

Secure Login System Using QR-Image

Shreya Dutta
Department of Computer
Engineering
D.Y. Patil Institute of
Engineering and Technology
Pune, India

Shalu Singh
Department of Computer
Engineering
D.Y. Patil Institute of
Engineering and Technology
Pune, India

Pratiksha Ghodke
Department of Computer
Engineering
D.Y. Patil Institute of
Engineering and Technology
Pune, India

Abstract: In this paper, we are introducing a new idea to secure the login by generating a QR code (Quick Response Code) image. QR code is an extension of a barcode. Since QR code has a great storage capacity than a barcode, it is used to carry or store different messages. In today's era, security is a very crucial issue to handle. So this is the aim of this paper. It mainly focuses on ciphering the generated unique user-id to a secure QR code which will then be converted to a QR-image. Later this image will be segmented by using Image Segmentation. This will not only eliminate the traditional password-based system but will also reduce the chance of attack.

Keywords: QR code; Cryptography; Segmentation; Cipher; Security.

1. INTRODUCTION

In this world full of technologies, security is becoming an important thing to take care of. These days due to weak security systems, there are many phishing attacks and frauds have taken place in the present digital world. These attackers can be in any form be it a hacker or an intruder who are always ready to misuse every person's personal data. So every individual's data needs to be kept secure. Keeping an individual's personal valuable data like passport information, bank statements, social security number etc is very important and it is also not possible for every individual to carry their documents with them everywhere. Even if they try to save their documents in any of the available online storage applications like Google drive, I cloud etc., there's a high possibility that the data may be lost or hacked.

For this purpose, the field of cryptography (data-hiding algorithm) and image segmentation is used in this study. Cryptography is the study of techniques for safe communication in the presence of third parties. So the existing problem can be solved by encrypting the data and hiding it in the form of QR code which can be kept with the user at any time. Image segmentation is the process of partitioning a digital image into multiple segments. The goal of segmentation is to simplify and/or change the representation of an image into something that is more meaningful and easier to analyze.

2. QR CODE

QR code abbreviated from Quick Response Code is the trademark for a type of two-dimensional barcode, which was first designed in 1994 for the automotive industry in Japan. Since barcode has many drawbacks it is not of much use. A QR code uses four standardizing modes: numeric, alphanumeric, byte/binary and kanji. It stores data efficiently and extensions may also be used.

The QR code is very popular nowadays because of its fast readability and greater storage capacity than standard UPC barcode. There are many applications of QR code. Some of them are product tracking, item identification, time tracking, document management, and general marketing.

A QR code includes of black modules that are arranged in a square grid on a white background, which can be interpreted by mobile applications like camera/scanners and processed using Reed Solomon error correction. The required data are then extracted from patterns that are present in both horizontal and vertical components of the QR image.



Figure. 1 QR code

3. PROPOSED SYSTEM

In the paper, we are using data hiding algorithm and image segmentation for any login system. In this proposed system, there will be two modules: admin and user. The admin can see how many users are there and also he/she can delete the users. The user can register himself/herself in the system and a unique QR code will be generated for that particular user in QR image format. He/she can auto-download the QR image in his/her respective systems and next time when they will login, they only have to upload that particular image instead of their username and password. The QR image will be divided into two parts with the help of image segmentation. One part of the QR image will be at the server and the other part will be available to the user in the QR image format. They can also save this image in their mobile devices and this will also enable them to login on their devices. While logging, the user will upload this image that is available on his/her system/device and this image will be matched with the image present on the server. Then the server will validate it. And when the validation will be successful, the user can successfully logged-in on to that system.

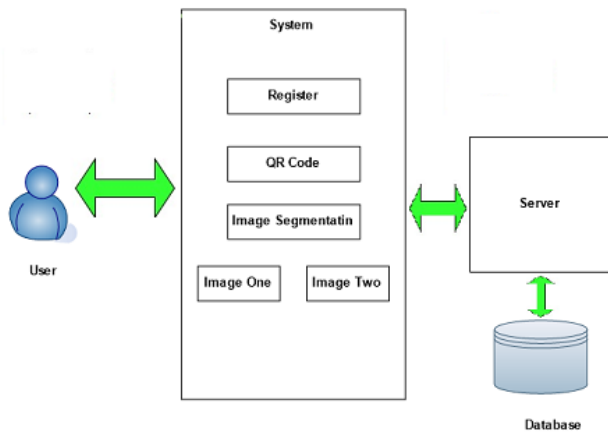


Figure. 2 System Architecture

4. ALGORITHM

4.1 Algorithm Of convert plaintext to QR code

Step 1: write message (text).

Step 2: generate QR code for the message.

Step 3: save QR image as P.

4.2 Algorithm of Convert Key to QR code

Step 1: write key as numbers or text.

Step 2: generate QR code for the key.

Step 3: save QR image as K.

4.3 Algorithm of get Begin Indies of Data Area in QR

Step 1: start.

Step 2: Do loop to get beginning of data area in plain.bmp with width i as height j.

Step 3: end.

4.4 Algorithm of Encryption

Step 1: start.

Step 2: load QR image P.

Step 3: load QR image k.

Step 4: define cipher as bitmap file with dimensions width (wd) & height (hg).

Step 5: Call function to put P(0)(0) to P(i)(j) in cipher(0)(0) to cipher(i)(j).

Step 6: loop statement x=i loop statement y=j cipher(x)(y)=P(x)(y) XOR k(x)(y) next y,x.

Step 7: end.

4.5 Algorithm of Putting Key in Cipher Bitmap File

Step 1: start.

Step 2: binarization each character or number in key as 8bit.

Step 3: loop statement l<key (length) If (key(l)=255) Key(l)=254; Else Key(l)=1; End if.

Step 4: if statement If (key(l)=255) Key(l)=253; Else Key(l)=2; End if.

Step 5: end.

4.6 Algorithm of Getting Key from Cipher Bitmap File

Step 1: start.

Step 2: loop statement until key(l)=253 or 2

If (key(l)=254 or 1)

Str=concat(str,'1');

Else Str=concat(str,'0');

End if.

Step 3: collect each 8bit in str and get character of this collection.

Step 4: end.

4.7 Algorithm of Decryption

Step 1: start.

Step 2: load QR image c.

Step 3: get width (wd) & height (hg) of c.

Step 4: define plain as bitmap file with dimensions width (wd) & height (hg).

Step 5: Call function to put cipher(0)(0) to cipher(i)(j) in plain(0)(0) to plain(i)(j).

Step 6: loop statement x=i

loop statement y=j

plain(x)(y)=cipher(x)(y) XOR key(x)(y)

next y,x.

Step 7: end.

4.8 Algorithm of Image Segmentation

Step1: Define the neighborhood of each feature (random variable in MRF terms). Generally this includes 1st order or 2nd order neighbors.

Step2: Set initial probabilities $P(f_i)$ for each feature as 0 or

Step3: where $f_i \in \Sigma$ is the set containing features extracted for pixel i and define an initial set of clusters.

Step4: Using the training data compute the mean (μ_i) and variance (σ_i) for each label. This is termed as class statistics.

Step5: Compute the marginal distribution for the given labeling scheme $P(f_i|i)$ using [Bayes' theorem](#) and the class statistics calculated earlier. A Gaussian model is used for the marginal distribution.

Step 6: Calculate the probability of each class label given the neighborhood defined previously.

[Clique](#) potentials are used to model the social impact in labeling.

Step 7: Iterate over new prior probabilities and redefine clusters such that these probabilities are maximized. This is done using a variety of optimization algorithms described below.

Step 8: Stop when probability is maximized and labeling scheme does not change. The calculations can be implemented in [log likelihood](#) terms as well.

5. CONCLUSION

Secure login system using QR code can be used in large scope for solving any real time problems of memorizing different user-id and password. This will reduce the headache of getting confused with different user-id and password for different websites.

6. ACKNOWLEDGMENTS

We would like to express our special thanks of gratitude to our guide Prof. Sujay Pawar, our project coordinator head Prof. Deepti Deshmukh as well as our head of the department Prof. Mangesh Manake who gave us the golden opportunity to do this project on the topic Secure Login System Using QRimage, which also helped us in doing a lot of Research and we came to know about so many new things. We are really thankful to them.



7. REFERENCES

- [1] Basheer N. Ameen, Sawsan K. Thamer, "A Novel Method for CIPHERING a Message Based on QR Codes" in International Journal of Scientific Engineering Research, Volume 8, Issue 4, 2017.
- [2] P. Kieseberg, M. Mulazzani, L. Munroe, S. Schrittwieser, M. Sinha, et al., "QR code security" in Proceedings of the 8th International conference on Advances in Mobile Computing and Multimedia, 2010.
- [3] S. Balaji, Dr. N. Pughazendi, S. E. Praveenkumar, V. Vishal, R. Vignesh, "E-Medical Application using QR code with OTP generation" in International Journal of Innovative Research in Science, Engineering and Technology, 2018.
- [4] S. Dey, S. Agarwal and A. Nath "Confidential Encrypted Data Hiding and Retrieval Using OR Authentication System" in International Conference on, 2013.

A Hybrid WOFOST and Cropsyst Model for the Prediction of Crop Yield

Achir Jerome Aondongu
Department of Mathematics,
Statistics and Computer Science,
University of Agriculture Makurdi
Benue State, Nigeria.

Iorshase Agaji
Department of Mathematics,
Statistics and Computer Science,
University of Agriculture Makurdi
Benue State, Nigeria.

Esiefarienrhe Bukohwo M
Department of Mathematics,
Statistics and Computer Science,
University of Agriculture Makurdi
Benue State, Nigeria.

Abstracts: Food availability is essential for any nation. The availability of food in turn depends on so many factors. In this work a hybrid model for the prediction of crop yield was proposed. This model combines the WOFOST and Cropsyst models and incorporated a crisis situation for prediction of crop yields. Factors used in the proposed model for prediction of crop yields include weather conditions, soil fertility, and crisis data. Crisis determines the availability of land for farming. Benue state of Nigeria was chosen as a study area. This choice is due to the fact that the state is tagged the food basket of Nigeria because of its mass production of many varieties of food crops. The crops covered in the study are maize, rice, tomato, millet, sorghum, beans. The new model was simulated using Visual Basic 2010 and results indicated that the model performed accurate predictions as compared to manual predictions. The system is recommended for use by food security agencies to avert hunger and starvation in future.

Keywords: WOFOST, CROPSYST, Hybrid, yield, crops, model, nutrient, computer

1. INTRODUCTION

Food security is a worldwide problem that has called the attention of all stakeholders in the agricultural sector. There is need to know the total crops yield in any economy. Such knowledge aids in planning in terms of agricultural inputs, storage facilities as well as processing.

Benue State is the Food Basket of the Nation and achieving food sufficiency in the state will go a long way to address most of food insecurity problems facing Nigeria.

According to Nwajiuba (2012), Nigeria has the ambition of diversifying her economy from crude petroleum dependency. The country also faces a looming food security crisis with a growing population that is increasingly dependent on imported foods. The once dominant subsistence-oriented farm economy is at risk of gradual marginalization. There are many models and methodologies used in the prediction of crop yields. In this work

two such models are studied in details. These are World Food Studies (WOFOST) and Cropping System (Cropsyst). Direct application of the two models individually or in combination may not yield the desired result because of the prevailing crisis in Benue state. Therefore we combined WOFOST and Cropsyst and added a crisis component on the hybrid model and used it to predict crop yields for selected years in Benue State.

2. LITERATURE REVIEW

Crop yield predicting and forecasting enable stakeholders to take crucial decisions especially if such predictions and forecasts are carried out before harvest. Stakeholders in agriculture in Nigeria include the various governments (Federal, states and local), investors in the sector, farmers and researchers in the agricultural sector. The decisions may include planning for storage, processing and import-export plans. In this review we dwelt mostly on the

various models and methodologies used for predicting and forecast of yields.

Anup et al (2006) used pairwise linear regression method with breakpoint and utilized 19 years of data comprising normalized difference vegetation index(NDVI), rainfall soil moisture and surface temperature to assess and predict crop yield for Iowa state, USA. Their model did not, however, consider the crisis situation such as in Nigeria where insurgents and herdsmen clash with farmers over land utilization, land being a vital resources for farming.

Kefaya et al (2011) explored the dynamics of neural networks in forecasting crop yield using environmental factors like temperature, CO_2 , vapor pressure deficit and radiation. Their model has only yield as the output mode.

Dahikar and Rode (2014) Used artificial neural networks and parameters related to soil and atmosphere to predict crop yield. Their paper demonstrated the ability of ANN technology to be used to predict crop yields at rural district

Verma et al (2015) used a mixed model procedure as a way of fitting a multi-level model for crop yield prediction. Their paper also demonstrated the usefulness of their mixed model framework for preharvest crop yield forecasting.

Li et, al (2007) used ANN to predict corn and soya beans yields in the “corn belt” area of the Midwestern and Great Plains region of the United States. A new procedure that utilized SCE-UA algorithm was used to train the ANN. Their method had a prediction accuracy that was as high as 85 percent

Hoogenboom and Gresham (1993) analyzed crop models SOYGR0, PNUTGR0, CERES-maize and CERES-wheat and linked the models with a geographic information system. Their system was to simulate crop growth and development for each field and also predict yield and other crop input and output.

Conor and Mikahail (2005) used a stochastic weather generator to produce a probabilistic ensemble of water series which was used with a crop simulation model to generate distribution of crop characteristics. They analyzed six sites in Europe and Australia and demonstrated that there is a great variation in lead times for predicting selected crop characteristics between sites.

Galan et al (2008) sought to identify factors influencing olive fruit production in Andalusia Spain. They modeled pollen release and used field floral phenology data as well as meteorological data over

the fruiting season. Their models provided earlier and more accurate crop estimates than those used by the Andalusian government.

Kushwaha and Sweta B (2015) tried to predict crop yield by processing Big Data using the Hadoop platform. Their work focused on soil type and the suitability of each crop for a given soil type. Their work identified good quality and improved crop yield using Agro algorithm implemented in Hadoop platform.

Wang etal (2012) developed a computer vision based system for crop yield estimation. Their system used a two-camera rig for the acquisition of images and a computer vision algorithm to generate apple count as crop yield estimation. Their results indicated that their system worked well with both red and green apples with minimum errors.

Savin etal (2007) examined the possibilities of using fuzzy neural network for predicting crop yield in Rostov oblast, Krasnodov and Stavropol kraiss regions of Russia. They used results from the simulation of CGMS model and values of vegetation index from SPOT VEGETATION satellite data as input to their model. Results from their work indicated 74 percent accuracy in predicting yield. Their result was however more suitable for sowing-flowering rather than sowing-ripening period.

Bornn and Zidek (2012) described how to incorporate spatial dependence into statistical models for crop yield. They created a Bayesian model which provided efficient predictions over least square methods. The also examined a range of possible dimension-reduction schemes as well as basic expansions to improve predictions. Their model also provided straightforward interpretation of the effects of climate on its output.

Sawasawa (2003) applied space- borne satellite based NDVI to predict rice yield at Andhra Pradesh state in India. His results indicated a significant correlation between remotely sensed NDVI and field level rice yield. His result revealed that land and management factors also significantly affect yield

Stockle (1996) developed CropSyst (Cropping Systems) Model. The model considered crop water uptake and actual crop transpiration as equal. The inputs of the model include weather file, location, soil, crop and management data files. It predicted yield (tons) as a product of nitrogen-limited biomass and harvest index. The model is limited by the fact that it cannot simulate crop-

specific potential evapotranspiration. It cannot also simulate crop water uptake different from actual crop transpiration. Subsequently the model neglected water retained by plant for turgidity and it placed no water stress in the estimation of crop evapotranspiration

Bouman *et al.* (1996) reported the development of World Food Studies (WOFOST) crop model. The model is site-specific and considered ecological factors under the assumption that optimum management practices were applied. It used maximum and minimum temperatures, rainfall, wind speed, water vapor pressure, global radiation and evapotranspiration as its inputs and predicted yield as a product of dry matter rate of the shoots and translocation factor of crop organ. The model is site and cultivar specific and that limits its general application.

The models and methodologies reviewed did not envisage the crisis situation which is now a major factor determining crop yield in Benue state, Nigeria. Apart from lack of available land for farming occasioned by crisis, crops are often destroyed by crisis. Therefore our aim in this paper is to build in crisis parameters in a hybridized WOFOST and Cropsyst model and to determine if it will improve crop yield prediction in crisis prone region having extremely fertile lands and climate for agriculture purposes.

3. METHODOLOGY

The WOFOST and Cropsyst models were studied in this work and their inadequacies observed.

The work proposed a new model to incorporate the strength of the two models, in addition, it incorporated the crisis situation which was not envisaged by both models.

The frequent occurrence of crisis within the Benue state has affected food production as hectares of land available for cultivation are usually reduced by crisis. A crisis sub-model was included in the hybrid model to estimate the number of hectares affected by crisis.

3.1 Design of the Proposed System

We began the design of the model with the design of its architecture as it gives a block structure of the system without specifying system details. The architecture of the new model is as shown in figure 1. The model is a 3-tier architecture made up of the front-end, logic and backend.

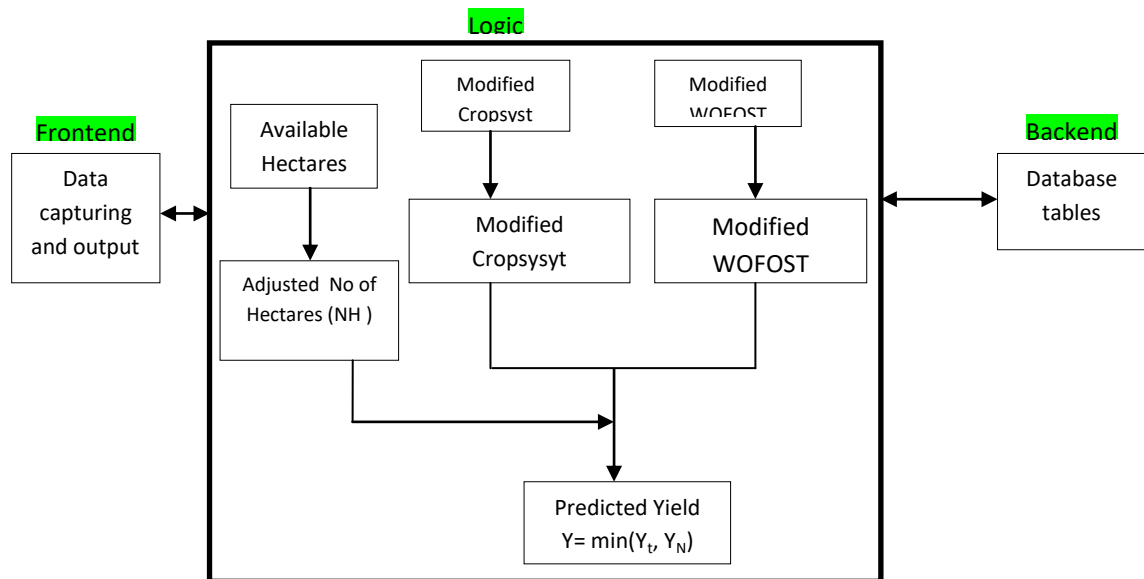


Figure 1. Architecture of the proposed model.

The front-end enables a two-way communication between the user and the system. This tier is responsible for receiving input and generation of reports. The input parameters of the proposed system are weather data, crisis data, soil fertility, crop parameters and location data. The sole report generated by the system is crop yield.

The logic tier is a collection of classes used in implementing the system. The various classes used as well their relationships are shown in figure 2.

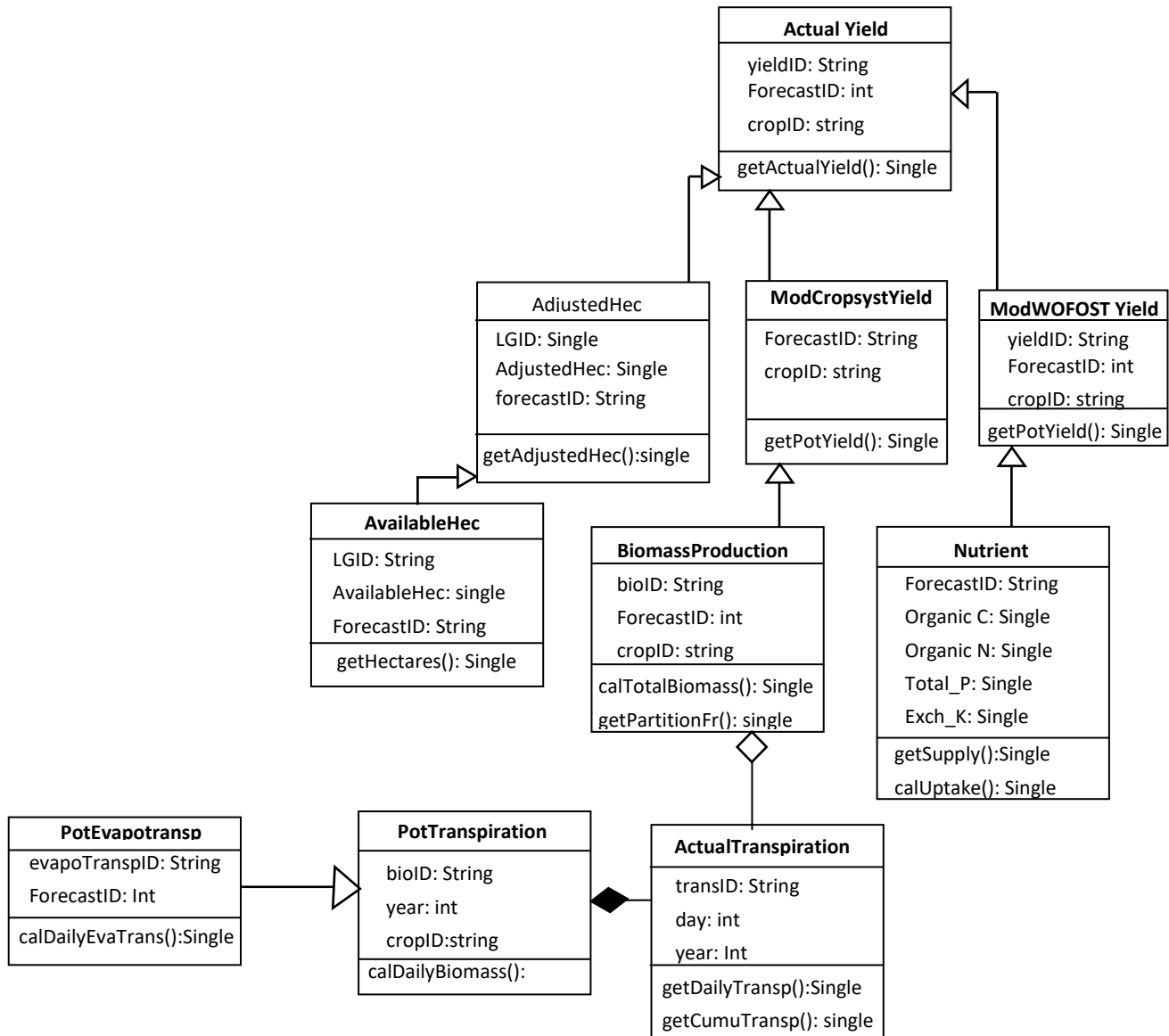


Fig 2: A class diagram of the proposed system

In the work ten (10) classes were used. The most important of these classes is ActualYield which is responsible for the forecast of the actual crop yield. This class spawned three classes namely AdjustedHec, ModCrosystYield and ModWOFOSTYield. The three classes in turn spawned all other classes in the system. The three classes represent the three components of the logic tier. The first component handled crisis and the availability of hectares for farming activities and the classes in this group are AvailableHec and AdjustedHec. The second component handled the crop yield prediction using the modified Cropsyst model and the classes included ModCropsystYield, BiomassProduction, ActualTranspiration, Pottranspiration and PotEvatramp. The third component handled crop

yield prediction using the modified WOFOST model. Classes in this group included ModWOFOSTYield and Nutrient.

The back-end of the proposed system is a database made up of nine (9) tables. The tables and the various relationships among them is as shown in the entity relationship diagram (ERD) in figure 3.

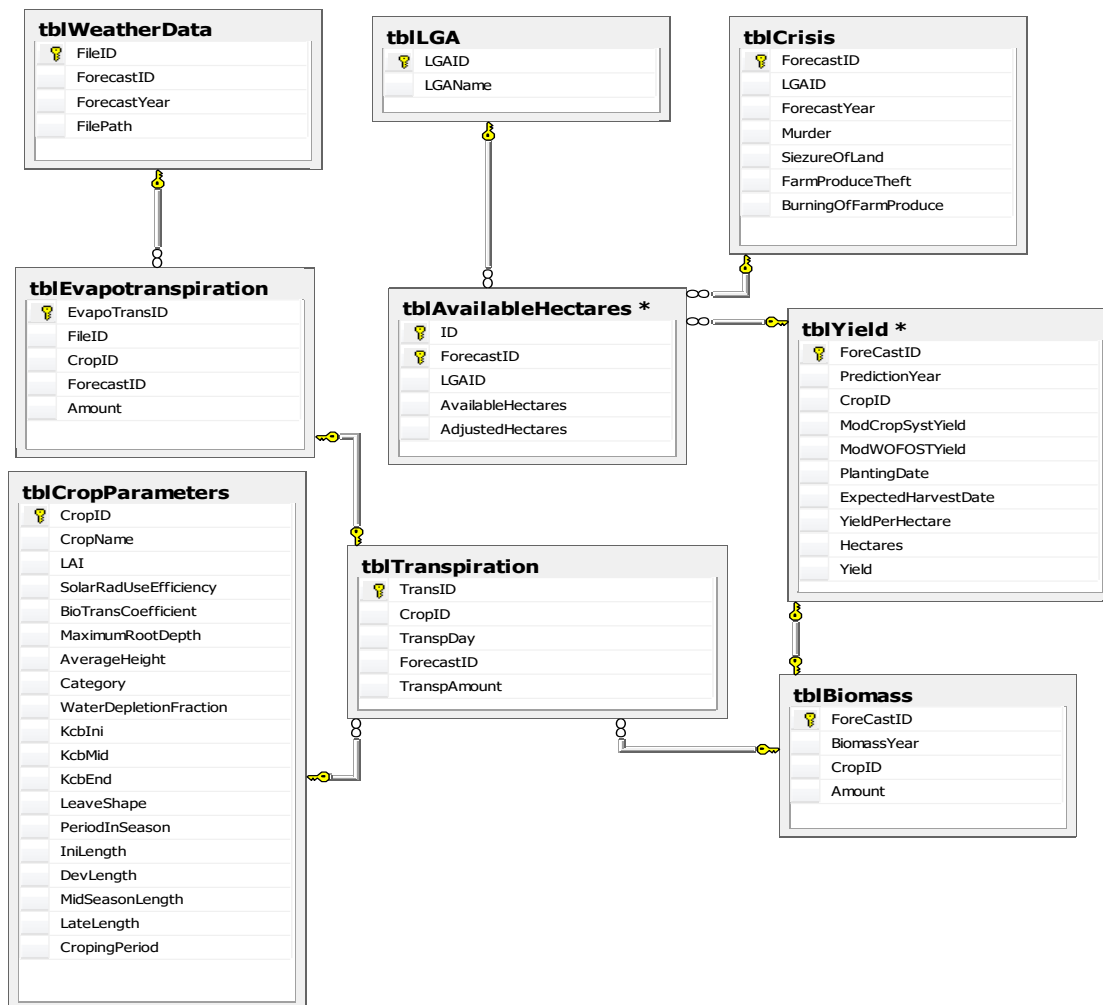


Figure 3. Entity relationship diagram of the proposed system

In figure 3, tblLGA stores the number of Local government areas (LGAs) in Benue state and available hectares of farmland, tblcrisis stores crisis data. Crisis data is represented in form of murder, land seizure and crop destruction with each carrying a designated value. E.g murder carries a value of 1. tblEvapotranspiration table stores the daily amount of water evaporated and

transpired into the atmosphere. tblcropparameters stores the crop specific properties like maximum root depth. tblAvailableHectares stores the number of hectares adjusted by crisis situation in an LGA. tblBiomass stores the daily accumulated crop biomass used in yield prediction, tblYield stores the predicted yield of a crop in a year.

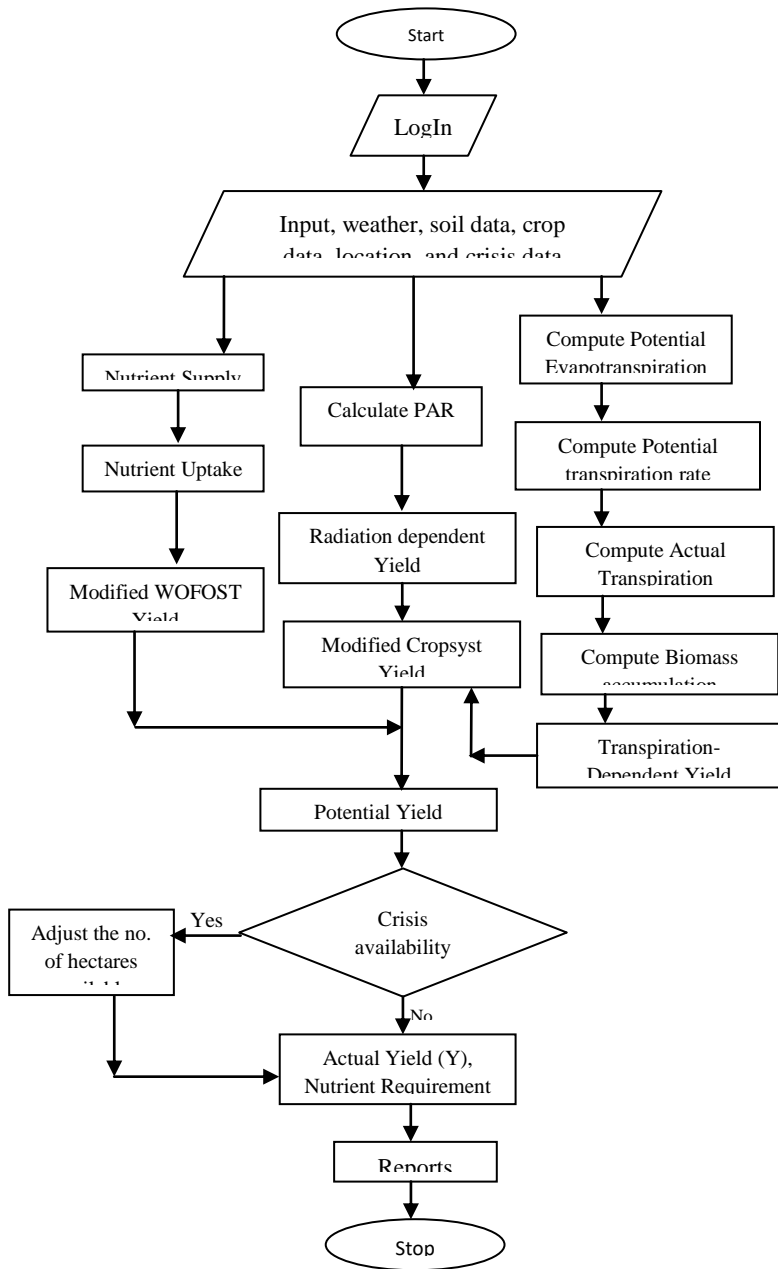


Figure 4: A system chart for the proposed system

3.2 Detailed Design of the Model

In figure 4, the user starts the system and logs in. If successful, the user inputs weather, soil, crop, location and crisis data. Soil data is used to estimate the amount of N, P and K in the soil and N, P and K supply is used to estimate nutrient uptake of a crop.

Nutrient-limited crop yield is then estimated using the modified WOFOST module

Modified Cropsyst computes the yield (Y_t) using weather data. The estimated yield from modified WOFOST and modified Cropsyst are used to compute Potential Yield.

Availability of crisis adjusts the number of hectares available for production and actual crop yield (Y_N) is computed. Reports are then generated and system stops.

4. RESULTS AND DISCUSSION

The model was simulated using Visual Basic 2010 and the back-end was implemented using Microsoft SQL Server 2008. Three (3) experiments were carried out involving years 2011, 2012 and 2013 and various crop yields generated. The three experiments utilized three different datasets for the three years. Each of the dataset comprise daily temperature, wind speed, sunshine and relative humidity from the planting date to expected harvest date for soybeans, maize, millet and sorghum. Each dataset also comprises latitude, rainfall and soil nutrient data. The results of the prediction were captured in table 1.

Table 1: Predicted crop yield (in metric tons (MT)) for various crops and years.

Year	2011	2012	2013
Crop name			
Soybeans	1.23	1.14	1.21
Maize	0.85	0.92	1.50
Millet	0.49	0.50	1.31
Sorghum	1.20	0.79	-

Table 1 shows the predicted yield of soybeans, maize, millet and sorghum for year 2011, 2012 and 2013 respectively. Soybeans, maize, millet and sorghum had a predicted yield of 1.23MT, 0.85MT, 0.49MT and 1.20MT for year 2011, 1.14MT, 0.92MT, 0.50MT and 0.79MT for year 2012. In year 2013, soybeans, maize and millet had predicted yield of 1.21MT, 1.5MT and 1.31MT respectively.

5. CONCLUSION

In this work, WOFOST and Cropsyst models were hybridized and a crisis component added to the hybrid model and used in the prediction of yields for selected

crops in Benue state, Nigeria, for three (3) years. The work used the two models to predict potential yield. Potential yield was modified using the crisis component to come up the predicted yield. The model was simulated using VB.net 2010. The results indicated high accuracy in yield prediction as related to crisis prone regions like Benue state in Nigeria, having extremely fertile lands and climate for agriculture purposes.

5.1. Recommendation

The work is recommended for use by stakeholders in the agricultural sector because of its accurate yield prediction. The work can also be used as a planning tool by stakeholders to

determine the level of food availability in future especially if taken alongside population growth. For future research, we recommend the integration of several models and

methodologies like neural-fuzzy, computer vision, GIS, satellite imaging, crisis modeling into a single model for more accurate crop yield prediction.

http://www.uco.es/raa/publicaciones/andalucia/cordoba/modelling_olive_andalusia_08.pdf.

6. REFERENCES

Anup K. P, Lim C, Ramesh P. S and Menas K 2006. Crop Yield estimation model for Iowa using remote sensing and surface parameters. *International Journal of Applied Earth Observation and Geo information* 8:26-33

Bornn, L. and Zidek, J. V. 2012. Efficient Stabilization of Crop Yield Prediction in the Canadian Prairies. *Agricultural and Forest Meteorology* 152(2012) pp23-232.

Bouman, B.A.M., Van Keulen, H., Van Laar H.H., and Rabbinge, R. 1996. The “School of de Wit” crop growth simulation models: A pedigree and historical overview. *Agricultural Systems*, 52(2-3), pp.171- 198.

Conor L and Mikahail A. S 2005. Assessing lead-time for predicting wheat growth using a crop crop simulation model. *Agricultural and Forest Meteorology* 135(2005) 302-313. Accessed on 11/10/2016 at www.elsevier.com/locate/agromet.

Dahikar S.S. and Rode S.V. 2014. Agricultural Yield Prediction using Artificial Neural Networks Approach. *International Journal of Innovative Research in Electrical, Electronics, Instrumentation and Control Engineering* 2(1): 683-686

Galan, C., Gracia-Mozo, H., Vazques, L., Ruiz, L., Guardia D. and Domínguez-Vilches E. C. 2008. Modeling Olive Crop Yield in Andalusia, Spain. *Agronomy Journal* 100(1) pp98. Accessed on 11/10/2016

Hoogenboom, G. and Gresham, D. D. 1993. Prediction of Spatial yield and water use in agriculture as a function of environmental conditions. Proceedings of 1993 Georgia Water Resources Conference held April 20 and 21 1993 at the University of Georgia.

Kefaya, Q. Evor, H. and Daciana, I. 2011. Recent research in Artificial Intelligence, Knowledge Engineering and Data Bases. Accessed on 13/11/2016 at <http://www.wseas.us/eLibrary/conferences/2011/Cambridge/AIKED/AIKED-34.pdf>

Kushwaha, A. K., Sweta B. 2015 Crop yield prediction using Agro Algorithm in Hadoop. *IRACST-International Journal of Computer Science and Information Technology & Security (IJSITS)*.

Nwajuba C. 2012. Nigeria’s Agriculture and Food Security Challenges. Accessed on 12/12/2015 at https://ng.boell.org/sites/default/files/uploads/2013/10/agriculture_-_green_deal_nigeria_study.pdf

Savin, I. Y., Stathakis, D., Negre, T. and Isaev, V. A. 2007. Prediction of Crop Yields with the use of Neural Networks. *Russian Agricultural Sciences* 33(6) pp361-363. Allerton Press Inc

Sawasawa, H. L. 2003 Crop Yield Estimation: Integrating RS, GIS and Management Factors. A case study of Birkoor and Kortgiri mandals in Nizamabad district, India. Thesis submitted to the International Institute for Geo-information and Earth Observation Eriscchede, the Netherlands in partial fulfillment of the requirements for the degree of Master of Science in Geo-information science and Earth Observation; Sustainable Agriculture.

Stockle C. O. 1996. The CropSyst Model: A brief description. Biological Systems Engineering Dept. Washington State University. Accessed on 22/09/2014 at www.sciencedirect.com/science/article/pii/S0308521X94900062

Verma V, Piepho HP, Hartung K, Ogutu JO and Goyal A. 2015). Linear Mixed Modeling for mustard yield prediction in Haryana state (India) Journal of Mathematics and Statistical Sciences 96-105.

Li A, Liang S, Wang A and Qin J 2007. Estimating crop yield from multi-temporal satellite data using multivariate regression and neural network techniques. Photogrammetric engineering & Remote Sensing 73(10): 1149-1157

Wang, Q., Nuske, S., Bergerman, M. and Singh, S. 2012. Automated Crop Yield Estimation for Apple Orchards. In proc. International Symposium on Experimental robotics, Quebec City.

Mobile Based Application of Document Delivery (Case Study: PT Waindo Specterra)

Helda Fitriana Sari
Faculty of Computer Science
Mercu Buana University
Jakarta, Indonesia

Nur Ismawati
Faculty of Computer Science
Mercu Buana University
Jakarta, Indonesia

Abstract: The document delivery process at PT Waindo SpecTerra is still running manually. Problems arising from road documents that have been received need to be inputted into digital format by admin, travel documents are lost and not stored properly, so that entry data process by admin becomes disrupted. The purpose of this study are the availability of a mobile application that facilitates Company Admin and Driver in sending documents process, data delivery history that's directly stored in the database, and backup data in a structured database. This application uses the PHP programming language, HTML, MySQL Database, and Apache Cordova technology in the development of mobile-based systems. The research method used are library method, observation method and documentation method. The final researches are expected to provide an application system that can facilitate the process of sending documents at PT Waindo SpecTerra, so the road history data is more structured and backup data is available.

Keywords: Document Delivery, Mobile Based Application, Google Maps Direction, Apache Cordova

1. INTRODUCTION

Rapid technological development in the development of hardware and software and communication technology has become an alternative for a company to support operational activities. The development of information technology in the company has made changes in the procedures of operational activities from manuals to an integrated system. Time and cost efficiency make entrepreneurs need to apply technology in their companies.

PT Waindo SpecTerra is a national company engaged in consulting services in providing natural resource management solutions both land and sea supported by digital technology. One of the company's operational activities is correspondence administration activities. For companies, correspondence is the main activity to strengthen relations with other companies and requests for user requirements that must be met by consultant services.

The concept of sending physical documents that are already running at PT Waindo SpecTerra is that company's driver delivers the document to the destination location, then the recipient signs a delivery order as evidence that document has been received well, after that company's driver reports the delivery order to company's admin as a report delivery.

The problem that arises with this manual method are the delivery document that has been received needs to be inputted into a digital format by the admin as a report to the company's supervisor so that it is more neat and structured, so it requires more time and admin staff. Another problems are drivers are not responsible for delivering documents properly, such as mail order orders lost, dirty because of rain or not properly stored evidence of delivery documents, so that the data entry process by the admin is disturbed.

Based on the problem, the authors propose making "Mobile Based Application Of Document Delivery (Case Study: PT Waindo SpecTerra)".

2. LITERATURE REVIEW

2.1. Mobile Application

The mobile application is software that runs on mobile devices such as smartphones or tablet PCs. The mobile application is also known as an application that can be downloaded and has certain functions that add to the functionality of the device [1].

2.2. Google Maps

According to [2] Google Maps is a free service from Google that is quite popular. Users can add the Google Maps feature on the web with the Google Maps API. Google Maps API is a JavaScript library. The use of Google Maps API can save time and money to build reliable digital map applications, so users can focus only on the data needed.

2.3. Apache Cordova

According to [3] Apache Cordova is the main framework for building cellular applications for several target platforms using HTML5 (HTML, JavaScript, and CSS). When a smartphone or tablet user plays a device running a web or Cordova application, the browser must be able to react to changes and adjust page properties. Otherwise, when the browser window switches from portrait to landscape, some of the available screens will not be used.

2.4. Company Document

According to [4], Company documents are data, records, and or information that are made and or received by company in the context of carrying out their activities, whether written on paper or other means or recorded in the form of any pattern that can be seen, read or heard.

2.5. Goods Delivery Service

According to (Moenir, 2006) in [5] Goods delivery service is an activity carried out by a person or group of people on the basis of material factors through certain systems, procedures and methods in the context of efforts to meet the interests of others in accordance with their rights.

2.6. Related Research

Research related of goods delivery have been carried out by several researchers from various perspectives, as follows [5]-[9],

Research by [5] provide an illustration that the process of making goods delivery reports is still manual so that the construction of a system that uses a computerized system is expected to provide better service, especially in terms of information needs. The goal is that employees do not have misunderstandings in processing data and there is no delay in goods delivery. The research methods used are library studies, field studies, and system development with the waterfall method.

Research by [6] explain design web-based information systems of goods delivery services to minimize the obstacles faced in the delivery of goods and services. The system design method used with the data flow diagram (DFD) method. The expected results help when logging in, or monitoring the effectiveness of the goods when the shipment takes place.

Research by [7] explained about VRP software that utilizes API services from Google Map capable of displaying maps, obtaining distance data, route data, and route depiction. The CVRP method uses the Sequential Insertion route search strategy.

Research by [8] provide an overview of online driver mobile application software on the android platform has helped drivers to get orders, help PT. XYZ to find out drivers who are ready to receive orders, and help customers place orders for cars and order drivers according to their choice.

Research by [9] explain Android-based application of tracking position goods delivery. This application purpose that couriers can log into application and can use each menu that is intended for couriers, process of selecting order of goods to be sent can run well, the process when courier updates the order status of goods can run well, a history page can display goods orders what has been done, courier can manage the profile data, and customer can track courier position when order status is in progress.

3. RESEARCH METHOD

3.1. Research Location

The research location at PT Waindo SpecTerra located on Jl. Pejaten Raya No.2, Pejaten Raya Office Complex 7-8, RT1 / RW7, Pejaten Barat, Pasar Minggu, South Jakarta City, Jakarta Special Capital Region 12510.

3.2. Software and Hardware

3.2.1. The hardware used are:

1. Laptop set of Acer Aspire V5 431 with specification:
 - Operating System = Windows 8.1 Pro 2013 Microsoft Corporation
 - Processor System = Intel® Core™ i3-3217U CPU @ 1.80GHz
 - Installed Memory (RAM) = 4.00 GB (3.80 GB usable)
 - System type = 64-bit Operating System, x64 based processor
2. Smartphone Vivo V7 series with specification:
 - Android Version = 7.1.2 (Android Nougat)
 - Processor = 1.8GHz Snapdragon Octa-core
 - RAM = 4GB
3. Printer set Canon IP 2770 series as a tool of printing document
4. *Scanner* as a tool to move printed documents into digital format

3.1.2 The software used are:

1. PHP MyAdmin within MySQL database
2. Microsoft Office for making final report
3. Sublime Text for writing source code
4. Mozilla Firefox to run HTML files
5. Web Server = localhost
6. Adobe Photoshop and Balsamiq for making interface design

Research flow diagrams of Mobile Based Application of Document Delivery (Case Study: PT Waindo Specterra), as illustrated below:

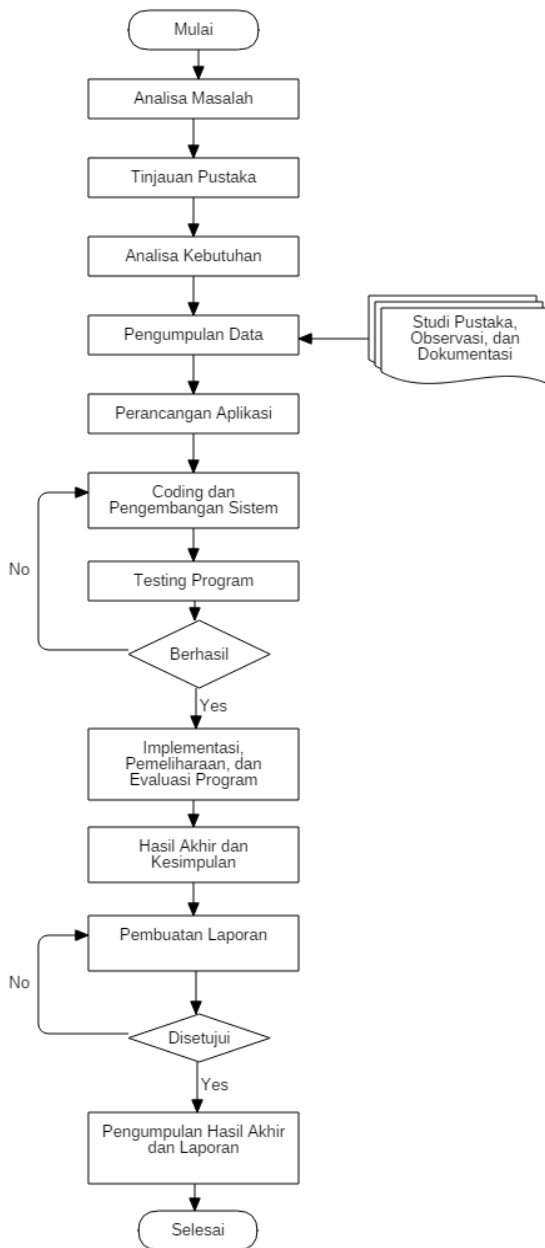


Figure 1. Research Flow Diagram

Explanation of each research stage are,

1. Problem Analysis

This stage identifies problems that must be solved based on the questions that arise, then analyzes the core of the problem, the cause of the problem, and the right solution to fix or resolve the problem.

2. Literature Review

This stage determines thoughts and theories that will be used as the basis for conducting research, then explains critical analysis of the relationship between journal articles from previous researchers and research that will be analyzed.

3. Needs Analysis

The needs analysis stage is the stage of determining features, constraints and objectives of the system in consultation with system users which are then defined in detail and function as system specifications.

4. Data Collection

Data collection is carried out to obtain information needed in order to achieve the research objectives. Data collection techniques used in this study are library study techniques, direct observation techniques, and documentation techniques.

5. Application Design

Application design stages allocate system requirements both software and hardware by forming the overall system architecture. The system architecture design and modeling phase focuses on data structure design, software architecture, interface display, and program algorithms.

6. Coding and System Development

The coding phase translates the logic requirements from pseudocode or flowchart into a programming language both the letters, numbers, and symbols that make up the program.

7. Testing Program

At this stage each program unit will be integrated with each other and tested as a complete system to ensure the system meets the existing requirements. System testing carried out is black box testing.

8. Implementation, Maintenance and Evaluation Program

This stage implements software to the customer, periodic software maintenance, software repair, software evaluation, and software development based on feedback provided so that the system can continue to run and develop according to its function.

9. Report Documents and Collection of Final Results

The report document is made as documentation research. The main purpose is written evidence about the results analysis that has been carried out. The next stage is the final result of application that has been built in accordance with the specifications and report documents approved.

4. RESULT AND DISCUSSION

Development research of Mobile Based Application of Document Delivery in PT Waindo SpecTerra designed with Unified Modelling Language (UML) and User Interface (UI) Design.

4.1 Use Case Diagram

The Use Case Diagram describes the activities that can be performed by system users in the application as shown in Figure 2.

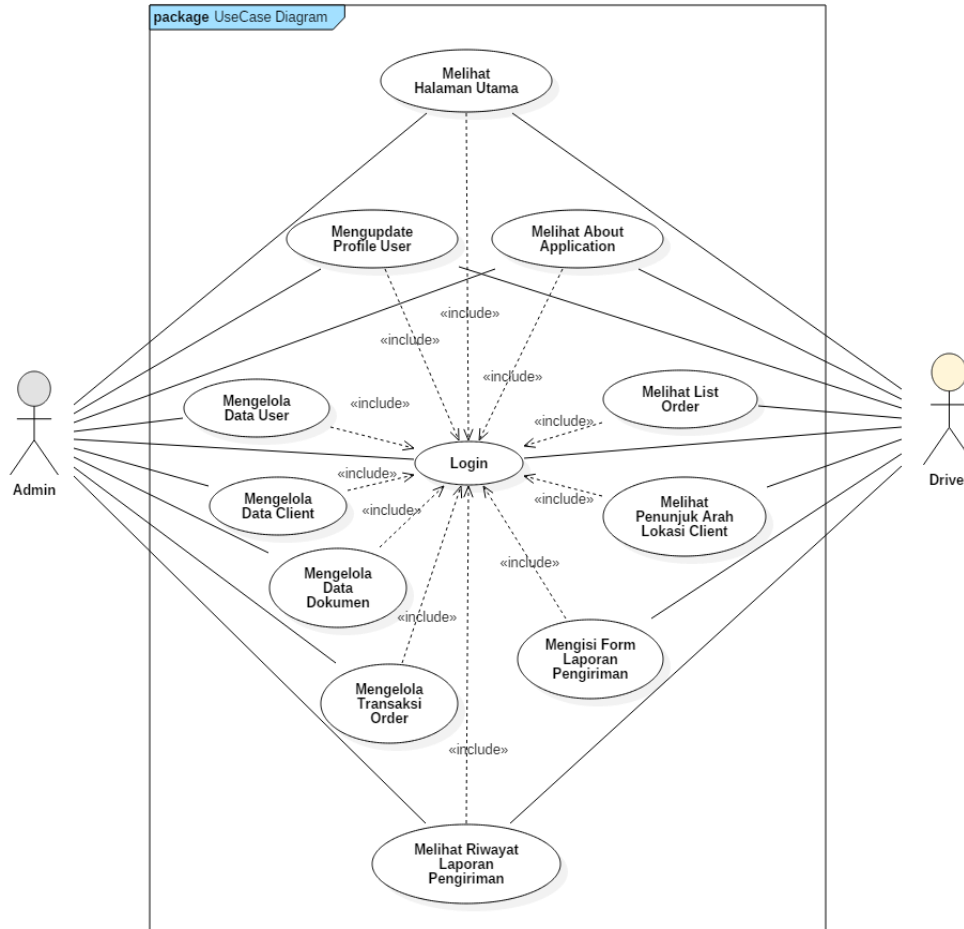


Figure 2. Use Case Diagram Application

Login activity is the initial stage to be able to access the application in full, the User enters a username and password. Activity views the main page is User (Admin and Driver) seeing information related to the company profile. Activity views about application is User (Admin and Driver) seeing information related to the application. Activity changes user profile is User (Admin and Driver) updates personal data that has been previously stored in the application. Activity manages user data is Admin manages user data, such as adding users (admin and driver) that have not been registered, updating user information and deleting user data. Activity manages client's data is Admin manages client's data, such as adding clients that have not been registered, updating client information and deleting client's data. Activity manages document is Admin manages document, such as adding document information to be sent to client, updating stored

document information and deleting document. Activity manages order transaction data is Admin manages order transaction data, such as adding order information that must be sent to client, updating information on order documents and deleting document delivery orders. Activity views list order is driver seeing the detailed order data for sending documents that must be sent to client. Activity views direction of client location is Driver selects the Directions button so he can see the fastest alternative route to company's client location. Activity fills out delivery order form is Driver fills out document delivery report, then he uploads order photo received by the recipient. Activity views delivery report history is User seeing the delivery report resume by printing the delivery report form, the document will appear in the pdf viewer.

4.2 Class Diagram

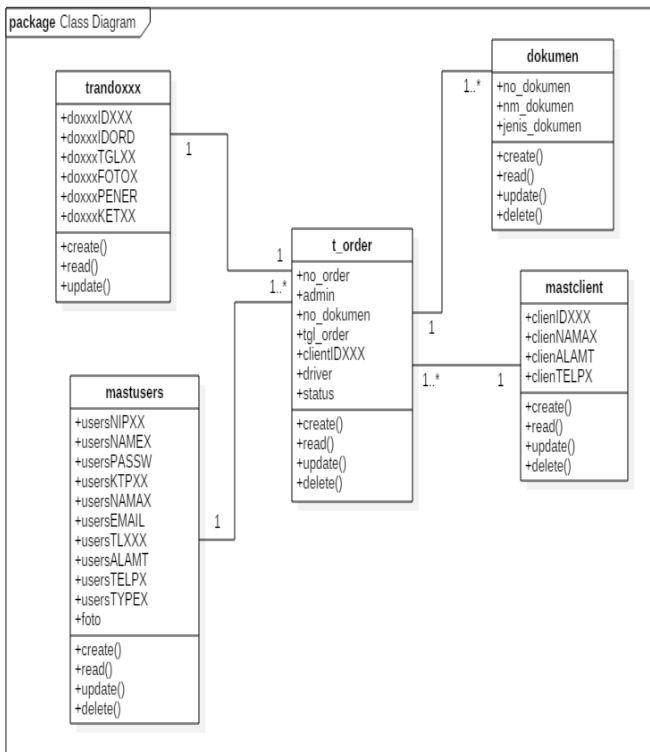


Figure 3. Class Diagram

4.3 Activity Diagram

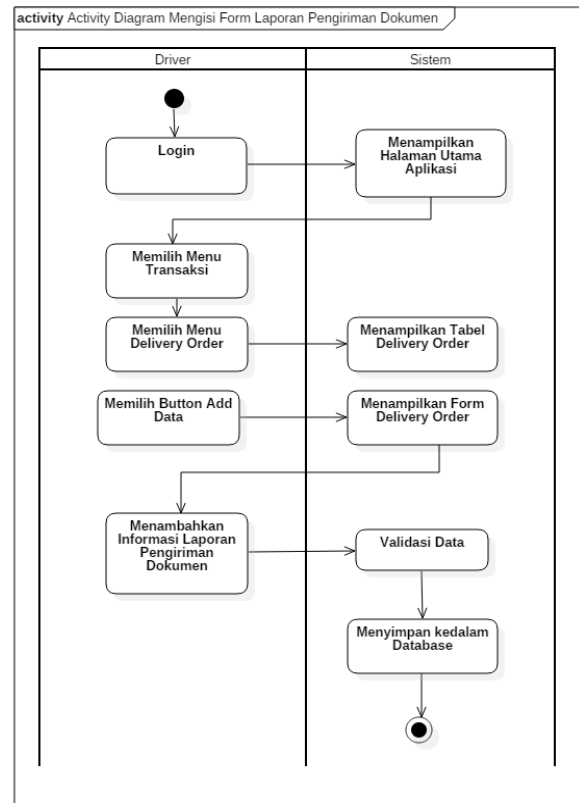


Figure 4. Activity Diagram Fill Out Delivery Report

4.4. Sequence Diagram

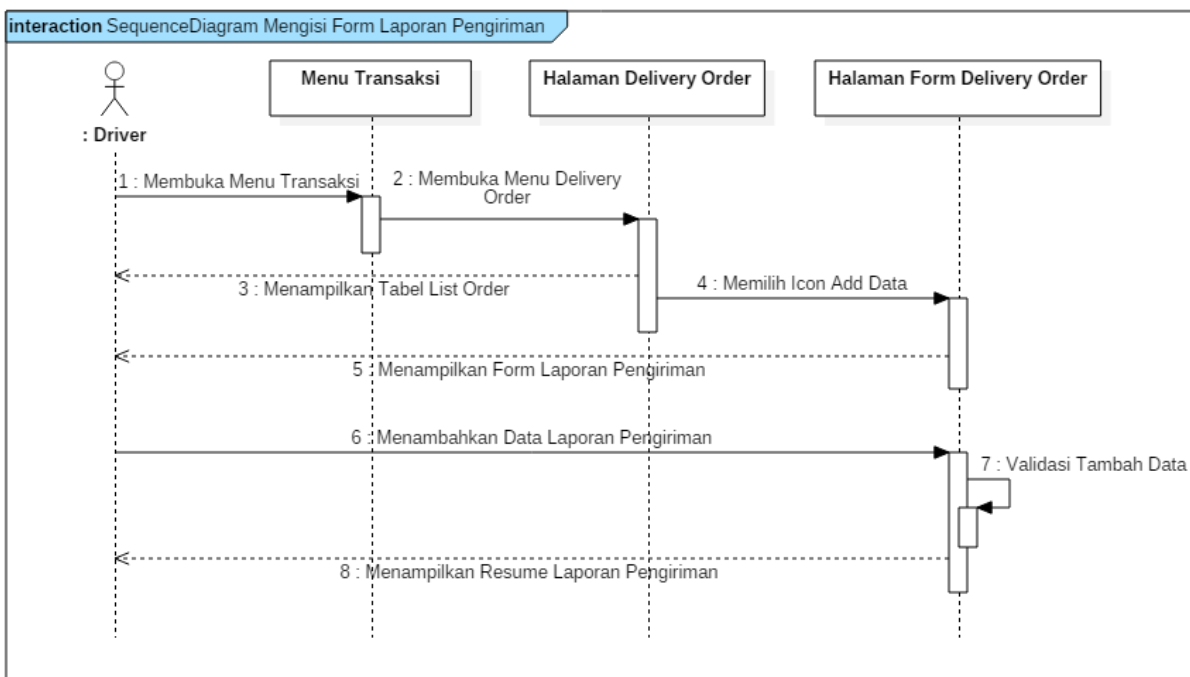


Figure 5. Sequence Diagram Fill Out Delivery Report

4.5. User Interface Design

User interface designs of mobile-based application of document delivery that will be created are:



Figure 6. User Interface Login Form

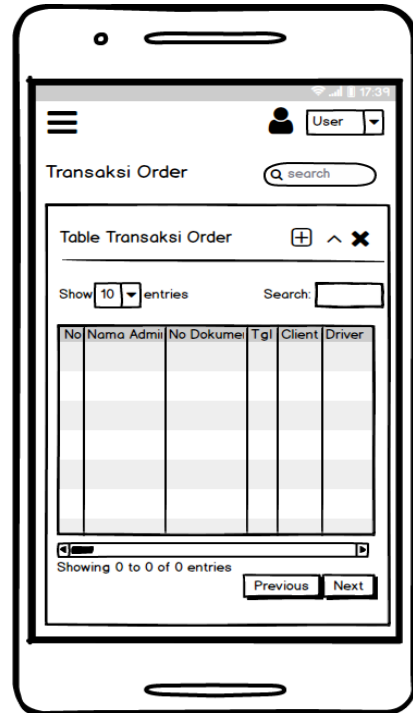


Figure 8. User Interface Order Transaction Page

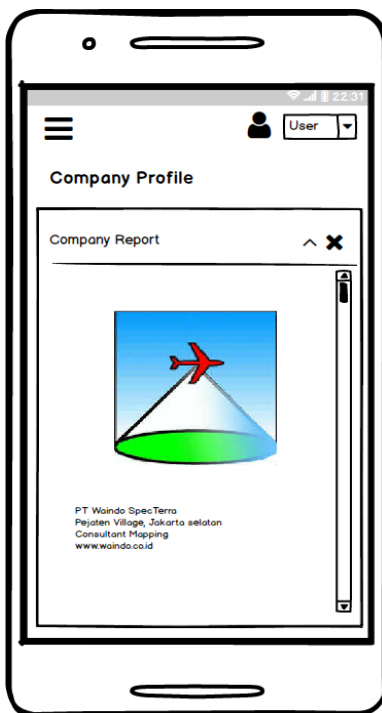


Figure 7. User Interface Main Page Application

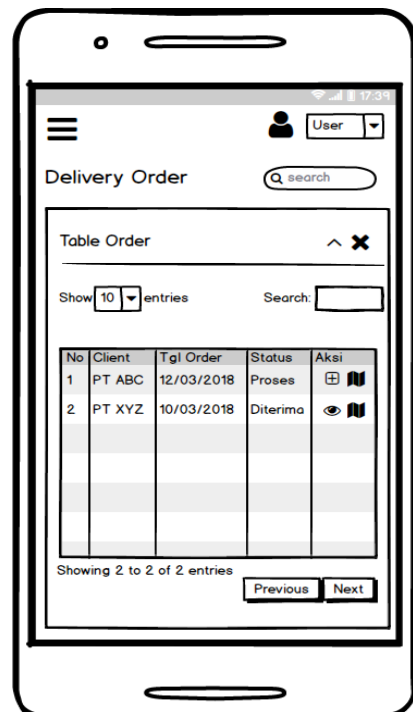


Figure 9. User Interface Delivery Order Page

4.6. Implementation Program

The results of display implementation based on the analysis and design of previous display design are:

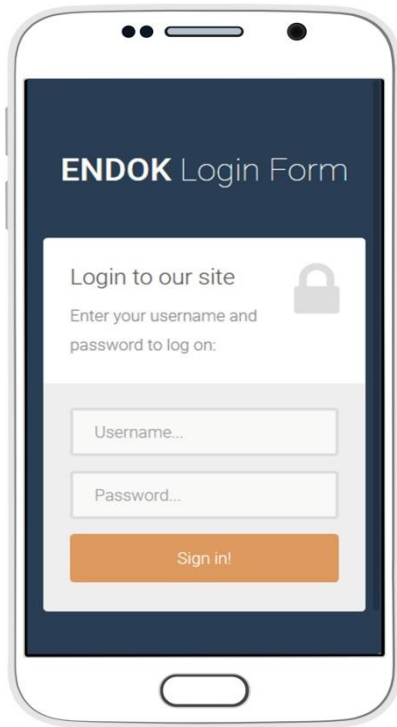


Figure 10. Implementation of Login Form

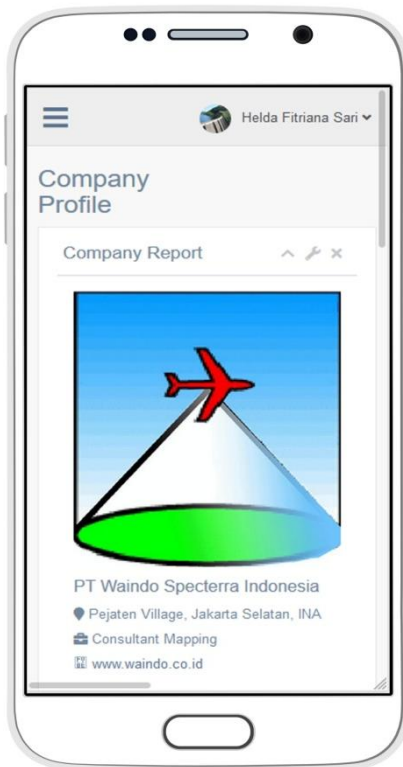


Figure 11. Implementation of Main Page Application

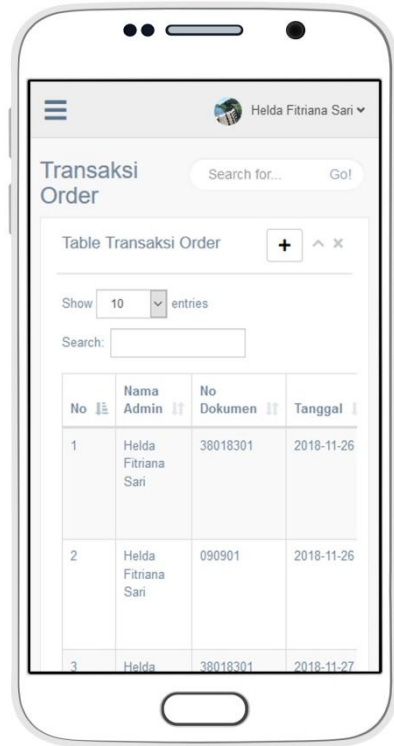


Figure 12. Implementation of Order Transaction Page

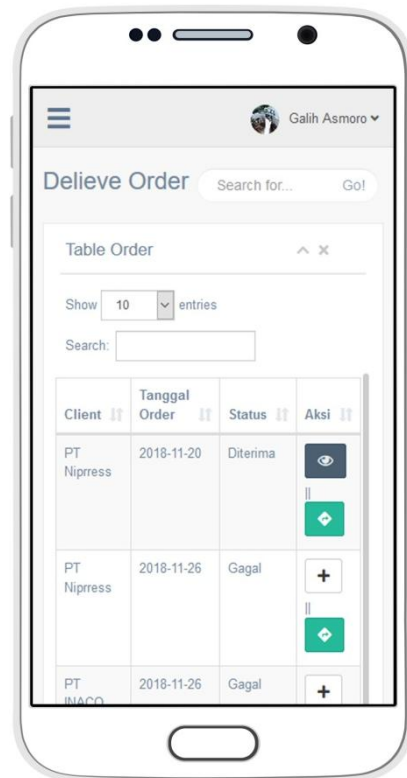


Figure 13. Implementation of Delivery Order Page

5. CONCLUSIONS AND SUGGESTIONS

5.1. Conclusions

1. Mobile-based Application of Document Delivery can support operational activities in providing speed of document delivery to clients, delivery reports can be safe and structured in the database.
2. The application uses a smartphone so it can be easily used by user because it can be carried anywhere and practically in the process of sending documents and filling in delivery reports.
3. Filling out the document delivery report is done by the driver using the features contained in the application so that data is directly stored in the database system, not scattered, and driver doesn't need to provide a written report on the goods delivery to admin staff.

5.2. Suggestions

1. Add driver position tracking feature, so that it can track the position of drivers and driver trip recordings.
2. Add signature features to recipient, so that proof of receipt documents is more valid.
3. Security system be improved to avoid the theft and destruction of data.

REFERENCES

- [1] Irsan, Muhammad. 2015. Rancang Bangun Aplikasi Mobile Notifikasi Berbasis Android Untuk Mendukung Kinerja Instansi Pemerintahan. Jurnal. Universitas Tanjungpura.
- [2] Shodiq, Amri. 2008. *Tutorial Dasar Pemrograman Google Maps API*. Tidak diterbitkan.
- [3] Wargo, John M. 2015. *Apache Cordova 4 Programming*. United States. Pearson Education, Inc.
- [4] Undang-Undang Nomor 8 Tahun 1997 Pasal 1 angka 2 UUDP Tentang Dokumen Perusahaan
- [5] Satika, Nur Dwi. 2014. *Sistem Informasi Pengiriman Barang Berbasis Web Dengan Metode Transshipment*. Skripsi. Sekolah Tinggi Teknologi Indonesia Tanjungpinang.
- [6] Dhika, dkk. 2016. Perancangan Sistem Informasi Jasa Pengiriman Barang Berbasis Web. Jurnal SIMETRIS. Vol 7(1) : 51-58.
- [7] Satyananda, Darmawan. 2017. *Google Map API Service For VRP Solving Application. Prosiding SI MaNIs (Seminar Nasional Integrasi Matematika dan Nilai Islami. Vol 1(1) ; 240-245*.
- [8] Surahman, Surawijaya. 2017. Aplikasi *Mobile Driver Online* Berbasis Android Untuk Perusahaan Rental Kendaraan. ULTIMA InfoSys. Vol VIII(1) : 35-42.
- [9] Fauzanofami, Luthfi. 2018. Aplikasi Tracking Position Pengiriman Barang Berbasis Android. Skripsi. Universitas Mercubuana. Jakarta.
- [10] E.D. Putra, E. Hidayat, and H. Noprisson. 2016. Model *Mobile Positioning System* Berbasis Android. Skripsi. Jurnal Pseudocode. Vol III (2) : 113-121.
- [11] H. Prastiawan, and I. Ranggadara. 2018. Design and Analysis Administration Approval Order System in PT Sysmex Indonesia. International Research Journal of Computer Science (IRJCS). Vol V (Issue 03): 111-119.
- [12] A. R. Wardhani, D. Susilo, and Y.S Triana. 2018. Design of Service Application for Auto Detailing: A Case Study of Jet Wash Auto Spa Tangerang. International Research Journal of Computer Science (IRJCS). Vol V (Issue 08) : 422-434.

Web View-Based E-Time Applications for Communities (Case Study : Polresta Bogor Kota)

Devi Setyawati
Faculty of Computer Science
Mercu Buana University
Jakarta, Indonesia

Dwi Ade Handayani Capah
Faculty of Computer Science
Mercu Buana University
Jakarta, Indonesia

Abstract - In the web view e-ticket application for the violating community, you can see the ticket form and then make a payment via transfer in accordance with the penalty imposed. Then the violator can take the evidence by showing the proof of payment. With the method of developing the System Development Life Cycle (SDLC) and applications can be accessed on computers or on smartphones by the public. The main purpose of this e-ticket application system is to make it useful for the community to complete the ticketing process and law enforcement or traffic police to be able to enforce the law and reduce paper use.

Keywords: E-Ticketing, Traffic, Offenders, Sanctions.

1. INTRODUCTION

In modern times, technological developments are increasingly advanced with various models. The technological advancements that we have felt in this era really provide convenience and comfort for humans so that people can communicate, find or obtain information wherever and whenever all needs will be fulfilled quickly and safely. And coupled with the existence of supporting factors, namely the internet and smartphones which when its function is not only as a communication tool but has turned into a basic need. Along with the development of technology there is an impact that affects the life. Not only affects the technology itself, technology also has an influence on other aspects such as religion, culture, social, politics, personal life, society and even the nation and state.

One of the effects of the influence of technology on legal regulation. Problems that are always faced in big cities including the city of Bogor are traffic problems. Evident from the indication of the number of accidents that always increases. And as is known a number of vehicles circulating from year to year are increasing. This also seems to have an influence on traffic security. Often violations are committed by two-wheeled, four-wheeled or other motorists that cause traffic accidents and congestion. Traffic accidents are caused by many factors not only by drivers of bad vehicles, but can be from pedestrians who are not careful, damage to vehicles, road design, and also less comply with traffic signs.

A certain traffic violation or ticket that is usually usually, is a violation of Article 54 regarding the completeness of vehicle license and vehicle registration documents as well as Article 59 concerning the excessive load of the transport truck then violation of Article 61 such as entering the crossing lane. Some cases of ticketing in the settlement of traffic violation cases are not in accordance with applicable regulations. Many cases of

traffic violations are settled in place by individual law enforcement officers or police officers, in other words, the violation cases are not processed according to the law. Other problems, namely the application of the e-ticket that is currently running, is only used by the prosecutors while the community only gets information on nominal penalties from cases that are carried out by receiving notifications via SMS, so that the public or violators do not understand what the e-application uses. ticket. And also violators do not know transparently the ticketing process that is being sued. In addition, violators are still having difficulties in making e-ticket payments due to delays in receiving briva code notifications from the respondent. based on these problems, in this final report the author wants to propose an android-based application system to overcome traffic cases so that they can be resolved until they are processed according to law. And also the legal process can be carried out effectively and orderly.

2. THEORETICAL BASIS

A. System Development Method

For the development of the system this research uses the SDLC (System Development Life Cycle) model. System Development Life Cycle (SDLC) is the process of making and changing the System sorta model and methodology used to develop a system. SDLC is also a pattern taken to develop a system of software systems, which consist of stages namely planning (planning), analysis (analysis), design (design), implementation (implementation), testing (testing), and management (maintenance) The SDLC model used in this study is the Waterfall model.

B. Related Research

Research related to software management has been conducted by several researchers from various perspectives including:
Research by [1] Setiyanto et al., Proposed the application of e-ticket penalty penalties for traffic violators in order to facilitate

speed and convenience, the openness of the ticketing process or in place of the ticketing process and the e-ticketing system would replace the ticketing system.

Research by [2] Ade Irma Suryani, designed an information system for reporting fines and ticket fees for the PARIAMAN state prosecutor's office. the system created to search case files and payment transactions is fast, the preparation and reporting process becomes timely and saves on office operational costs.

Research by [3] Pramuditya Ananta Nur et al., Developed a 3-pillar information system in the settlement of ticketing cases in the city of Kediri using a RESTfull Web Service with the aim of being able to facilitate existing businesses.

Subsequent research by [4] Syeni Rakhmadani, concerning the implementation of e-ticketing in realizing Go Governance in Indonesia, is a step of change for the police to improve the public service system.

Research by [5] Yudi Muhammad Irsan et al., Application of E-Tilang Using Recordings of CCTV (Closed Circuit Television) by having superior service faster than conventional ticketing. The advantage is that this system is very practical and fast, in accordance with the principle of justice that is simple, fast and low-cost.

The research above is a related study used to complete this study.

3. RESEARCH METHODOLOGY

The research is divided into several stages such as the following chart:

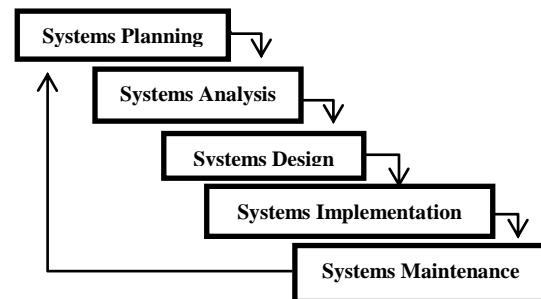


Fig. 1 SDLC (System Development Life Cycle)

The following is an explanation of each research stage:

1. Systems Planning

More emphasis on aspects of the feasibility study of developing the system, the existing activities include:

- Identify whether existing problems can be resolved through system development.
- Determine and evaluate strategies that will be used in system development.
- Determination of technology priorities and application selection.

Establishment and consolidation of the development team.

2. Systems Analysis

- At this stage, the system operation is described in detail. activities carried out are:
- Analyze the interaction of objects and functions in the system.
- Analyze data and create database schemas.
- Designing a user interface.

3. System Design

This stage, the features and operations of the system are described in detail. Activities carried out are:

- Analyze the interaction of objects and functions in the system

- Designing a user interface.

- Analyze data and create database schemas.

4. System Implementation (Systems Implementation)

Implementation of the system is implementing the design of the previous stages and conducting trials. Activities carried out as follows :

- Making a database in accordance with the design scheme.
- Making applications based on system design.
- Testing and repairing applications.

5. System Maintenance

Done by the designated admin to keep the system able to operate properly through the system's ability to adapt according to needs.

4. RESULTS AND DISCUSSION

The Use Case Diagram describes the activities that can be carried out by system users in the application, including Managing police accounts, Managing police locations, managing violation articles, managing payment agreements, managing violation data, vehicle input, registration, violation input, viewing ticket letters , upload proof of payment.

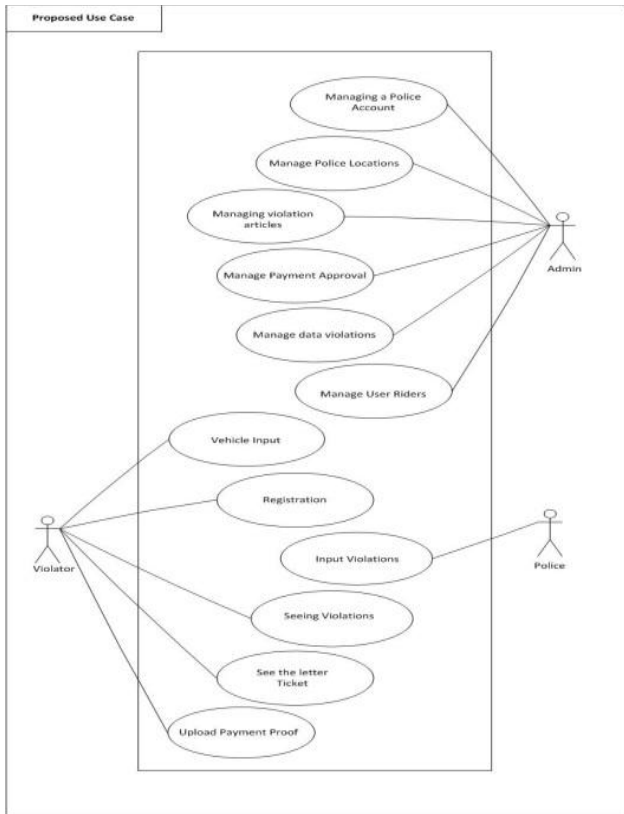


Fig. 2 Proposed Use Case Diagram of the Bogor City Police E-Ticket System.

The activity of managing a police account is a process of managing police data. Activity managing location is the process of managing location data where the police are on duty. The activity of managing violation articles is the process of managing violation articles and can add new articles or edit articles if there are changes. The activity of managing payment approval is a process of approving payments that have been paid by the violator. The activity of managing data violations is a process of monitoring some of the stored data violations. Activity managing user riders is the process of managing driver data. Vehicle input activity is the process of registering a vehicle ticketed by the police. The violation input activity is the process of inputting violation data by the police. The activity of seeing a violation is a violator process can see the ticket data that has been done. The activity of seeing the ticket ticket is a violator's process of being able to see the details of the ticket ticket and the payment status of the ticket. Upload proof of payment activity is an upload process of receipt of payments made via transfer or teller.

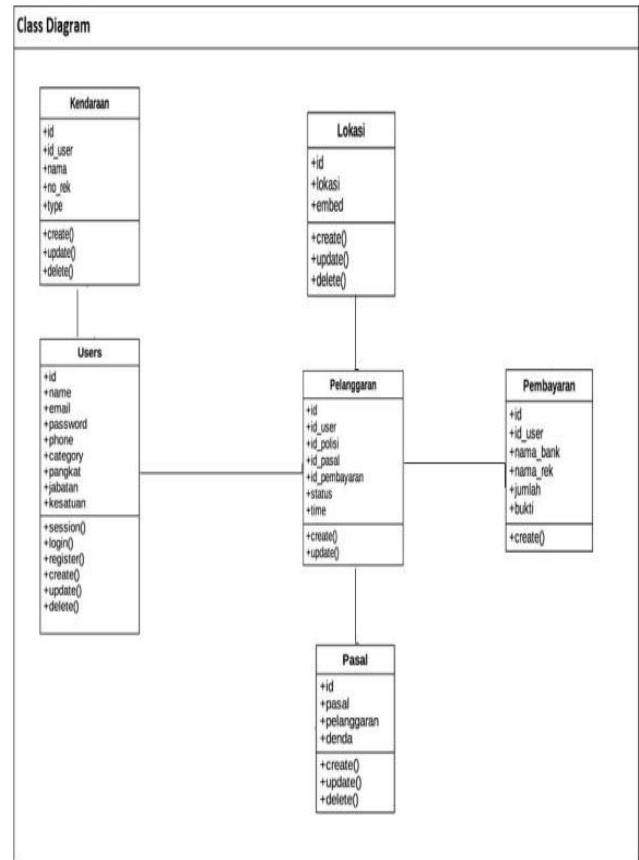


Fig. 3 Proposed Class Diagram

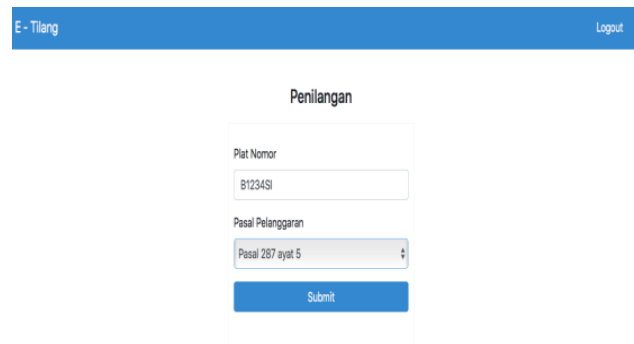
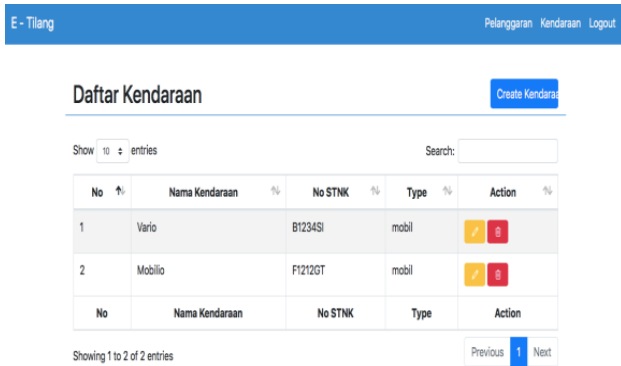


Fig. 4 Ticket Action Page



The screenshot shows a web application interface for 'E-Tilang'. At the top, there is a blue header with 'E-Tilang' on the left and 'Pelanggaran Kendaraan Logout' on the right. Below the header, there is a section titled 'Daftar Kendaraan' with a 'Create Kendaraan' button. The main content area features a table with columns: 'No', 'Nama Kendaraan', 'No STNK', 'Type', and 'Action'. There are two entries in the table. Entry 1: No. 1, Nama Kendaraan: Vario, No STNK: B1234SI, Type: mobil, Action: [edit icon] [delete icon]. Entry 2: No. 2, Nama Kendaraan: Mobilio, No STNK: F1212GT, Type: mobil, Action: [edit icon] [delete icon]. Below the table, there is a search bar and pagination controls showing 'Showing 1 to 2 of 2 entries' and 'Previous 1 Next'.

No	Nama Kendaraan	No STNK	Type	Action
1	Vario	B1234SI	mobil	[edit] [delete]
2	Mobilio	F1212GT	mobil	[edit] [delete]

Fig. 5 Page Registering a Vehicle

5. Conclusions and Recommendations

The conclusions of this study are:

1. Successfully built an e-ticket application for the community that serves to resolve ticket cases for people who violate traffic regulations easily and can monitor the ticketing process experienced
2. Successfully implemented an e-ticket application that provides a payment menu so that traffic violators can immediately complete payments without making payments. wait for the identification of the briva number from the police.

The suggestions that need to be added for further application development are as follows:

Based on the results of the conclusions above, suggestions that can be given for further development are expected to be more supported by features that make it easier to use, and more attractive appearance and functions.

REFERENCE

- [1] Steven, Janet, *Pengertian Xampp*, 2013:75.
- [2] Prodjodikoro.W, *Pengertian pelanggaran*, Yogyakarta 2003:33.

- [3] Saputra. *Pengertian MySQL*, Jakarta, 2012.
- [4] Nugroho. *Javascript*, Yogyakarta 2012.
- [5] Steven, Janet, *Xampp*, 2012:75.
- [6] Sidik, *Framework Codeigniter*. Bandung: Informatika, 2012.
- [7] McLaughlin, Brett, *Pengertian PHP*, 2013:2.
- [8] <https://crudbooster.com/Crudbooster/>, 180520/29 September 2018, 21.15 .
- [9] Setiyanto, Gunarto. Sri Endah. (2017). "*Penerapan Sanksi denda E-Tilang bagi pelanggar Lalu Lintas*, Jakarta, 2017.
- [10] Suryani, Ade. Irma, *Sistem informasi pelaporan denda dan biaya perkara tilang pada Kejaksaan Negeri Pariaman*, Sumatera Barat, 2017.
- [11] Pramuditya A.N, Adam H. B, dan Agi P. K. *Pengembangan Sistem Informasi 3 Pilar Dalam Penyelesaian Perkara Tilang Dikota Kediri Menggunakan RESTfull Web Servis*. Jawa Timur, 2018.
- [12] Rakhmadani, Syeni, *Penerapan E-Tilang dalam mewujudkan Good Governance di Indonesia*, Jakarta, 2017.
- [13] Yudi Muhammad Irsan, Gunawan J, Budi Rizki Husin , *Perspektif Penerapan E-Tilang Dengan Menggunakan Rekaman CCTV (Closed Circuit Televiti*. Bandar Lampung, 2018 Di <http://jurnal.fh.unila.ac.id>.
- [14] F. Masya, Elvina, and Fitri. M. S, "Sistem pengaduan masyarakat pada Divisi Humas Polri Berbasis Web", Salatiga, Indonesia, 2014.
- [15] Rizhul. J. R, YS. Triana, "*APPLICATION DESIGN OF THE NATIONAL BOOK READER USING ZAHMAN FRAMEWORK METHOD*", Jakarta, 2018.
- [16] Arishita N. A, I. Handriani, "*Aplikasi Sistem Order Jasa Graphic Designer Berbasis Web pada PT. Decorner*", Publikasi.mercubuana.ac.id, Jakarta.

Application for Recording Operational Activities in the Helpdesk Division

(Case Study : PT.Maybank Indonesia, Tbk)

Dwi Suharto
Faculty of Computer Science
Mercu Buana University
Jakarta, Indonesia

Imam Juhri
Faculty of Computer Science
Mercu Buana University
Jakarta, Indonesia

Dwi Ade Handayani Capah
Faculty of Computer Science
Mercu Buana University
Jakarta, Indonesia

Abstract: Helpdesk is a solution to help handle customer / user needs related to questions, services, technical support, or complaints against IT operations within the company. During the operational process the Helpdesk requires an application that can record its activities and as a reference for management in considering assessment and performance helpdesk personnel. Under these conditions the author designs an application to record operational activities in the helpdesk division. Research Methods conducted include data collection in the form of literature studies and field studies in the form of interview observations as well as for the process of designing the author using the model. UML (The Unified Modeling Language) for problem identification and analysis, needs analysis, system design, system implementation and testing, the language used is .NET and for the database the author uses SQL Server.

Keywords: Research, Helpdesk, Operational IT, UML, .Net, SQL Server

1. INTRODUCTION

The need for information and use of computer applications, encourage the formation of a system that is able to accommodate activities and problems for employees while working in the office. A company must have a helpdesk division that can connect between several operational parts with the helpdesk division. Through the helpdesk division every operational section gets help from problems found in the use of software and hardware in one company.

Based on this background the problems that will be studied in designing the application are: How to design an application so that it can help helpdesk employees in managing the information received from the user ? How to make the application easy to record in operation ? How can the recording application help management in managing information ?

So as not to be too far from the actual goal, the writer limits the problem described as follows: Application This recording is designed using analysis pieces in the helpdesk division, this recording application uses ASP.net programming language and uses Microsoft Sql Server, this Recording Application can help management in managing information because management can see the helpdesk division performance report on a monthly basis.

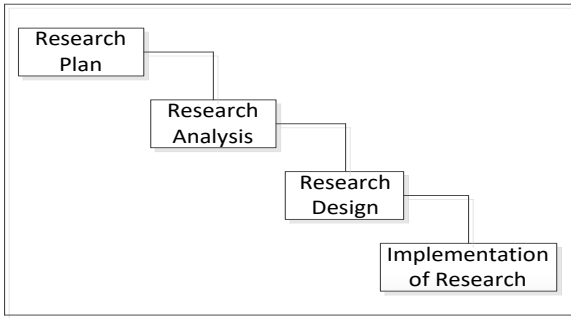
2. RELATED WORKS

In conducting research, researchers conduct data collection using the method : Library, Observation, Interview. On the method library researchers use several scientific journals that researchers have summarized, example : helpdesk theory, According to Hendra Santoso (2014: 1)

[19] The Helpdesk system is an application to provide information to customers or users related to the product or service provided. Theory of Active Server Pages, Active Server Pages (ASP) is a web setting that is used to build dynamic and interactive web pages. Active server pages are facilities provided by Microsoft to facilitate the creation of Web Server applications. This is possible by combining the components of Hyper Text Markup Language (HTML) with Visual Basic Script (VBScript).

one of the scientific journals that the researcher quotes is from Agus Irawan, Nanda Krisna Setiyorini : Rancang Bangun Aplikasi Helpdesk Dengan Menggunakan Pendekatan Knowledge Management System Pada Seksi Teknisi PT. Indah Kiat Pulp & Paper Tbk. Jurnal ProTekinfo Vol.4 Agustus 2017, Issn 2406-7741, E-issn 2597-6559, 2017 conclusions that can be taken are Constraints and difficulties often experienced by technicians in managing reports of damage and in providing handling

Observation, The researcher made observations directly in the Helpdesk Division. Interview, The researcher conducted interviews with several speakers at the Helpdesk Division regarding the running system in the Helpdesk Division. In this study using the flow diagram as follows:

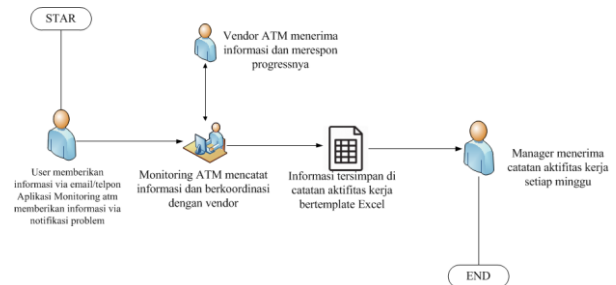


Picture 2.1. Flow Diagram

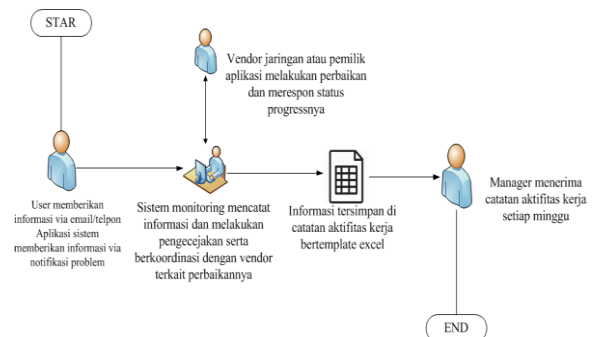
The Helpdesk Division is a part of the task of responding to and handling complaints and problems related to IT devices. There are 3 (three) workflow processes that are in the helpdesk : Servicedesk, Information is obtained from the reporter via telephone or e-mail, then the service receives and records the information in the excel template made by the manager then the service provider responds back to the reporter regarding the repair or status of the information. ATM Monitoring, Information obtained from the branch or an ATM machine problem monitoring application. Then information is recorded into an excel template created by the manager. After recording the information given to the ATM machine vendor stage 1 as a complaint there has been a problem with the ATM machine. Then stage 1 ATM machine vendors respond to the information via email for the visit. The information received will be updated status by the ATM monitoring section in the process of monitoring repair information carried out by the vendor of ATM machine level 1 to a normal ATM machine. If the ATM machine vendor stage 1 cannot solve the problems that occur at the ATM machine. The ATM level 1 vendor will provide information to the ATM monitoring department that the ATM machine will repair the level 2 ATM machine vendor and the information will be updated again, that the ATM machine problem is being handled by the ATM machine vendor level 2, then the ATM monitoring monitor information on repair process carried out by level 2 ATM machine vendors until the ATM machine returns to normal. System Monitoring, Information is obtained from the branch or monitoring the application. Then the information is recorded into the excel template created by the manager. If the information is in the form of a branch network problem, the monitoring system will check the branch network and coordinate with the network service provider for repairs, then the information that has been recorded will be updated status until the network repair process to the branch returns to normal. Then if the information is in the form of an application problem. The monitoring system will coordinate with the application to fix the application problems and the process of recording the information will always be updated until the application runs back to normal. Every week the manager receives a record of the helpdesk work activities as a report and to be managed and as a material for the issue that will be given to the parties regarding the problems that occur in the operational part of IT. Here's an overview of the recording process that is running on the helpdesk.



Picture 2.2 Workflow servicedesk



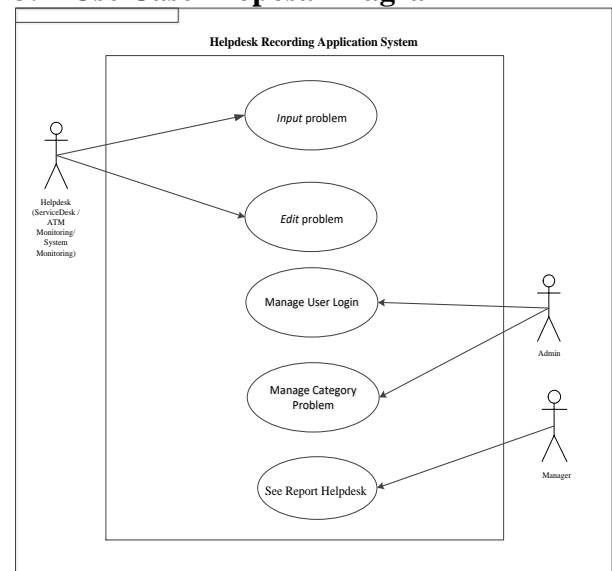
Picture 2. Workflow ATM monitoring



Picture 2.4 Workflow system monitoring

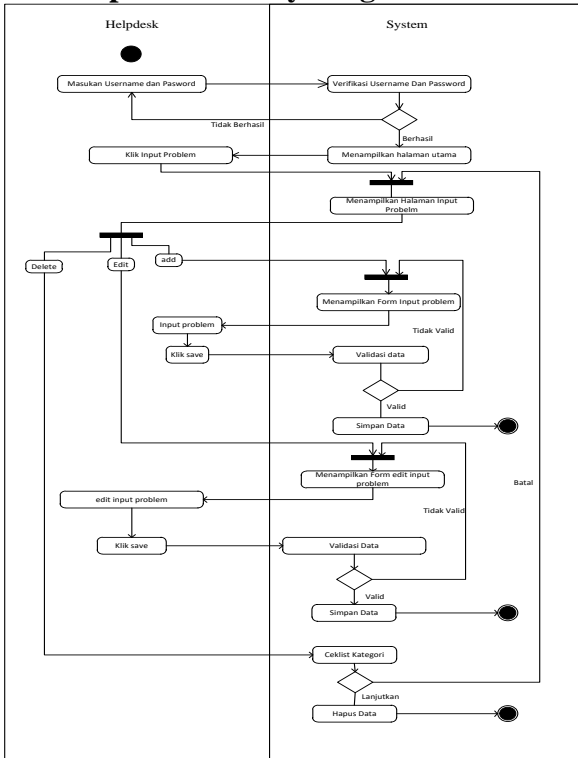
3. PROPOSED WORK

3.1 Use Case Proposal Diagram



Picture 3.1. Proposal Use Case Diagram

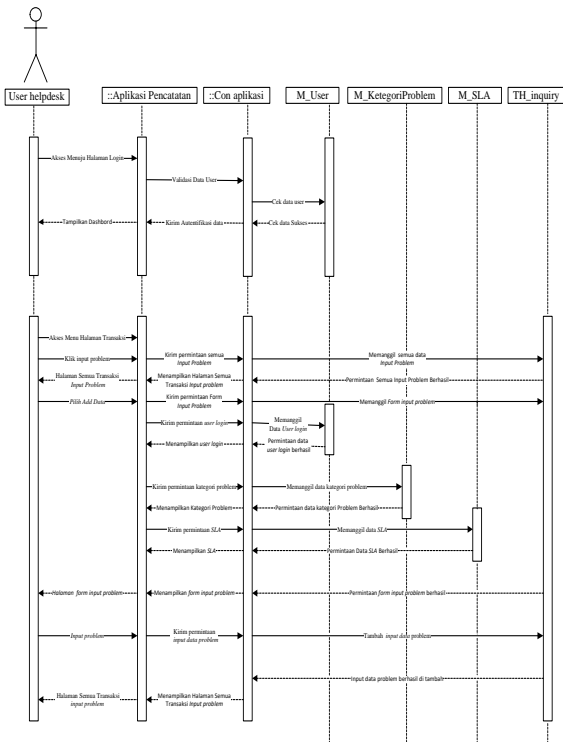
3.2 Proposed Activity Diagram



Picture 3.2 Activity Diagram Input Problem

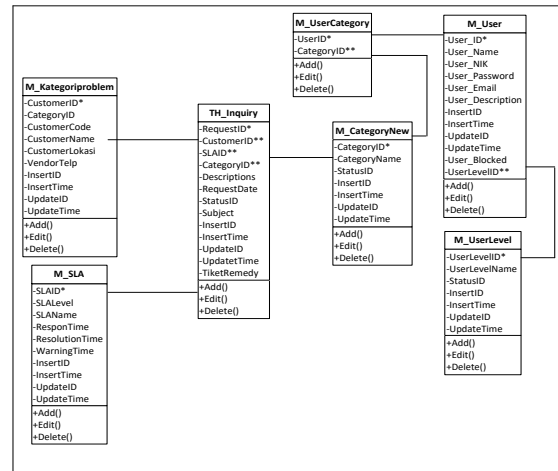
3.3 Sequence Diagram

Sequence Diagram describes the interaction between objects in and around the system (including the user, display, etc.) in the form of a message that is described against time.



Picture 3.3. Proposed Sequence Diagram Input Problem

3.4 Class Diagram



Picture 3.4 Class Diagram

3.5 Implementation of Interface

Activity Logs

username

password

RESET
LOGIN

Picture 3.5. Login Display

Input Problem

+ Save x Cancel

User Login : System Monitoring

Tanggal : 12/16/2018

Category : Aplikasi

Customer List : Aplikasi PCE

SLA : None

Tiket Remedy :

Problem :

Detail :

Picture 3.6. Input Problem

3.6 Application Testing Results

Tests are carried out to ensure that the designed application can function and run according to a predetermined plan. The method used in the testing process is to use Black BoxTesting.

Black Box trials attempt to determine errors in several categories such as: False or missing functions, Interface errors, Data structure errors or database access.

4. CONCLUSION

After the application is built, we can conclude that the application of recording has a very meaningful use, among

5. FUTURE SCOPE

So that the recording application has run better. So what we can suggest is: For the display of the application recording is still not full power, so it would be nice if you maximize the existing display to be better, Add functions that can be integrated by other applications such as email or can give messages via cell phone

6. REFERENCES

- [1] Darmawan Dion, Senjaya Wilsen, Sistem *Aplikasi Helpdesk Online* Berbasis Web Pada PT. XYZ, di Jurnal Ukrida, 2018
- [2] Mustopa Ali, Sistem Informasi IT-Helpdesk Pada Universitas Amikom Yogyakarta Berbasis Web, di Jurnal Universitas Amikom Yogyakarta, 2017
- [3] Irawan Agus, Krisna Setyorini Nanda, Rancang Bangun Aplikasi *Helpdesk* Dengan Menggunakan Pendekatan Knowledge Management Sistem Pada Seksi Teknisi PT. Indah Kiat Pulp&Paper, Tbk, di Jurnal Ippmunsera, 2017
- [4] M. Sipayung Evasaria, Fiarni Cut, Aditya Ernest, Perancangan Sistem Informasi *Helpdesk* Menggunakan Framework ITIL V3, di jurnal ejenteti UGM, 2017
- [5] Fajar Masya, Hendra Prastiawan, Yana Sukmana, Analysis of Services Desk Web-Based Information System on ITIL V3 Framework in PT. Bsi, di jurnal Ijctt, 2017
- [6] Rico, Analisis dan Perancangan Sistem Informasi IT-Helpdesk (Studi Kasus : PT. Lontar Papyrus Pulp&Paper Industry, di ejournal stikom, 2016
- [7] Amin Ruhul, Sistem Informasi Helpdesk Berbasis Web Pada PT. Sisindokom Lintasbuana Jakarta, di jurnal nusa mandiri, 2016
- [8] Pranoto, Nur Hakim Fitur, Gayuh Utomo Viktor, Perancangan Aplikasi Helpdesk Servis Software dan Hardware Berbasis Web (Studi Kasus : PT. Karya Zirang Utama Semarang, di jurnal ijns, 2015
- [9] Hendra Santoso S.Kom, MT, Membuat Helpdesk Sistem Berbasis OOP & PDO dengan PHP, Jakarta : Lokomedia, 2014
- [10] Hendra Setyo Adi Nugroho, Anjik Sukmaji, Kurniawan Jatmika, Sistem Informasi IT-Helpdesk Prioritas Kerja Berbasis Web (Studi Kasus : PT. Pelabuhan Indonesia III Cabang Tanjung Perak), di journal stikom, 2013
- [11] Lena Magdalena, Analisis Problem Management Pada IT Helpdesk Dengan Implementasi ITS dan SLA (Studi Kasus : Citi Group Indonesia), di jurnal digit, 2011
- [12] Nur Ani, M. Agus Setiono, Service Desk Call Logging System in Itsm Framework, di jurnal its, 2010
- [13] Ragil, Wukil, “Pedoman Sosialisasi Prosedur Oprasi Standar”, Jakarta : Mitra Wacana Media, 2010
- [14] Teddy Markus Zakaria, Rina Angelina, Aplikasi Helpdesk Untuk Pencatatan Masalah dan Solusi Perbaikan Peralatan Komputer, Repository Maranatha, 2009
- [15] Kusrini M, Kom dan Andri Koniyo, Tuntutan Praktis Membangun Sistem Informasi Akuntansi Dengan Visual Basic dan Microsoft SQL Server , Yogyakarta; Andi Publisher, 2007
- [16] Wooten, G.W, Building & Managing a World Class IT Helpdesk, Newyork : MCGraw-Hil. (2001)

others are: Storage process recording work activities becomes more effective and efficient. All data information on company data can be managed properly, Managers more easily get information that occurs in operations Helpdesk Division

Research on Cloud Hard Disk Capacity Prediction Scheme Based on Time Series Model

Zizhen Yuan
School of Communication
Engineering
Chengdu University of
Information Technology
Chengdu, China

Chengyu Wen
School of Communication
Engineering
Chengdu University of
Information Technology
Chengdu, China

Xiaoli Zhang
School of Communication
Engineering
Chengdu University of
Information Technology
Chengdu, China

Abstract: OpenStack is a cloud operating system, but it does not provide the predictive functionality for cloud disk usage of the virtual machines running on it. In this paper, it propose a prediction schem of virtual machine cloud hard disk capacity. First the Libvirt API is used to obtain the disk data of the virtual machine. After data processing, the ARIMA time series model is built. Then the capacity of the disk in the future is predicted. This scheme can predict the disk capacity of virtual machine, facilitate the user to expand capacity or issue an alarm, and then reduce disk failure.

Keywords: capacity prediction; time series model; cloud hard disk; OpenStack; Elastic block storage

1. INTRODUCTION

OpenStack is an open source private cloud platform. Due to it's excellent features, rich functions and free features as open source software, a large number of researchers and companies are contributing code to it, and it has a secondary development as their private cloud platform by various manufacturers around the world. OpenStack Cinder is a block storage component in OpenStack. Its main function is to conduct logical abstraction between virtual machine and heterogeneous storage as a unified driver management, ensure the high availability of storage services, and provide block storage scheduling services for virtual machine through it's own scheduling algorithm. Specific ways of storage are multiple including local storage, Ceph, GlusterFS, etc. Current block storage does not provide capacity prediction function for users. Users need to manually predict the future capacity of disk and perform capacity expansion operation, which may cause system failure due to insufficient disk space caused by overdue capacity expansion. This paper proposes a scheme that can monitor the disk usage data of virtual machine and model the data through time series model, so as to predict the space that the storage may grow in the future. Later users can choose to issue disk warning or perform capacity expansion operation.

2. DATA MONITORING MODULE

The virtual machine monitor solutions can be realized by a built-in monitoring module in a virtual machine, or it's own monitoring component Ceilometer, or the Libvirt library[1]. The built-in monitoring module in the virtual machine can achieve better monitoring effect, but the service needs to be turned on in the host. If the user manually disables the service, the data cannot be collected, and there are too many uncontrollable factors, so this method is abandoned. OpenDtack's own monitoring component Ceilometer can obtain the data about CPU of virtual machine, disk read-write and network read-write. But there is no disk space data, which is one disadvantage. The other point is that the request timeout is too serious to collect data in real time. Therefore,

OpenStack's built-in virtualization software Libvirt was selected to obtain the virtual machine disk data.

Libvirt provides a native layer interface for KVM in OpenStack cloud platform, which can perform basic management operations on virtual machines in the cloud platform. The Libvirt library is implemented in C and includes direct support for python, which is the python language binding toolkit based on the Libvirt API[2]. This article can achieve the collection of virtual machine performance indicators through the functions in the libvirt-python package.

Because the libvirt-python package does not directly capture the function of CPU utilization of the virtual machine, the acquisition of `cpu_usage` in the virtual machine performance index requires other methods. In this paper, the `cpu_numbers` and `cpu_time` values were obtained by using `domain.info()` function, and `cpu_usage` was calculated by combining with `time.time()` function[3]. The function of `domain.info()` and `time.time()` needs to be run simultaneously before the `time.sleep()` runs or after it does. `Domain.info()` is run to get `cpu_numbers`, `cpu_time1` and `cpu_time2`, and `time.time()` is run to get `t1` and `t2`. `cpu_usage` was obtained through calculation of the obtained value. The calculation formula is shown in following :

$$\text{cpu_usage} = 100 \times (t_1 - t_2) / ((\text{cpu}_{\text{time}1} - \text{cpu}_{\text{time}2}) \times \text{cpu_numbers} \times 10^9)$$

Memory performance indicator data in virtual machine performance indicators is mainly collected through `domain.memorystats()` function. However, `mem_usage` cannot be directly obtained from a function, and it can only be calculated by using the available and unused data collected by `domain.memorystats()` function. `Major_fault` can be directly collected by using `domain.memorystats()[4]`. The specific formula is as follows:

$$\text{mem_usage} = (\text{available} - \text{unused}) / \text{available}$$

Disk I/O performance index of the virtual machine can also be collected through `domain.blockstats()`.

Network performance indexes of virtual machines can be collected through domain.interfacestats().

3. MODEL BUILDING

3.1 Date Processing

In real business, the monitoring system collects disk information at regular intervals every day, but in general, the disk capacity attribute is a fixed value (the case of midway expansion is not considered), so there will be duplicate data of disk capacity in the original data of the disk. In the process of data cleaning, duplicate data of disk capacity are removed, and the disk capacity of all servers is taken as a fixed value to facilitate model warning.

In disk data after data cleaning, disk-related properties exist in the data as records in kilobytes. Because the disk information of each server can be distinguished by the NAME, ID and ENTITY attributes in the table, and the above three attribute values of each server are unchanged, the values of the three attributes can be combined to construct new attributes[5].

3.2 Model Building

An application failure is usually not a sudden crash (unless the server is directly cut off), but rather a gradual process. For example, if the system runs for a long time, the data will continue to be written to the storage, and the storage space will gradually decrease, and eventually the disk will be full and the system will fail. Therefore, when human factors are not considered, the storage space has a strong correlation with the change of time, and historical data has a certain impact on the future development, so we can use the time series analysis method to build the model[6].

First, the stability test of the observation value sequence is required. If the observation value sequence is not stable, the difference processing is carried out until the data after the difference processing is stable. After the data is stable, the white noise is tested. If the model does not pass the white noise test, the model identification is carried out to identify which model it belongs to, AR, MA or ARMA[7]. Furthermore, determine the order of the model by BIC information criterion, then determine p and q parameters of ARIMA model. After model recognition, model test is required to detect whether the model residual sequence is the white noise sequence. If the model does not pass the test, it needs to be re-identified. The maximum likelihood estimation method is used to estimate the parameters of the tested model. Finally, use the model to predict and compare the actual value and the predicted value for error analysis[8]. If the error is relatively small (the error threshold needs to be set through business analysis), it indicates that the model fitting effect is good, and the model can be ended. Instead, the parameters need to be reevaluated.

The following methods are required in the process of model building.

- 1) stationarity test: in order to determine that there is no random trend or definite trend in the original data sequence, stationarity test should be carried out on the data, otherwise the phenomenon of "pseudo-regression" will occur. This paper adopts the method of unit root test (ADF) or the method of sequence diagram to test the stationarity.
- 2) white noise test: in order to verify whether the useful information in the sequence has been extracted, it is necessary to carry out white noise test on the sequence. If the sequence test is a white noise sequence,

it means that the useful information in the sequence has been extracted, and all the rest are random perturbations that cannot be predicted and used[9]. There are currently two commonly used methods, Q statistics:

$$Q = n \sum_{k=1}^m \widehat{\rho}_k^2$$

and LB statistics after correction:

$$LB = n(n+2) \sum_{k=1}^m \left(\frac{\widehat{\rho}_k^2}{n-k} \right)$$

- 3) model identification: maximum likelihood ratio method is adopted to estimate the model and estimate the values of various parameters. Then, for each different model, BIC information criterion is used to determine the order of the model, and p and q parameters are determined, so as to select the optimal model.
- 4) model test: after the model is determined, check whether the residual sequence is white noise. If it is not white noise, it indicates that there is still useful information in the residual, which needs to be modified or further extracted.
- 5) model prediction: the verified model is applied for prediction to obtain the predicted value in the next 5 days and compare it with the actual value.
- 6) model evaluation: in order to evaluate the effect of time series prediction model, mean absolute error, root mean square error and mean absolute percentage error can be used[10].

4. EXPERIMENTAL ENVIRONMENT AND RESULTS

4.1 Experimental Environment

In order to verify the prediction effect of the time series model, the following experimental clusters are built, which are respectively composed of a control node, a computing node and a storage node.

Table 1. Experimental environment

Name	Operating system	Hard drive sizes	Memory Sizes
Controller	Centos7	20GB	4GB
Compute	Centos7	100GB	16GB
Block Storage	Centos7	1TB	4GB

4.2 Experimental Results

Data collection is conducted according to the granularity of 5 minutes, and the collected disk data format is shown in table 2:

Table 2. Disk capacity

Name	ID	Entity	Time	Value
CWXT	184	C:\	2018/12/27	34270787.33
CWXT	184	D:\	2018/12/27	80262592.65

Disk data after attribute construction is shown in table 3.

Table 3. Disk data after Attribute construction

Name	184: C:\	184: D:\	Time
CWXT	34270787.33	80262592.65	2018/12/27

Then the stability test is carried out on the data. The test results are shown in table 4:

Table 4. Stationarity test

Name of the sequence	Stationarity	The corresponding p value	Stability after N - order difference
D disk size for use	Non-stability	0.8921	1

After the stationarity test, white noise test is needed to monitor whether there is any useful information. The results are shown in table 5:

Table 5. White noise test

Name of the sequence	White noise	The corresponding p value
D disk	False	9.9585×10^{-6}
D disk first order difference	True	0.1143

Then, model recognition of the data sequence is required. The recognition results are shown in table 6:

Table 6. Model recognition

Name of the sequence	Model type	Minimum BIC value
D disk size for use	ARIMA(0,1,1)	1300.46

According to the identified ARIMA(0,1,1) model, its residual sequence has been proved white noise, which has passed the test successfully.

Then the model tested is used to make predictions and the prediction values for the next 5 days are obtained, as shown in table 7:

Table 7. Prediction results

Days	Prediction value	Actual value
1	83.79671	83.20745
2	83.99399	82.95645
3	84.16823	82.66281
4	84.34248	85.6081
5	84.51672	85.23705

The model evaluation results are shown in table 8:

Table 8. Model evaluation

Mean absolute deviation	Mean squared error	Mean absolute percent error
1.0236	1.1621	1.2207

5. CONCLUSIONS

This paper proposes a block storage capacity prediction scheme based on time series, the first data monitoring module was designed, and the Libvirt API can be used to obtain disk usage data of the virtual machine, then to obtain clean data through data cleaning and property construction. Then use these data to predict the disk capacity by the ARIMA time series model, and the prediction values for the next period of time are obtained, but its predictions for long periods of time are not accurate because of the ARIMA sequence dynamic prediction--- in addition that the first value predicted is based on a true value, the rest are all further predicted based on the first prediction value. Therefore, it is better for a short-term capacity prediction.

6. REFERENCES

- [1] Stokely, Murray, et al. "Projecting disk usage based on historical trends in a cloud environment." Workshop on Scientific Cloud Computing Date 2012.
- [2] Ji, Xue, et al. "PRACTISE: Robust prediction of data center time series." International Conference on Network & Service Management 2015.
- [3] Box, George E. P, and G. M. Jenkins. "Time series analysis forecasting and control - Rev. ed. " Journal of Time 31.4(1976):238-242.
- [4] Hassoun, M. H. "Fundamentals of Artificial Neural Networks." Proceedings of the IEEE 84.6(2002):906.
- [5] Lee, Ho Seong, and L. Guo. "Servo performance prediction for high capacity disk drives." American Control Conference 1998.
- [6] Gmach, Daniel, et al. "Capacity Management and Demand Prediction for Next Generation Data Centers." IEEE International Conference on Web Services 2009.
- [7] Shen, Zhiming, et al. "CloudScale:elastic resource scaling for multi-tenant cloud systems." Acm Symposium on Cloud Computing ACM, 2011.
- [8] Gong, Zhenhuan Gong Zhenhuan, X. G. X. Gu, and J. Wilkes. "PRESS: Predictive Elastic Resource Scaling for cloud systems." International Conference on Network & Service Management IEEE, 2010.

- [9] Meng, Xiaoqiao , et al. "Efficient resource provisioning in compute clouds via VM multiplexing." International Conference on Autonomic Computing DBLP, 2010.
- [10] Chen, Yuan Chen Yuan , et al. "Integrated management of application performance, power and cooling in data centers." IEEE/IFIP Network Operations & Management Symposium IEEE, 2010.