Additionally, they do comparison analyses to provide perspectives on current IoT-based smart home automation systems and pinpoint areas for development.

Together, these articles advance the creation of complex and effective IoT-based smart home automation systems that address a range of convenience, security, energy-saving, and personalization needs.

## **V) CONCLUSION**

The assessment of IoT-based home automation research that is provided in this paper underlines the impressive advancements made in this area and offers crucial details on how the field is changing. With the development of smart homes that improve comfort, security, and energy efficiency, IoT has emerged as a disruptive force. Numerous studies have shown how IoT frameworks can be successfully implemented and incorporate features like real-time monitoring, sensor integration, and data analytics to guarantee smooth operation and customer satisfaction. Home automation now offers a new level of user-friendliness thanks to the emergence of interactive dual-mode systems and voice-controlled interfaces.

The pursuit of sustainable living is furthered by initiatives to optimize energy use using IoT-based solutions. These technologies are now available to a wider audience, regardless of financial restraints, thanks to cost-effective implementations and adaptable hardware solutions. However, issues with standards, security, and privacy difficulties continue to be major sources of worry.

The research articles that have been evaluated collectively show the enormous potential of IoT-based home automation, providing adaptable solutions that satisfy various consumer demands. IoT promises to transform our homes as technology develops by making them smarter, more effective, and sensitive to our changing lives.

## **VI) REFERENCES**

- [1] H. Shareef, M.S. Ahmed, A. Mohamed, and E.Al. Hassan, 2018. Review on home energy management system considering demand responses, smart technologies, and intelligent controllers. *IEEE Access*, 6, pp.24498-24509.
- [2] H. Singh, V. Pallagani, V. Khandelwal and U. Venkanna, 2018, March. IoT based smart home automation system using sensor node. In 2018 4th International Conference on Recent Advances in Information Technology (RAIT) (pp. 1-5).
- [3] J. Saha, A.K. Saha, A. Chatterjee, S. Agrawal, A. Saha, A. Kar, and HN. Saha, 2018, January. Advanced IOT based combined remote health monitoring, home automation and alarm system. In 2018 IEEE 8th annual computing and communication workshop and conference (CCWC) (pp. 602-606).
- [4] K. Venkatesh, P. Rajkumar, S. Hemaswathi, and B. Rajalingam, 2018. IoT based home automation using raspberry Pi. *J. Adv. Res. Dyn. Control Syst*, 10(7), pp.1721-1728.
- [5] M. Al-Kuwari, A. Ramadan, Y. Ismael, L. Al-Sughair, A. Gastli and M. Benammar, 2018, April. Smart-home automation using IoT-based sensing and monitoring platform. In 2018 IEEE 12th International Conference on Compatibility, Power

- Electronics and Power Engineering (CPE-POWERENG 2018) (pp. 1-6).
- [6] S. Somani, P. Solunke, S. Oke, P. Medhi and P.P. Laturkar, 2018, August. IoT based smart security and home automation. In 2018 Fourth International Conference on Computing Communication Control and Automation (ICCUBEA) (pp. 1-4).
- [7] W.A. Jabbar, M.H. Alsibai, N.S.S. Amran, and S.K. Mahayadin, 2018, June. Design and implementation of IoT-based automation system for smart home. In 2018 International Symposium on Networks, Computers and Communications (ISNCC) (pp. 1-6).
- [8] O. Hamdan, H. Shanableh, I. Zaki, A.R. Al-Ali, and T. Shanableh, 2019, January. IoT-based interactive dual mode smart home automation. In 2019 IEEE international conference on consumer electronics (ICCE) (pp. 1-2).
- [9] K. Agarwal, A. Agarwal, and G. Misra, 2019, December. Review and performance analysis on wireless smart home and home automation using IoT. In 2019 Third International conference on I-SMAC (IoT in Social, Mobile, Analytics and Cloud) (I-SMAC) (pp. 629-633).
- [10] M.S. Mahamud, M.S.R. Zishan, S.I. Ahmad, A.R. Rahman, M. Hasan and M.L. Rahman, 2019, January. Domicile-an IoT based smart home automation system. In 2019 International Conference on Robotics, Electrical and Signal Processing Techniques (ICREST) (pp. 493-497).
- [11] S.K. Vishwakarma, P. Upadhyaya, B. Kumari, and A.K. Mishra, 2019, April. Smart energy efficient home automation system using IoT. In 2019 4th international conference on internet of things: Smart innovation and usages (IoT-SIU) (pp. 1-4).
- [12] T. Chaurasia, and P.K. Jain, 2019, December. Enhanced smart home automation system based on Internet of Things. In 2019 Third International conference on I-SMAC (IoT in Social, Mobile, Analytics and Cloud) (I-SMAC) (pp. 709-713).
- [13] A. Eleyan and J. Fallon, 2020, October. IoT-based home automation using android application. In 2020 International Symposium on Networks, Computers and Communications (ISNCC) (pp. 1-4).
- [14] R. Sivapriyan, K.M. Rao and M. Harijyothi, 2020, January. Literature review of iot based home automation system. In 2020 Fourth International Conference on Inventive Systems and Control (ICISC) (pp. 101-105).
- [15] S.K.A. Shah and W. Mahmood, 2020. Smart home automation using IOT and its low-cost implementation. *International Journal of Engineering and Manufacturing (IJEM)*, 10(5), pp.28-36.
- [16] V.R. Shankar, S. Suchitra, B. Pavithra, P.S. Rajendran, S.G. Sophia, and M.J. Leo, 2020, February. Energy optimization for smart home automation in multi-cloud environment. In 2020 International Conference on Inventive Computation Technologies (ICICT) (pp. 534-539).
- [17] B. Pedro, F. Barata, and H. Canacsinh, 2021, October. Wireless Home Automation System for Multifunctional Devices Incorporating Internet of Things (IoT). In 2021 International Conference on Electrical, Computer, Communications and Mechatronics Engineering (ICECCME) (pp. 1-6).
- [18] C. Stolojescu-Crisan, C. Crisan and B.P. Butunoi, 2021. An IoT-based smart home automation system. *Sensors*, 21(11), p.3784.
- [19] M.S.H Shawon, C. Das, M.T. Ahammed, G. Biswas, M.S. Mia, E.A. Eva, and M.N. Sakib, 2022, February. Voice controlled smart home automation system using Bluetooth technology. In 2021 4th International Conference on Recent Trends in Computer Science and Technology (ICRTCST) (pp. 67-72).
- [20] R. Kaur, P. Vats, M. Mandot, S.S. Biswas, and R. Garg, 2021, September. Literature survey for IoT-based smart home automation: a comparative analysis. In 2021 9th International Conference on Reliability, Infocom Technologies and Optimization (Trends and Future Directions) (ICRITO) (pp. 1-6).
- [21] T. Maragatham, P. Balasubramanie and M. Vivekanandhan, 2021, February. IoT Based Home Automation System using Raspberry Pi 4. In IOP Conference Series: Materials Science and Engineering (Vol. 1055, No. 1, p. 012081). IOP Publishing.
- [22] M.S.H Shawon, C. Das, M.T. Ahammed, G. Biswas, M.S. Mia, E.A. Eva, and M.N. Sakib, 2022, February. Voice controlled smart home automation system using Bluetooth technology. In 2021 4th International Conference on Recent Trends in Computer Science and Technology (ICRTCST) (pp. 67-72).
- [23] R. Islam, M.W. Rahman, R. Rubaiat, M.M Hasan, M.M. Reza, and M.M. Rahman, 2022. LoRa and server-based home automation using the internet of things (IoT). *Journal of King Saud University-Computer and Information Sciences*, 34(6), pp.3703-3712.
- [24] Z. Wang et al., 2022. A Survey on IoT-Enabled Home Automation Systems: Attacks and Defenses. in *IEEE Communications Surveys & Tutorials*, vol. 24, no. 4, pp. 2292-2328.