Wireless Scoreboard Technology Architecture for Athlete Performance Data Warehouse at Multiple Table Sports Games

Wireless Scoreboard Technology Architecture for Athlete Performance Data Warehouse at Multiple Table Sports Games

Estiyan Dwipriyoko[1*], Widjajani[2], Wahyu Purnama Sari[1], and Mujiarto[3]

[1]Program Studi Informatika, Fakultas Teknik, Universitas Langlangbuana, Bandung
[2]Program Studi Teknik Industri, Fakultas Teknik, Universitas Langlangbuana, Bandung
[3]Department of Mechanical Engineering, Universitas Muhammadiyah Tasikmalaya, Indonesia

*estiyand@unla.ac.id

Abstract. The presence of technology brings many new changes that facilitate human life. In the field of information for sports competition results in the form of a scoreboard. Scoreboard is used in sports tournaments as a display of the results of a tournament. So everyone who is in the arena can find out the results of the tournament score. Scoreboard generally displays the value of the tournament, displays the time of the tournament and the number of rounds during the tournament. The majority of scoreboard shows only one result from one tournament, while there are tournaments where several teams compete simultaneously in one room, so the audience has difficulty knowing the score of other tournaments even though they are in one room. For example, in a pool or table tennis tournament, in one arena there are more than one team competing. At that time, usually the scoreboard is only on each table. That causes a limited number of scoreboard that can be seen by the audience, not all tournaments. Meanwhile, the scoreboard used in Indonesia also still uses the remote and cable as the transmission media when inputting scores. The remote is held to a distance according to the length of the cable which is very impractical. The space for the remote holder is also not flexible because the remote is connected by a cable. Therefore, in inputting the score there is no need to use cable anymore, because this application is web-based and connected via a wireless network. The purpose of this research is: to make it easier to record scores of tournaments with multiple tables, and to record performance statistics from athletes. The benefits of this research are: to make it easier to record values because they are connected to a wireless network and display them in real time, and get athlete performance statistics during the competition.

1. Introduction

1.1. Research Background

The presence of technology brings many new changes that facilitate human life. In the field of information for sports competition results in the form of a scoreboard. Scoreboard is used in sports tournaments as a display of the results of a tournament. So everyone who is in the arena can find out the results of the tournament score. Scoreboard generally displays the value of the tournament, displays the time of the tournament and the number of rounds during the tournament. The majority of scoreboard

shows only one result from one tournament, while there are tournaments where several teams compete simultaneously in one room, so the audience has difficulty knowing the score of other tournaments even though they are in one room. For example, in a pool or table tennis tournament, in one arena there are more than one team competing. At that time, usually the scoreboard is only on each table. That causes a limited number of scoreboard that can be seen by the audience, not all tournaments. Meanwhile, the scoreboard used in Indonesia also still uses the remote and cable as the transmission media when inputting scores. The remote is held to a distance according to the length of the cable which is very impractical. The space for the remote holder is also not flexible because the remote is connected by a cable. Therefore, to input the score there is no need to use cable anymore, because this application is web-based and connected via a wireless network.

The objective of this research is: to make an easier way to record scores of tournaments with multiple tables. And to record performance statistics from athletes. The fewer turns (or series) and the greater the value made per turn (or series), the higher the athlete's performance.

The benefits of this research are: to make an easier way to record values because they are connected to a wireless network and display them in real time. And to get athlete performance statistics during the competition, because every value an athlete makes on each turn (or series) is an indicator of the athlete's performance.

Expected output and goals from this activity is to make the wireless scoreboard application. This application is used to help record activities and display scores in sports tournaments with many tables. It also display player statistics. This application project documentation is also used as scientific articles.

2. Literature Review

2.1. Wireless Scoreboard

So many people around the world know and love sports. There are those who make sport as a hobby or entertainment, while others make it as a profession and a means to get money. Sports are synonymous with the tournament, where this tournament is useful to measure the potential of each player. Benchmark of victory is usually seen from the numbers listed on the scoreboard. Everyone in the arena can see it. Scoreboard is a display device that displays an acquisition value that has been generated at an event (tournament). Scoreboard generally displays the value of the tournament, displays the time of the tournament and the number of rounds during the tournament [1].

With this application, the coach can find out the athlete's performance during the tournament. Data entered by the referee, using a tablet, passed on the wireless network to the router, and stored in a data warehouse server. Computer networks that use wireless data connections between points are called wireless networks [2]. Web technology is used as an intermediary for Database and Mobile interfaces (used on RefereesTablet), and viewers on Television and internet browsers.

2.2. Data Warehousing

Data warehousing is needed to gain athlete performance. With the data warehousing, coach can analyze and know the performance statistics of his athletes. So that the coach can figure how to train the athlete, as well as strategies for the next tournament. Data warehouse is a concept and combination of technologies that facilitate organizations to manage and maintain historical data obtained from systems or operational applications. The use of data warehouse technology is needed by almost all organizations, including libraries [3]. Data warehouse allows integration of various types of data from various applications or systems. This guarantees access mechanisms to give "one door for management to obtain information and analyze it for decision making" [4].

The software development model used in this application is the prototyping model. Prototype is a process that allows developers to create a software model, this method is best used if the client cannot provide maximum information about the needs he wants [5].

2.3. Technology Architecture

Enterprise Architecture is one of the standard approaches to the company's technical systems [6][13]. Technology Architecture is a part of Enterprise Architecture that shows the architecture of hardware,

networks and platforms that offer services [6][13]. This technology architecture shows the Technology Architecture Diagram, the User Function Catalog, and the Technology - User Matrix[6][13].

3. Research Method

3.1. Research Method

Research philosophy used in this research are Positivism. Research approach used in this research are Deductive. Research strategies used in this research are Experiment. Research philosophy used in this research are Positivism. Research choices used in this research are Mono Method. Research time horizon used in this research are Cross Sectional [6][7][10][11].

3.2. Data Collection

Data collection methods for application development is to search for references in various literature such as journals, books, information from the internet related to the program in question. In addition, by conducting surveys and interviews with partners [6][7][10][11].

4. Result and Discussion

4.1. System Design and Requirements

Scoreboard generally displays the value of the tournament, displays the time of the tournament and the number of rounds during the tournament [8]. The majority of scoreboard shows only one result from one tournament, while there are tournaments where several teams compete simultaneously in one room, so the audience has difficulty knowing the score of other tournaments even though they are in one room.

The traditional scoreboard are written on the board and on the paper, by the referee assistant. Then, after the game is over, referee assistant will pass the score paper to the Tournament Manager. Then, Tournament Manager will approve the score to be announce on the main tournament scoreboard. But the score paper never been use to record the athlete performance. They only used the final score to be announce in the main tournament scoreboard.

From these work flow, we going to eliminate the referee assistant score paper courier [8]. So the score will directly written to data base to be recorded. The score will be announce instantly, after Tournament Manager digitally approved the score. And the application will have the athlete performance during the match, by analyzing the adding of the score. The fewer turns (or series) and the greater the value made per turn (or series), the higher the athlete's performance. These are the design gap that has to be fill by the application.

For each tournament, data is entered by the Referee through the Referee's Tablet of each tournament. From the diagram above it can be seen that each type of tournament has a different referee. Data is routed to the wireless Access Point or Router, and forwarded to the Server via a LAN cable. Data is always saved to the server from the data of the referee, athletes, management, score, and others.

For example: in 15 Ball Tournament, if there is every additional score or violation, the application can send data, via tablet to the server, and be routed through to the Tournament Manager laptop, then the data can be displayed to the Wireless Scoreboard laptop and Television for a larger display. The choice of wireless technology is due to the large tournament room, many tournament tables, many referee tablet inputs, many tournament viewer laptops and for easy installation. Figure 3 bellow shows Wireless Scoreboard Technology Architecture [6] Diagram.

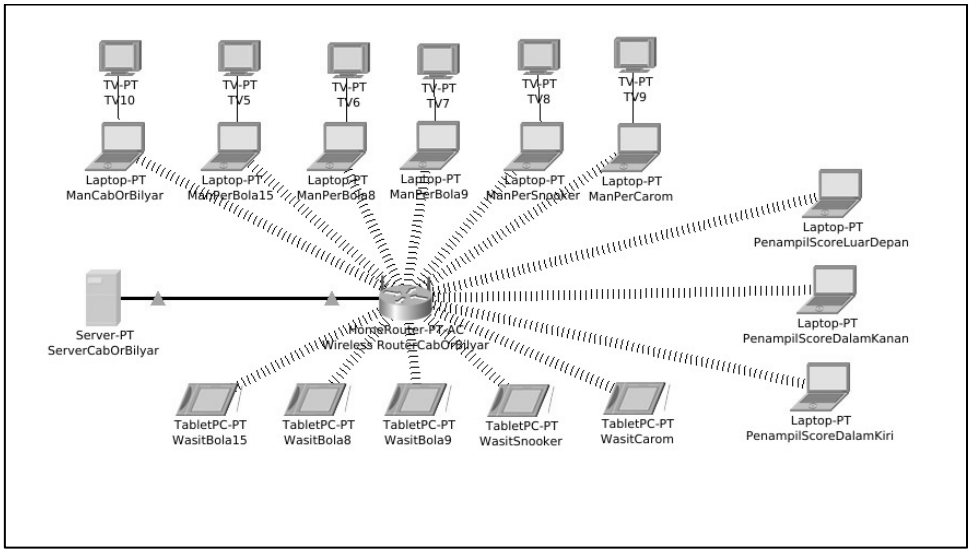

Figure 1. Wireless Scoreboard TechnologyArchitecture Diagram

Wireless Scoreboard Technology Architecture shows that the application has eliminate the referee assistant courier function (as shown at Table 4).Also, the application give new feature to the score board, that is automatic scoreboard counter and athlete performance data input. Table 3 show User Function Data of the application.

Table 1. User Function Data Catalog

No	User	Function
1	Referee	Keep an eye on the game and give the tournament score results
2	Referee Assistant	Write down the score to the application
2	Tournament Manager	Receive a score from the referee and give approval to display.
3	Administrator	View and manage tournament data

Technology Architecture Diagram shows all the technology needed in the system [6][13]. To show subject that use the technology, the technology items has to be mapped to the user. This map uses matrices. This matrices also shows duplication of user, so it is possible to eliminate one. Table 4 shows the Technology - User Matrices[6][13] to show technology users in this system.

Table 2. Technology - User Matrices

No	User	Router	Server	Referee's Tablet	Manager's Laptop	Score Monitors	Can be Eliminate
1	Referee	No	No	Yes	No	No	No
2	Referee Assistant	No	No	Yes	No	No	Yes
3	Tournament Manager	No	No	No	Yes	No	No
4	Administrator	Yes	Yes	Yes	Yes	Yes	No

4.2. Development of the System

To make this application, we use the prototyping development method. This method is chosen to fully do the business process re-engineering [6][7][9]. This application is done by using several steps in the process. The steps [5] taken are as follows:

1. Requirements: Developer and clients will meet and then determine the general objectives, requirements and anything that will be needed,
2. Design: Design represents all known aspects of the software, and this design is the base for making prototypes
3. Encoding system: In this stage the prototype is translated into the appropriate programming language.
4. System testing: After the system has become ready-made software, it must be tested before use. This test is done by white box, black box, base path, architecture testing and others.
5. System evaluation: The client evaluates whether the finished system is as expected. If so, then the seventh step is done, if not then repeat step 2 and step 3.
6. System implementation: Software that has been tested and accepted by customers is ready to use.

5. Conclusion

It can be concluded from this research are: This application makes an easy way to record the value of tournaments with many tables that are far apart, in digital way, because it is connected to a wireless network and displays it in real time. This application is also used to records the athletes performance statistics, because every value made by athletes in each series is an indicator of athlete performance. The fewer series and the greater the value made each series, the higher the athlete's performance. Wireless Scoreboard Technology Architecture shows that the application has eliminate the referee assistant courier function. Also, the application give new feature to the score board, that is automatic scoreboard counter and athlete performance data input.

References

[1] Wang, P., Development of Portable Ball Game Electronic Scoreboard, 8th International Conference on Social Network, Communication and Education. Atlantis Press, 2018.
[2] Zanjireh, M. M., Shahrabi, A., & Larijani, H., Anch: A new clustering algorithm for wireless sensor networks, 27th International Conference on Advanced Information Networking and Applications Workshops (pp. 450-455), IEEE.2013.
[3] Ridha,MR., Pramiarsih,EE., Widjajani, The Use Of Geogebra Software In Learning Geometry Transformation To Improve Students' Mathematical Understanding Ability, Journal of Physics: Conference Series (Vol. 1477), IOP Publishing,2020.
[4] Siregar, A.M., dan Puspabhuana, A., *Data Mining : Pengolahan Data Menjadi Informasi dengan Rapidminer*,Surakarta, Kekata Publisher, 2002.
[5] Yurindra,*Software Engineering*, Yogyakarta, Deepublisher, 2017.
[6] Dwipriyoko,E., Bon,ATB , Sukono,F., Enterprise Architecture Planning as New Generation Cooperatives Research Methods, Journal of Physics: Conference Series (Vol. 1179, No. 1, p. 012094), IOP Publishing, 2019
[7] Dwipriyoko,E., Widjayani, Partial Business Process Re-engineering in New Generation Cooperatives Enterprise Architecture Implementation, In Journal of Physics: Conference Series (Vol. 1477,), IOP Publishing, 2020.
[8] Hutauruk,S., Siagian,P., & Sianturi,L., Scoreboard wireless universal based on microcontroller, IOP Conference Series: Materials Science and Engineering (Vol. 420, No. 1, p. 012052), IOP Publishing, 2018.
[9] Widjajani, Nurjaman,R., The Framework of Strategic Agility in Small and Medium Enterprise, Journal of Physics: Conference Series (Vol. 1477), IOP Publishing, 2020.
[10] Gumilar,AC., Afrian,NFS., Pramiarsih,EE., Widjadjani, The Effect of Mathematics Learning

With Improve Method to the Mathematical Representation Ability of Junior High School Students, Journal of Physics: Conference Series (Vol. 1477), IOP Publishing, 2020.
[11] Sutarman,E., Widjajani, Dwipriyoko,E., Effect of Additive Chemicals on Soil Characteristics, Journal of Physics: Conference Series (Vol. 1477), IOP Publishing, 2020.
[12] Ridha,MR., Pramiarsih,EE., Widjajani, The Use Of Geogebra Software In Learning Geometry Transformation To Improve Students' Mathematical Understanding Ability, Journal of Physics: Conference Series (Vol. 1477), IOP Publishing,2020.
[13] Dwipriyoko, E., Bon, A. T. B., & Sukono, F., New Generation Cooperative Financial Mathematical Model Preliminary Concept. Journal of Engineering and Applied Sciences, 12(18), 4590-4594,IOP Publishing, 2017.

Acknowledgments
Authors would thanks the students and give effort to do Program Kreativitas Mahasiswa with this WISTA (Wireless Scoreboard *dan Data Statistik Atlit untuk Pertandingan Olahraga Banyak Meja*), in 2019. The students are Erni Susilawati, Deden Wahyudi Julianto, Arifah Ramadhani, and Arya Abim Pangestu. Representing the client for this WISTA is the Manager of POBSI Kota Bandung, Subiyanto.