

Building an Android-Based Application for Schedule Reminders for Students' Assignments at SMKS Sri Langkat Tanjung Pura with Encryption and Decryption Processes Using the RSA Algorithm

Risma Armenda^{1*}, Achmad Fauzi², Juliana Naftali Sitompul³

^{1,2,3} STMIK Kaputama
rismaarmenda691@gmail.com^{1*}, fauzyrivai88@gmail.com², joellyanna07@gmail.com³

Abstract

This research aims to solve the problems faced by students of SMKS Sri Langkat Tanjung Pura in organizing their schedules and assignments, while protecting their personal data. An Android-based schedule reminder application was created as a solution to better manage assignments. To ensure the confidentiality and security of sensitive data such as assignment files, this research uses the RSA (Rivest-Shamir-Adleman) cryptographic algorithm in the encryption and decryption process. This application is designed so that students can manage their assignments in an orderly and efficient manner, with the hope of improving the quality of education and reducing the level of negligence. The methodology applied includes system requirements analysis, system design using flowcharts and UML, and system testing to ensure the application functions properly. The implementation of this application is carried out using Android Studio with the Java programming language and the phpMyAdmin database. As a result, this application not only provides a practical solution for students in managing assignments, but also contributes to the field of computer science in the development of mobile applications and data security.

Keywords: Data Security, RSA Cryptography, Schedule Reminder Application, Task Management.

1. Introduction

The development of information and communication technology has transformed many aspects, including the education sector. Many students struggle to manage their time and fulfill their academic obligations. To address these challenges, Android-based applications have emerged as a solution, giving students the ability to manage their schedules and assignments more efficiently anywhere and anytime, in line with the increasing use of *mobile devices*. [1]. However, it is very important to maintain the security of students' personal data, such as information regarding schedules and assignments, so that it is not misused. One step to protect this sensitive data is to use a cryptographic algorithm, for example RSA (*Rivest-Shamir-Adleman*). RSA functions to encrypt information, ensuring that only authorized parties can access it, thus maintaining the privacy and security of student data [2] [3].

The purpose of this application is to overcome the ineffectiveness of manual reminders or poorly organized reminders on mobile phones, and to provide a more planned solution in managing student assignments. Data security is the main focus. Student assignment files are sensitive information that is vulnerable to possible leaks if not properly protected. Thus, the RSA cryptographic algorithm is applied to encrypt and decrypt data, ensuring that the privacy and security of student information remains protected from unauthorized access [2].

The choice of the Android *platform* is based on its popularity and ease of access among students, while RSA was chosen because of its ability to provide a high level of security [2]. This application is specifically intended for students of SMKS Sri Langkat Tanjung Pura to help them organize their assignments more efficiently and orderly, which is ultimately expected to improve the quality of education by encouraging students to immediately submit the assigned assignments and reduce the level of laziness [1].

The RSA algorithm described in [2] offers several significant advantages. First, the software it creates has the ability to encrypt and decrypt a wide variety of characters, from letters and numbers to symbols, providing flexibility in its application. Second, the algorithm is very efficient in protecting the confidentiality of messages, especially in the case of private messages sent via SMS, by providing defense against possible interception on mobile phones. Finally, the security of RSA relies on the extremely high difficulty of breaking large numbers into their prime factors, ensuring its robustness until an effective method for factoring such numbers is found. Meanwhile, [4] the advantage of this implementation is the application's ability to convert file contents into difficult-to-understand symbols, protecting file security, and restoring files to their original state after decryption. The choice of the RSA algorithm is determined by the effectiveness of its encryption mechanism.

Research on the development of effective reminder applications on the Android *platform* aims to overcome the problem of inattention. [1] is specifically aimed at helping students plan and organize their lecture schedules and assignments by providing reminder notifications that

can significantly improve learning outcomes. Meanwhile, [5] provides a solution for remembering various daily activities with a *Pop Up Reminder feature* that can appear automatically, ensuring that all activities are carried out according to plan. The main advantage of these two methods is their ability to increase effectiveness and reduce negligence in organizing daily schedules and tasks.

Overall, this research is expected to produce a well-functioning task schedule reminder application, equipped with task management features and automatic reminders [1] and an effective implementation of the RSA algorithm to maintain data security. This application not only offers a practical solution for students, but also contributes to the field of computer science in the development of *mobile applications* and data security, opening up opportunities for future innovation.

2. Research methodology

This study aims to create an Android application that serves as a reminder for students' homework schedules at Sri Langkat Tanjung Pura Private Vocational School, implementing an encryption and decryption process using the RSA algorithm to maintain data security. The methodology used in this study is as follows:

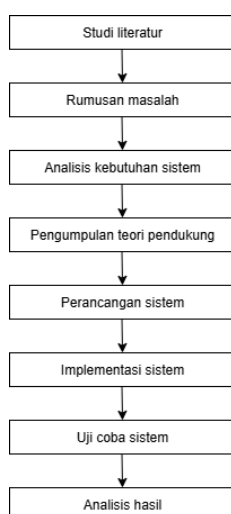


Fig. 1: Research Methodology

From the flow diagram in the image above, the stages of this research can be described as follows: following:

1. Literature Review: Begin your research by searching for and reviewing relevant journal literature.
2. Problem formulation: This initial step involves identifying and explaining the problem to be researched in detail and accurately. This phase also involves formulating research questions that need to be clarified.
3. System requirements analysis: This step may be more specific to research focused on technology or system development. Requirements evaluation aims to understand user needs and the expected functions of the designed system.
4. Collection of supporting theories : Collection of concepts related to the core of the problem such as theories regarding Task Schedule Reminders with Encryption and Decryption processes using the RSA Algorithm, the methods applied and the required system design applications. In this phase, concepts are taken from various books, journals, articles and other references.
5. System design: Based on the results of the needs evaluation, the next step is to design the structure, interface, and elements of the system to be created.
6. System implementation: This stage is the process of developing an Android-based application based on the design. Implementation will include developing application features and integrating the RSA algorithm for encrypting and decrypting task schedule data. The choice of programming language and development tools will be tailored to the project's needs.
7. System testing: The implemented system will then undergo a series of tests to ensure that it operates as intended and meets user needs. Various types of testing can be performed, including unit testing, integration testing, and system testing.
8. Results analysis: Data from testing and user feedback will be reviewed to determine whether the application achieved the research objectives and met user needs. This analysis will include the effectiveness of the reminder feature, the level of data protection, and the app's ease of use.

3. Results and Discussion

3.1. Discussion

This Android-based application is for scheduling reminders for tasks in PDF documents with secure encryption and decryption processes using the RSA algorithm. This application was built to make it easier for users to design a more structured and efficient task management system, so that it can overcome problems that arise due to less effective manual reminders.

3.2. Implementation

This implementation focuses on building an Android application that aims to help students of SMKS Sri Langkat Tanjung Pura in managing their assignments. This application functions as an efficient reminder for schedules, developed to replace less effective manual methods. The development process uses Android Studio, the Java programming language, and phpMyAdmin as a database, with a customized interface for admins, teachers, and students. In addition to these main features, this study also emphasizes the importance of data security by implementing the RSA algorithm. This cryptographic method is responsible for encrypting and decrypting assignment documents, thus ensuring the confidentiality and protection of sensitive data from unwanted access. The choice to use RSA because this algorithm is known to be strong, utilizing public and private key pairs to protect information.

3.3. System Trial

After implementing the above implementation and designing a system for a task reminder application with encryption and decryption using the RSA algorithm, the next step is to test the developed system to determine the results of the system implementation. The following are the results of the tests:

1. Test Login on Admin

Testing the admin login will display the login page for the admin, requiring them to enter their username and password before logging in. The admin login screen appears as shown in the image below:



Fig. 1: Teacher Login Display

2. Data Input Trial on Admin

The following is a display of admin data input which contains the username, password and available admin data and there are also "add, change, and delete" buttons. After that, it will appear below as in the following image:



Fig. 2: Admin Data Input Display

3. Data Input Trial for Teachers

The following is a display of teacher data input which contains the username, password and available teacher data and there are also "add, change, and delete" buttons. After that, it will appear below as in the following image:



USERNAME	guru
PASSWORD	guru
TIPE	guru
NAMA	nama guru
NOMOR NIS/NIP	2222
ALAMAT	null
KELAS	null

TIPE	NAMA
ADMIN	NAMA ADMIN
GURU	NAMA GURU
SISWA	SISWA

Fig. 3: Teacher Data Input Display

4. Data Input Trial on Students

Next, this is the student data input display which contains the username, password and available student data and there are also "add, change, and delete" buttons. After that, it will appear below as in the following image:



USERNAME	siswa
PASSWORD	siswa
TIPE	siswa
NAMA	siswa
NOMOR NIS/NIP	3333
ALAMAT	binjai
KELAS	X

TIPE	NAMA
ADMIN	NAMA ADMIN
GURU	NAMA GURU
SISWA	SISWA

Fig 4: Student Data Input Display

5. Teacher Login Display Trial

Testing the teacher login will display the login page for teachers, requiring them to enter their username and password before logging in. The teacher login screen appears as shown in the image below:



SELAMAT DATANG DI TASK REMINDER

Username
guru

Password
.....

Login

Fig. 5: Teacher Login Display

6. Teacher Home View Trial

The following is a trial of the teacher's homepage display which contains the deadlines for assignments that have been determined by each teacher and all other priority assignments as shown in the following image:



Fig. 6: Teacher Home View

7. Teacher Profile Display Trial

The following is a trial of the teacher profile display, which contains the number, name, address and class in the teacher data, as shown in the following image:



Fig. 7: Teacher Profile Display

8. Teacher Task List Display Trial

The following is a trial display of the task list, which shows the tasks that students will work on with a predetermined deadline. There is also a task input "button" to add tasks, as shown in the following image:



Fig. 8: Teacher Task List Display

9. Test Task Input and Task Details View

Next, click on the "Input task" button to add the next task, where the display contains the task title, subject, deadline, task description, select the task file to be uploaded and save the encryption to save the file as shown in the following image:

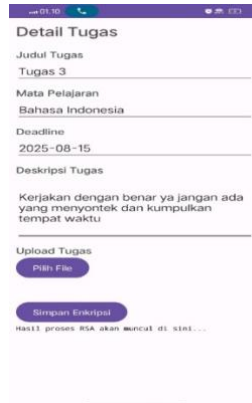


Fig. 9: Task Input and Task Details Display

10. Test the Select Task File View

Then, to upload the task, click the "button" and select the task to be uploaded as shown in the following image:

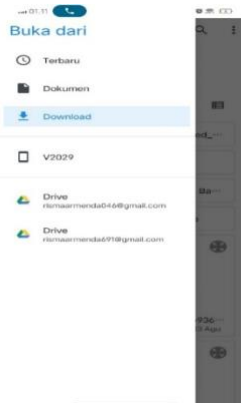


Fig. 10: Select Task File View

11. Test Save Confirmation Display

After selecting the file and saving the encryption, a save confirmation display will appear to save the uploaded file as shown in the following image:

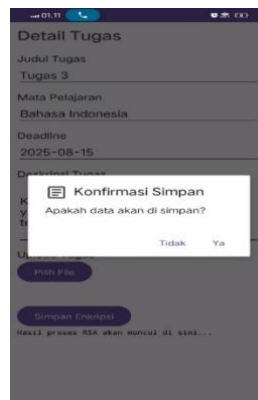


Fig. 11: Save Confirmation Display

12. Test Encryption Process Result Display

Next, if you have saved the file, the results of the manual RSA calculation process for encryption will appear as shown in the following image:

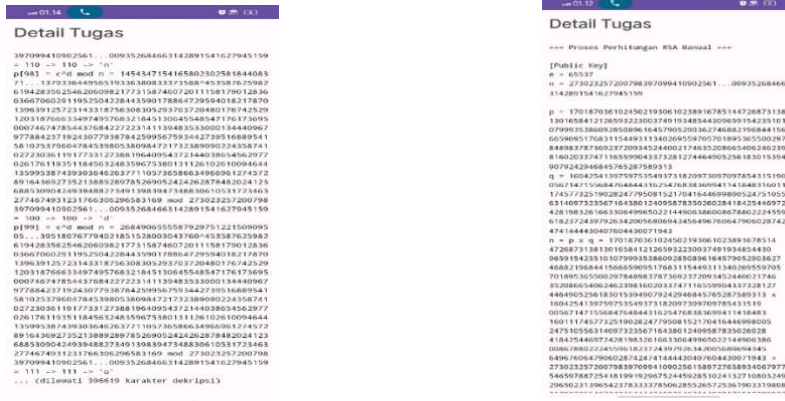


Fig. 12: Encryption Process Results Display

13. Test Task View View View

The following is a trial view to see the assignments submitted by the students, as shown in the following image:



Fig. 13: View Tasks view

14. Teacher Calendar View Trial

The following is a calendar display with predetermined task deadlines as shown in the following image:



Fig. 14: Teacher Calendar View

15. Teacher Exit Confirmation Display Trial

The following is a display of the teacher's exit confirmation. If the user wants to exit the system, click "Yes." If not, click "No," as shown in the following image:

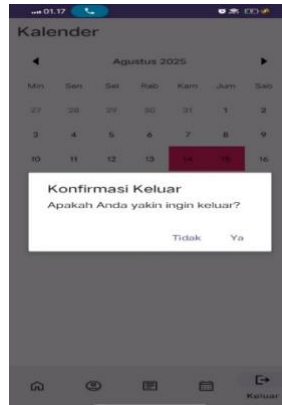


Fig. 15: Teacher Exit Confirmation Display

16. Student Login Display Trial

Testing student login will display the login page, requiring students to enter their username and password before logging in. The admin login screen appears as shown in the image below:



Fig. 16. Student Login Display

17. Student Home Screen Trial

The following is a trial of the student homepage display which contains the deadlines for assignments given by the teacher and all other priority assignments as shown in the following image:



Fig. 17: Student Home View

18. Student Profile Display Trial

The following is a trial of the student profile display which contains the number, name, address and class in the student data as shown in the following image:



Fig. 18: Student Profile Display

19. Student Assignment List Display Trial

The following is a display of a list of student assignments which contains the assignments that will be completed and also applies the specified assignment deadlines as shown in the following image:



Fig. 19: Student Task List Display

20. Student Assignment Detail View Trial

The following is a detailed trial of the assignment for students which contains the assignment title, subject, deadline, assignment description, create notifications and download the assignment/decryption on the assignment and then there are the results of the RSA decryption process as shown in the following image:



Fig. 20: Student Assignment Details View

21. Test Display of Decryption Process Results

After downloading/decrypting, the results of the manual process will appear in the task file as shown in the following image:

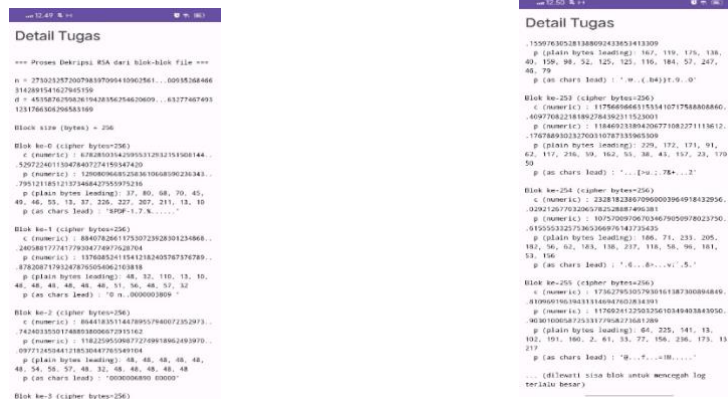


Fig. 21: Display of Decryption Process Results

22. Calendar View Test

The following is a trial of the calendar display containing the deadlines for the tasks that have been given and there is also a "button" to collect tasks as shown in the following image:

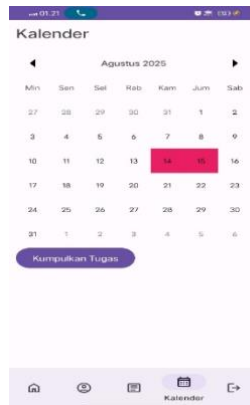


Fig. 22 : Calendar View

23. Test the Select Task View

After clicking the "collect assignments" button, a screen will appear, selecting the assignments to be collected and showing what assignments will be collected as shown in the following image:

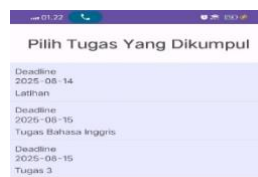


Fig. 23: Select Task View

24. Test the Assignment Upload View

Next, if you have clicked on the assignment to be collected, a display will appear to upload the assignment in the "upload assignment" section, after that select the answer file to be collected as shown in the following image:



Fig. 24: Task Upload Display

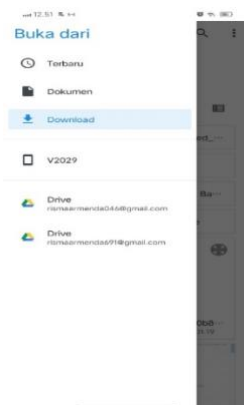


Fig.25: Select Task File View

25. Exit Confirmation Display Test

The following is a display of student exit confirmation. If the user wants to exit the system, click "Yes." If not, click "No," as shown in the following image:



Fig. 26: Exit Confirmation Display

26. Admin Database Input Trial

The following is a view of the database in the admin data which stores all user data via PhpMyadmin as shown in the following image:

#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra
<input type="checkbox"/>	1 id	int			No	None		AUTO_INCREMENT
<input type="checkbox"/>	2 username	varchar(255)	latin1_swedish_ci		Yes	NULL		
<input type="checkbox"/>	3 password	varchar(255)	latin1_swedish_ci		Yes	NULL		
<input type="checkbox"/>	4 tipe	varchar(32)	latin1_swedish_ci		Yes	NULL		
<input type="checkbox"/>	5 nama	varchar(255)	latin1_swedish_ci		Yes	NULL		
<input type="checkbox"/>	6 nomor	varchar(20)	latin1_swedish_ci		Yes	NULL		
<input type="checkbox"/>	7 alamat	varchar(255)	latin1_swedish_ci		Yes	NULL		
<input type="checkbox"/>	8 kelas	varchar(10)	latin1_swedish_ci		Yes	NULL		
<input type="checkbox"/>	9 public_key	text	latin1_swedish_ci		Yes	NULL		

Fig. 27: Admin Database View

27. Teacher Database Input Trial

The following is a database display of teacher data stored via PhpMyadmin as shown in the following image:

#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra	Ac
<input type="checkbox"/>	1 id	int			No	None		AUTO_INCREMENT	
<input type="checkbox"/>	2 tanggal	date			Yes	NULL			
<input type="checkbox"/>	3 nama	varchar(255)	latin1_swedish_ci		Yes	NULL			
<input type="checkbox"/>	4 nomor	varchar(32)	latin1_swedish_ci		Yes	NULL			
<input type="checkbox"/>	5 mapel	varchar(255)	latin1_swedish_ci		Yes	NULL			
<input type="checkbox"/>	6 judul	varchar(255)	latin1_swedish_ci		Yes	NULL			
<input type="checkbox"/>	7 deskripsi	text	latin1_swedish_ci		Yes	NULL			
<input type="checkbox"/>	8 file	varchar(255)	latin1_swedish_ci		Yes	NULL			

Fig. 28: Teacher Database View

28. Student Database Input Trial

The following is a database display of teacher data stored via PhpMyadmin as shown in the following image:

#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra	Ac
<input type="checkbox"/>	1 id	int			No	None		AUTO_INCREMENT	
<input type="checkbox"/>	2 id_tugas	int			No	None			
<input type="checkbox"/>	3 nama	varchar(255)	latin1_swedish_ci		Yes	NULL			
<input type="checkbox"/>	4 nomor	varchar(32)	latin1_swedish_ci		Yes	NULL			
<input type="checkbox"/>	5 file	varchar(255)	latin1_swedish_ci		Yes	NULL			

Fig. 29: Student Database Display

Based on the results of the application and implementation that has been carried out, the following conclusions can be drawn:

1. The implementation of this Android-based application has been successfully implemented among students at SMKS Sri Langkat Tanjung Pura. This application is designed with secure encryption and decryption processes using the RSA algorithm which functions to help teachers upload student assignments in organizing assignments in a more systematic and efficient manner, this application is

also developed using the Android Studio O application with the JAVA programming language and the phpMyadmin database and this application also overcomes the ineffectiveness of manual reminders or reminders on cellphones that are less organized by providing a more planned solution in managing student assignments.

2. The implementation of the RSA algorithm has been successfully applied for schedule reminders on student assignments with encryption and decryption using the RSA algorithm, so that the security of teacher and student personal data can be maintained from unauthorized access. This success is proven by system testing that shows positive results from the encryption and decryption process on assignment files, the developed system has features that are in accordance with the design plan, including interfaces for admins, teachers, and students. System testing shows that various features such as login, homepage, profile, task list, task input, task details, uploading answers and calendars are functioning properly.

Confession

I would like to thank my parents who always give me motivation and full support, and I also thank my supervisors who have helped and given me advice in conducting this research.

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