*Article*

# A Student Presence System and Its Development to the Internet of Things A Literature Review

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**Abstract:** Presence is one of the inherent aspects of the students. The presence system conducted in kindergarten Nurul Huda Kotapinang still uses a conventional system in the form of absent notes or books. This is considered less efficient because the data written by the teacher on the students still use the Presence book that is vulnerable to damage due to exposure to water and destructive things. Based on the background of the problems faced by teachers in kindergarten Nurul Huda Kotapinang, the authors designed the information system for students. This system is designed using Visual Basic .Net. In contrast, the programming language used is VBsrift and MySQL database. This system is designed and built to facilitate the delivery of information. The primary purpose of this system is to make it easier for teachers to attend to their students. It can be concluded Development Information System Presence can replace the confessional way previously used in kindergarten Nurul Huda Kotapinang into Student Presence Information Systems Based Visual Basic. As a development, this present system was modified in its programming language to produce a compatible platform with the Internet of Things Technology.

**Keywords:** Student Presence, Waterfall method, visual basic, mysql_db, Internet of things



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## 1. Introduction

Attendance is an activity or routine carried out by students. The usefulness of this presence occurs on the part of the perpetrators of the teaching and learning process. Another use of attendance is to count students to find out the number of attendance of these students and one of the uses of this attendance information to the perpetrators of teaching and learning activities, among others, is to evaluate student satisfaction with a subject and make future benchmarks in order to provide relevant knowledge better. Presence data retrieval is done manually has many shortcomings, such as invalid data when the data entered is wrong. Another disadvantage of manual attendance is the loss or destruction of existing data. Another drawback is the lack of efficiency and effectiveness in the data processing. Based on the background of the problem above, several problems can be formulated, [1] How to design a student attendance information system at TK Nurul Huda Kotapinang, South Labuhanbatu Regency, using visual basic.net. [2] Applying the waterfall method to the student attendance information system at TK Nurul Huda Kotapinang, Labuhanbatu Selatan Regency using visual basic.net. The problems in building a presence information system with visual basic.net are [1] data updating student attendance information systems at Nurul Huda Kindergarten Kotapinang, Labuhanbatu Selatan Regency using visual basic.net using primary data for students at Nurul Huda Kindergarten Kotapinang 2020/2021. [2] The Student attendance information system at Nurul Huda Kindergarten Kotapinang, South Labuhanbatu Regency, was built using visual basic.net with student data stored in a database using MySQL.

Furthermore, the system is a network of procedures that are interconnected, gathered together to perform an activity or to perform an activity or to complete a certain goal. The system is a collection of elements that interact with each other to achieve certain goals. This research fully uses Vb software; visual basic is a desktop-based programming language released by Microsoft's largest computer software company. Basically, Visual Studio .NET is designed to accommodate various programming languages and is included in Visual Studio. NET. Thus, you can build Windows applications in Visual Studio. NET. Visual Basic. NET is a programming language that can be used to create application programs. With the storage and display of data, the storage system, in this case, is indispensable. A database is a mechanism used to store information or data. A database is a collection of data that contains appropriate information for a company. A database management system (DBMS) is a collection of interconnected data and a collection of programs for accessing data.

In this study, one method is used, namely the Waterfall SDLC Model; the Waterfall SDLC model is a sequential software development process in which progress is considered to flow progressively down (similar to a waterfall) through a list of phases that must be executed in order to build computer software successfully. Initially, the Waterfall model was proposed by Winston W. Royce in 1970 to describe possible software engineering practices.

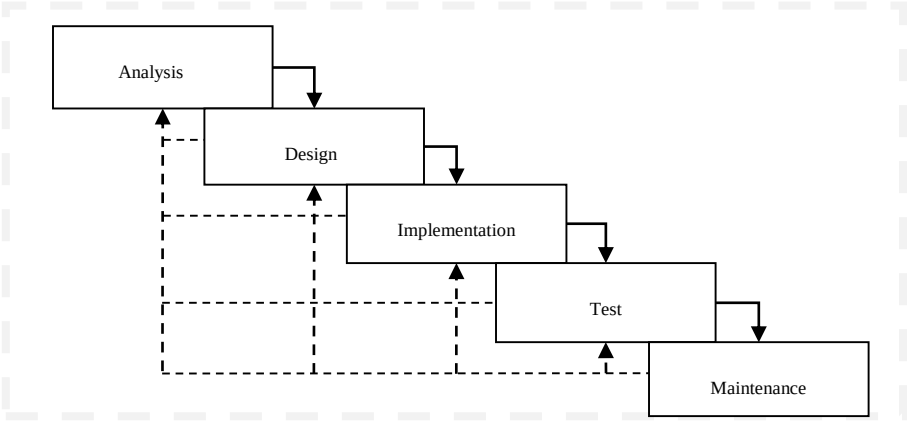


**Figure 1.** The waterfall model applied in this research

Furthermore, The Waterfall model defines several successive phases that must be completed one after another and moves to the next phase only when the previous phase is completely completed. For this reason, the Waterfall model is recursive because each phase can be repeated until it is perfected. Figure 1 Illustrating the various phases of the SDLC Waterfall model. The right programming algorithm is needed to get efficiency [3, 30]. Finally, one of the supporting packet platforms that contain all the completeness of making a database website is XAMPP. XAMPP is an instant installation package for Apache, PHP, and MySQL that can be used to assist the installation process of the three products.

Moreover, this research develops a desktop-based web system for the Internet of Things. IoT devices use an Android-based platform that is enabled to be connected to hardware such as the ESP32 Module. In this case, how the application of Vb can be combined with javascript that dynamically displays student attendance data. Then the attendance system is inputted from an ESP32-CAM camera with Module OV2640, which will be input to the MySQL database with the Visual Basic App platform. It will be a powerful amalgamation of desktop and IoT technologies [27.28.29].

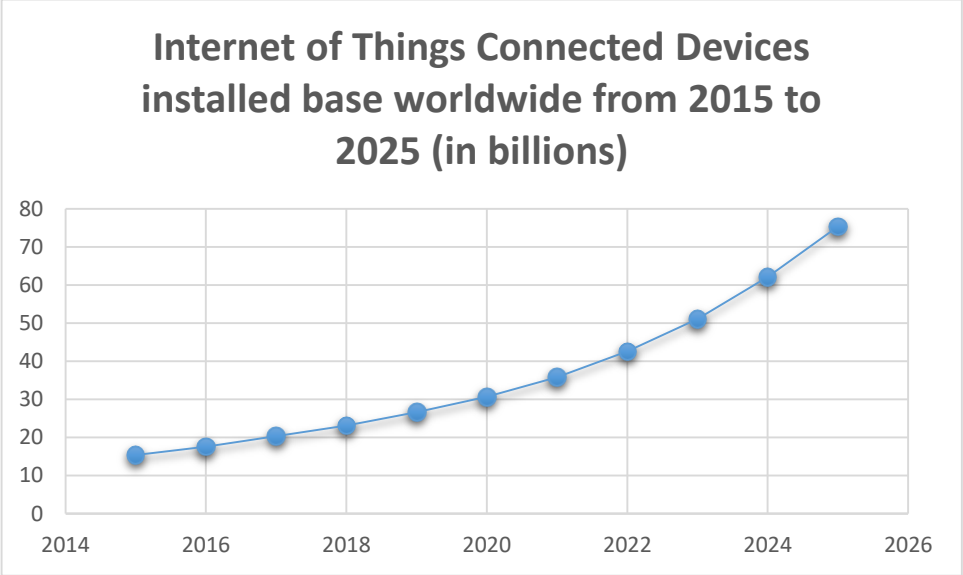


**Figure 2.** IoT Connected devices 2015-2025 prediction

With the continued increase in the use of IoT technology [4,5,6,7,8,9,10], it will make IoT increasingly popular in addition to the Web or desktop App. This is because customers already want a super real-time system to provide data. In Figure 2, there is a connected Internet of Things system from 2015-to 2025, and there is a very significant increase starting from 15 billion IoT devices connected [11], which is predicted to increase in 2025 to reach 75 billion IoT devices connected. In the future, data needs will lead to flexibility, And also flexible data input using smartphones and similar devices, real-time data is needed, such as the Internet of Things using various devices and Radio Frequency (RFs). Previous studies used Raspberry Pi as an internet server using MariaDB and Python Language [1]. And regarding IoT devices, previous research used the M5Stack Board which was equipped with ESP-32 for basic and intermediate research using MQTT Broker.[12,23,24].

## 2. Research Methods

Basically, the proposed process design is a change from a system that runs manually to a computerized system. The design of the attendance information system for Nurul Huda Kindergarten in Kotapinang is to provide an alternative by creating an attendance system for students. In detail, the following are the stages of working on the Kindergarten Presence Information System: [1] Analysis That is by determining the needs of the system as a whole, among others, by determining the system components (Entity), component attributes, and the relationship between components. [a] System Requirements: at this stage, the admin/principal will input data on teacher data and subjects where the teacher as the second party will input student data and, at the same time, check attendance for students who do not come, whether sick permission or without information. [b] Hardware Requirements: At this stage, the hardware requirements only involve a laptop, 500 GB hard drive, 2 GB RAM, and the Windows 7 Ultimate 64-bit operating system to run the kindergarten attendance program or application. [c] Brainware Needs: The admin as the principal and the teacher can be said to be the second user who will run the program.

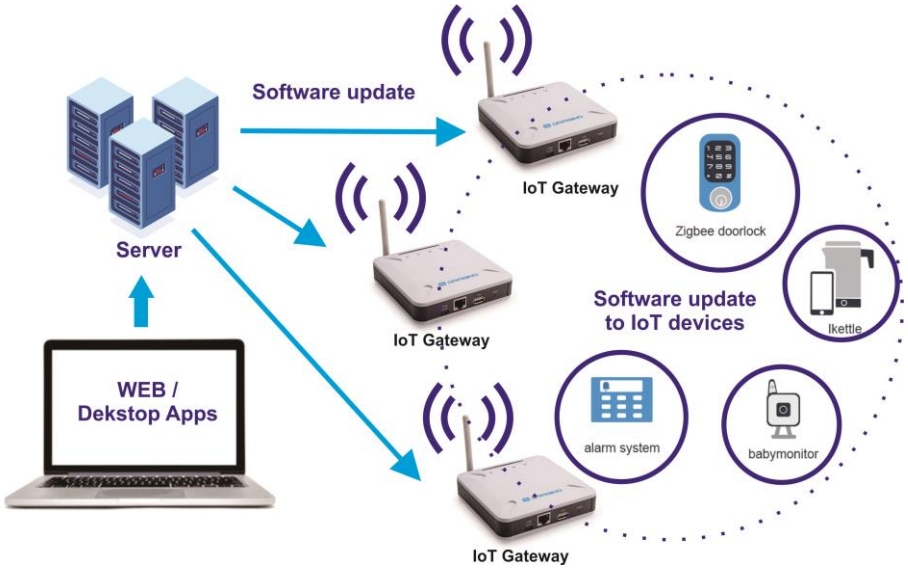


**Figure 3.** Web/Dekstop Apps to IoT

[2] System Design: By defining the analysis results by designing the design application module, i.e.,[a] The data structure, the design is defined in the Entity-Relationship Diagram (ERD). [b] Application architecture, the design is defined in the Data Flow Diagram (DFD). [3] Implementation: Implementing the design or design by writing program code according to the selected programming language. [4] Verification: Testing the application program that has been completed by paying attention to the concept of logic to determine whether the application's performance is following system requirements and preventing errors to a minimum. [5] Maintenance allows changes to data, system environment, and usage requirements so that applications can still be developed according to changes that occur. Moreover, Context diagrams [Figure 5] give an idea of what kind of interaction relationship between external entities with the system; the relationship is described by the flow of data flowing and the environment outside the system (outside entities) into the system or vice versa. The following is a form of the proposed context diagram accompanied by incoming and outgoing data flows.

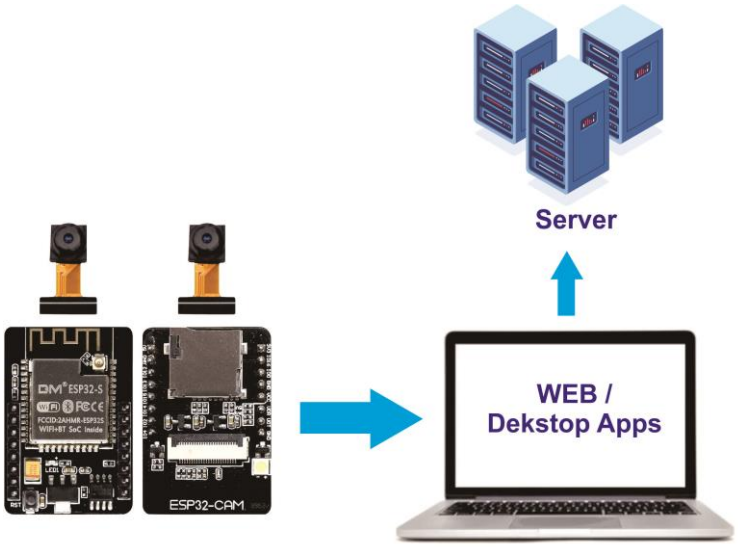


**Figure 4.** Face Recognition Web IoT based

The development of Desktop to IoT technology is shown in Figure 3, where the process of changing to IoT is passed by upgrading software programming from Web or desktop App to Server and connected by the Internet of Things servers and devices. Internet of Things is a technology [13,14,15,16,25,26] where the use of sensors and real-time monitoring are included in the process of making the system. For example, attendance is combined with a camera system using Image recognition using ESP-CAM and Module OV2640 as a camera, as shown in Figure 4.

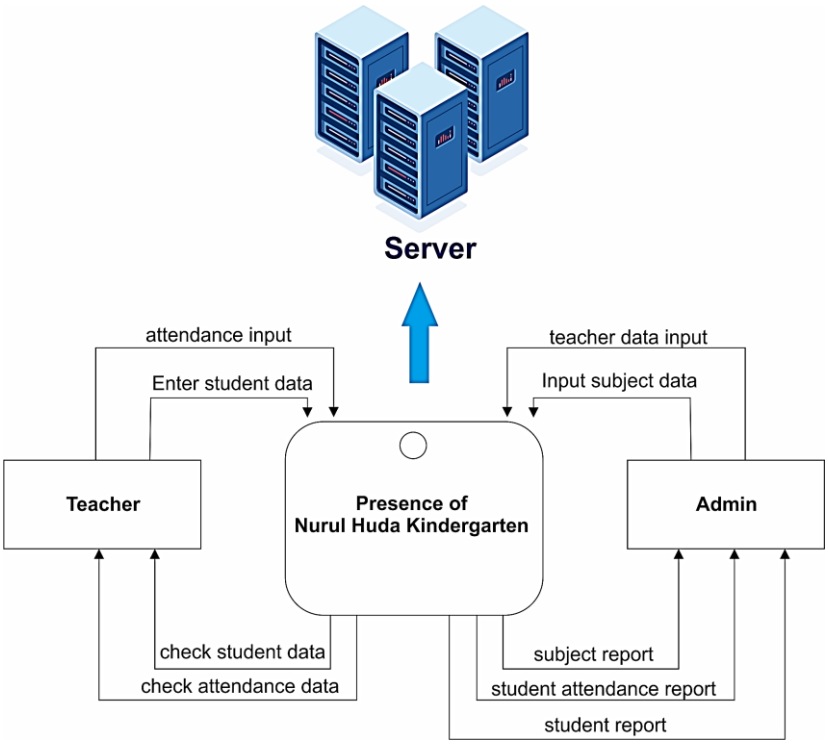


**Figure 5.** Context diagram in Desktop-based and Web-based

### 3. Result and Discussion

The results of the program execution display include menus, system input forms, and reports (system outputs) which will be discussed in this chapter. The menu structure is a general form of a program design to make it easier to see and function according to the needs of the application program structure design is the overall program design both from the application menu display, input menu, and report menu. Its purpose is to describe the program being created. Moreover, this login page is used to run a program so that the program can run properly.

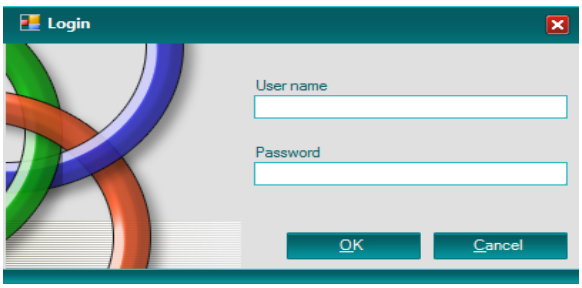


**Figure 6.** Login Page in Desktop-based

Figure 6 is the login page for teachers or admins as school principals who can access a login form that has a username and password to enter the student attendance application at Nurul Huda Kindergarten Kotapinang, Labuhan Batu Selatan Regency. In the Username and Password fields, both the admin and the teacher enter the Username, : admin, and the password: admin. When pressing the ok button will go to the main page and the cancel button to exit. Moreover, From the Main Menu is a display that displays the desired menus; the main menu form is the start page that is seen when the user opens and runs the system. Main Page, There are three menu strips on the main page. Namely files, exits, and reports. In the file menu, there are four forms, i.e., student forms, subject forms, teacher forms, and attendance forms. In the automatic exit menu, all pages that are opened in the main menu will be closed. We have all the reports that we input on the respective data forms for the report menu.

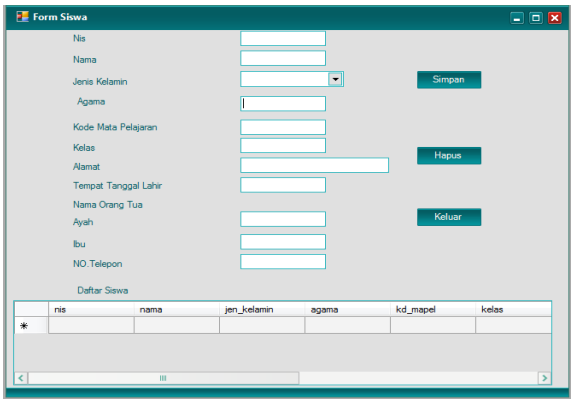


**Figure 7.** Student data input page in Desktop-based

In Figure 7, the Student Data Input page consists of fields containing Nis, Name, Gender, Religion, Subject Code, Class, Address, Place of Birth Date, Name of Father and Mother, and Parents' Telephone Number. The student data page is filled in by the teacher who teaches at Nurul Huda Kindergarten, Kotapinang, South Labuhanbatu Regency. The data in the contents can be saved, deleted, and changed.In the fields in all fields will be filled by the teacher, who will be saved directly to the database. The save button is used to save data that has been inputted and then stored in the database. The delete button is used to delete data that has been stored in the database. The exit button is used to close the open form on the main page.

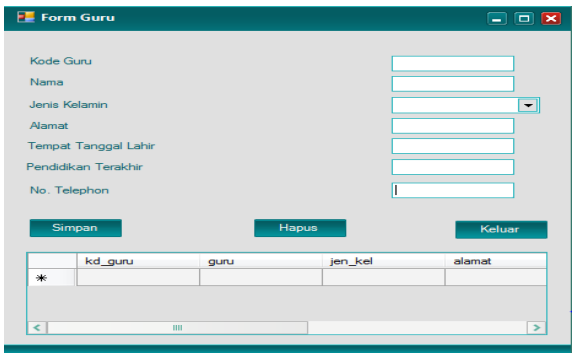


**Figure 8.** Teacher data input in Desktop-based

In Figure 8, the teacher data input page consists of Teacher Code, Name, Gender, Address, Place, Date of Birth, Last Education, Teacher Telephone No. As for the teacher form, the data is filled in by the admin or school principal who is at Nurul Huda Kindergarten in Kotapinang. The save button is used to save data that has been filled in

and is directly saved to the database. The delete button is used to delete data that has been stored in the database. And the exit button is used to close the form that appears in the main menu. In Figure 9, the subject data page contains fields consisting of the subject code, subject name, and teacher code. The Subject Form is to be filled out by the admin or principal at Nurul Huda Kindergarten Kotapinang. The save button is used to save data that the principal has filled into the database. The delete button is used to delete data that has been saved to the database. And the exit button is used to close the subject form on the main page.


**Figure 9.** Enter lesson data in Desktop-based

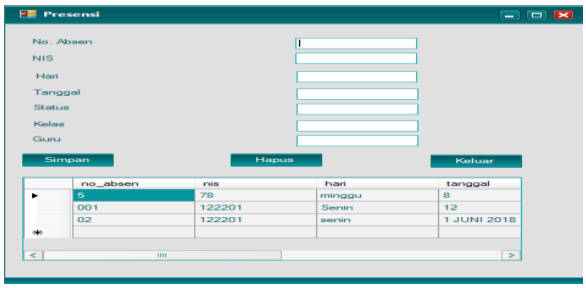


**Figure 10.** Enter presence page in Desktop-based

In Figure 10, the attendance data page contains fields consisting of No Absence, NIS, Day, Date, Status, Class, and Teacher. The Presence Form is filled out by the teacher who teaches at Nurul Huda Kindergarten in Kotapinang. The attendance form is addressed to absent, present, and sick students. The save button is used to save the teacher's data to the database that has been filled in. The delete button is used to delete the data saved to the database. And the exit button is used to close the present form. Moreover, The stage which is the process of producing output from the results of data processing to the output device (output device), which is in the form of information. It is a report that contains after the input data has been filled in completely. The following is a table of Student Data reports. An example of a desktop-based student output or report can be seen in Figure 11.

08/06/2018

LAPORAN DATA SISWA

| NIS | NAMA SISWA | JENIS KELAMIN | AGAMA | KD MATAPEL | KELAS | ALAMAT | TEMPAT / TGL LAHIR | NAMA AYAH | NAMA IBU | NO TELEPON |
|---|---|---|---|---|---|---|---|---|---|---|
| 1234 | Andi | Laki-Laki | Islam | 001 | 0 | Jakarta | Kotapinang 12 Mei 2014 | Sudi | Mursi | 087765442211 |
| 1 | Aidil | Laki-Laki | Islam | 01 | 0 | kotapinang | Jakarta 12 Mei2014 | Budi | Risma | 082274095242 |
| 1224 | Lisma | Perempuan | Islam | 001 | 0 | jakarta | Kotapinang 12 Mei 2015 | Ilham | Mida | 089976554444 |
| 6776 | JHJHK | Laki-Laki | KJBK | KJBJ | KJBK | KJB | 02 PEB 1990 | HJGJ | KJBK | 8768768 |
| 1222 | Jeb | Laki-Laki | Islam | 12 | 0 Besar | Kampung Banjarll | Kotapinang 12 April 2014 | Riko | Miles | 082274095242 |

**Figure 11.** Example Student Report data Desktop-based

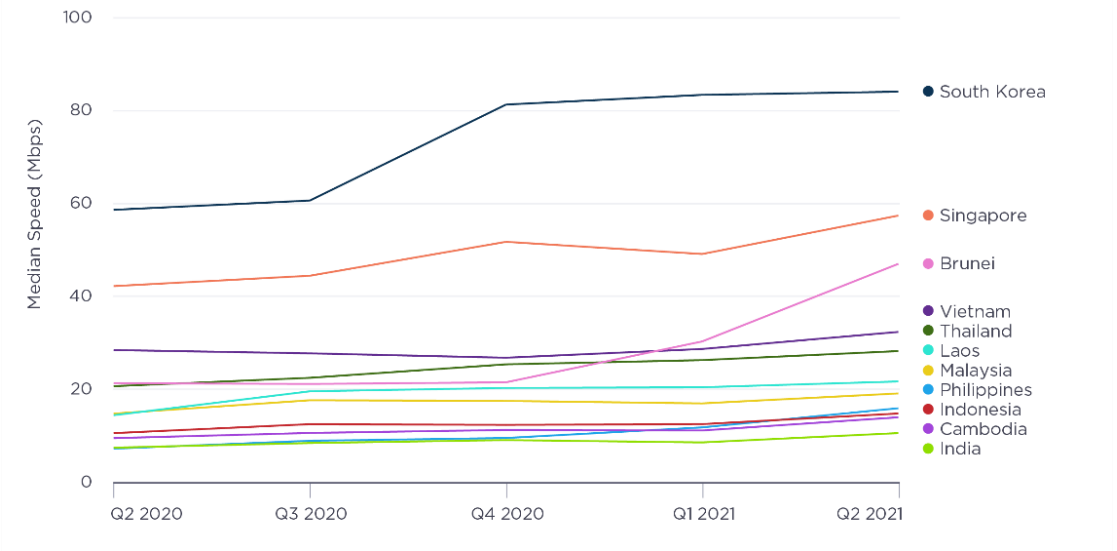


**Figure 12.** Median Mobile Download Speeds in Indonesia and other countries

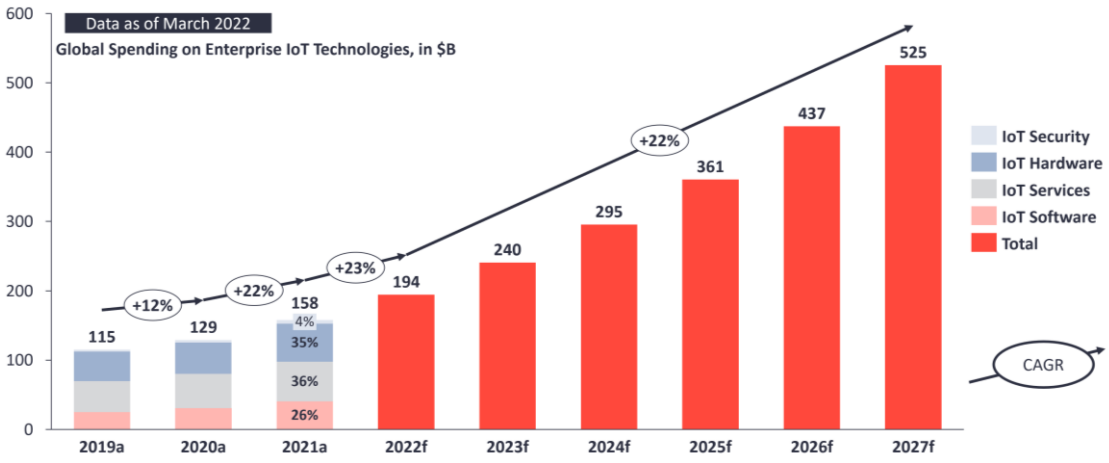


**Figure 13.** Enterprise IoT market 2019-2027 prediction

**Table 1. Advantages and Disadvantages of Desktop-Based Programs**

| **Advantages and Disadvantages of Desktop-Based Programs** |
|---|
| 1. Has good performance because it runs on hardware specifications that have been previously determined. |
| 2. It does not take time to flow data from the Server or vice versa. |
| 3. The program is difficult to access remotely if there is a need to monitor or retrieve databases and reports from the program itself. this can be overcome by using Remote Desktop Software, but both computers must be connected to the Internet. |
| 4. It is difficult to deploy the software because each user must first install, adjust, and set the database if it is not connected automatically. |
| 5. For developers, it will be difficult to update and maintain software and the system itself. |

**Table 2. Advantages and Disadvantages of Web-Based Programs / Web-Based**

| **Advantages and Disadvantages of Web-Based Programs / Web-Based** |
|---|
| 1. Files and Database of Software will be centralized and only need to do the installation on the Server and make it easier to update or maintain software. |
| 2. It can be easily accessed remotely via a browser without installing the software. |
| 3. Must use an Internet connection to access remotely. |
| 4. The level of security of data and files is vulnerable to being sabotaged by crackers. |

**Table 3. Key distinctions between web-based and IoT based environments**

| **Data and Related Processes** | **Web of Things** | **Internet of Things** |
|---|---|---|
| Data | Online/Digital, environment/context largely constructed by providers | Physical, Environment/context is largely constructed by nature, with many aspects/contexts created by customers. |
| Data Entry | Active, Customer | Passive, Devices |
| Data Sharing | With other providers | With other machines |
| Learning | Action in the online/digital world | Action in the natural/physical world |
| Decision Making | Provider, more fixed/static, less real-time | Machines, dynamic, more real-time |

**Table 4. Key distinctions between web-based and IoT based environments**

| Parameters | IoT Stack | Web Stack |
|---|---|---|
| TCP/IP | IoT Application, Device Management | Web Applications |
| Data Format | Binary, JSON, CBOR | HTML, XML, JSON |
| Application Layer | CoAP, MQTT, XMPP, AMQP | HTTP, DHCP, DNS |
| Transport Layer, Security Layer | UDP, DTLS | TCP, UDP, TLS/SSL |
| Internet Layer (Network Layer) | IPv6/IP Routing, 6LoWPAN | IPv6, IPv4, IPSec |
| Data Link Layer | IEEE 802.15.4 MAC | Ethernet (IEEE 802.3), DSL, ISDN, Wireless LAN [17] (IEEE 802.11), Wi-Fi |
| Physical Layer | IEEE 802.15.4 PHY/ Physical Radio | |

Moreover, a detailed analysis of the review of the advantages of IoT over the Web or desktop App can be seen in the data rate graph and whether it is useful for customers. Desktop App developed for Website of Things depends on available Bandwidth (Mbps). So the web site's performance is determined by the Internet provider, as shown in Figure 12. Indonesia is a country in Asia that is low in terms of bandwidth. Indonesia, from 2020-to 2021, as seen from the Speedtest, includes countries that have a Bandwidth or Median Speed (Mbps) of less than 20 Mbps. Thus placing it in the third lowest position after India and Cambodia. Meanwhile, South Korea is a country that has bandwidth above 80 Mbps at Median Speed in 2020-2021. Moreover, Figure 13 is the Enterprise IoT market 2019-2027 data on data retrieved in March 2022. This data is taken from IoT analytics. Finally, Table 4 shows the significant difference between the IoT Stack and Web Stack when viewed from the parameters of TCP/IP, Data Format, Application Layer, Transport Layer, Security Layer, Internet Layer (Network Layer), Data Link Layer, and Physical Layer. So that the IoT system must be equipped with reliable security, it is necessary to develop Cyber-IoT technology [2,16]. Research on the theme of the IEEE 802.15.4 protocol was completed in research [1] and [18],[20] while using LoRa and LoRaWAN were analyzed in detail in research [19,21,22],[31].

## 4. Conclusions and Suggestion

Based on the description and discussion in the previous chapters, it can be concluded Make apps easier, The population data collection process can be carried out properly, and By making this program can be done quickly, precisely. The suggestions that are proposed after creating an information system are as follows: Can only enter data on teachers, students, subjects, and attendance; the program can only be done on a laptop/pc that has the application installed. Teachers and admins can only do the data input

process. The technology for this development is expected to be more sophisticated. With this student data information system, it becomes a reference for making a better and perfect student data information system. The development of a presence system towards IoT based with camera devices that support Face Recognition will be a future technological sophistication that can be applied to various schools in Indonesia.

**Author Contributions:** Conceptualization; Yanris.G.J (Y.G.J), methodology; (Y.G.J), validation; (Y.G.J), formal analysis; (Y.G.J), investigation; (Y.G.J), data curation; (Y.G.J); writing—original draft preparation:(Y.G.J), writing—review and editing; (Y.G.J), visualization; (Y.G.J), supervision; (Y.G.J), project administration; (Y.G.J), funding acquisition; (Y.G.J), have read and agreed to the published version of the manuscript.

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**Conflicts of Interest**: The authors declare no conflict of interest.

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