



Research on a High Efficiency Work Flow for Automated Mail Sending

Zhongbing Tan^{1,2}(✉) and Huibin Luo¹

¹ Beijing Institute of Technology ZhuHai, Zhuhai, China
22615037@qq.com

² Software Engineering Technology Research Center Zhuhai, ZhuHai, China

Abstract. In the daily work of enterprises, there is a large amount of complex and repetitive labor. Rapid customization of automated work flows to automate repetitive work for enterprises through low code development has attracted increasing attention from enterprises. This article introduces the the design and implementation of an work flow by Power Automate, which can run automatically to check certificates of power plant equipment, and which can further send an email automatically to the equipment owner at a specified time if the certificate of the equipment will be expired. The work flow effectively helps users in enterprises automate repetitive tasks that were originally manually completed, which greatly improves work efficiency.

Keywords: Power Automate · Work Flow · High Efficiency

1 Background

Large power enterprises usually have many power equipment distributed in different geographical locations. After the equipment is put into operation, regular inspections and maintenance are required to understand the operation status of the equipment, maintain the equipment, or timely detect abnormal problems. Various types of power equipment have different types of certificates, and each type of certificate has a different validity period, such as one year, three years, or five years. Before the certificate expires, the equipment needs to be checked again, and the corresponding certificate will be issued again when the equipment is running normally. Due to the differences in the time to put into use and validity period of various types of equipment, it becomes extremely difficult to know in a timely manner when each device will expire when the equipment is in a large quantity. How to automatically calculate which device certificates are about to expire every day, and automatically send an email to the device owner and attach relevant information about the devices that are about to expire at appropriate times, such as 30 days before and on the day of certificate expiration, has become an urgent problem to be solved.

2 Actual Requirements of the Project

In the project of power plant information management system, there are three tables in the database. The first table named Master, which used to record detailed equipment information, such as team which is responsible for the equipment, equipment description, equipment type, testing time, site, etc. The second table named Certificate, which used to record the certificate information of the equipment, including certificate number, certificate type, certificate date, etc. And the third one is PMCM, which is used to record maintenance information of equipment, including work Order number, maintenance content, order release date, plan-start-date, plan-complete-date, completion status, etc.;

Since Real-time computing is needed to determine whether the certificate is about to expire, an automated work flow is needed to read the certificate information of each device which recorded in the Certification table regularly every day to calculate the remaining time before the next time to re-certification. If the number of remaining days is 30 or 0, the team responsible for the device needs to be queried from the Master table according to the OwnerID in the certificate, and the team leader will be sent an email to remind that the certificate of the device(s) is(are) about to expire, and it(they) needs to be re-certificated.

The email address of the team leader is not directly saved in the above three tables of the system database. It needs to be searched in the data dictionary of SHAREPOINT according to the team name. The team table of SHAREPOINT stores the information about the team name and the email address of the team leader.

In addition, multiple certificates that are about to expire may belong to the same TEAM, and all information about the upcoming expiration needs to be grouped. If a group of devices that belongs to the same TEAM are about to expire, only one email should be sent to the team leader with information about all devices that are about to expire.

3 Ways to Solve the Problem

Essentially, building automated processes and avoiding repetitive labor are a typical application scenario for low code platforms. Repetitive work usually follows certain rules and processes, so it is recommended to design and implement automated work flow by low code platforms. By using visual coding tools such as interfaces, logic, objects, and work flow provided by low code platforms, a large amount of development work can be completed quickly, which reduces uncertainty and complexity in software development, greatly improves development efficiency, and enable enterprises to reduce development costs, lower technical barriers, innovate applications, and achieve agile iteration, etc.

The technology of Low code platform is currently developing rapidly both domestically and internationally, with representative examples including OutSystems, Mendix, and Microsoft's Power Platform. In China, low code platforms have developed rapidly in recent years. Mingdaoyun, Jiandaoyun, APICloud and technology giants such as Huawei and Alibaba have also launched their own low code platforms [1].

The automated work flow in this project is implemented by Power Automate, which is one of the four core services provided by the Power Platform platform. It is mainly

aimed at process automation in low code development, helping users automate repetitive work that was originally manually completed and improve work efficiency. Professional programmers can combine Power Automate with developed applications, integrate low code and professional code to handle complex business scenarios [2].

The key issues that need to be addressed in this project include the following two aspects:

- 1) Dynamic update of certificate data that is about to expire. Since Real-time computing is required to determine whether a certificate is about to expire, the certificate that is about to expire will change dynamically every day, and it is necessary to automatically send an email based on the dynamically updated data. Due to the fact that all the required data for the project is saved in an Excel spreadsheet, it is possible to add a Warning worksheet in Excel to dynamically store the certificate information of an equipment that meets the expiration reminder rules. The dynamic update of the Warning worksheet can be completed using functions in Excel.
- 2) Time triggered work flow to automate email sending. Create a Power Automate work flow that reads the data in the Warning table regularly every day and filters them by team name. Find the email address of the team leader in the Team table of Sharepoint and send an email automatically to remind re-certification of the equipment to be expired.

4 Design and Implementation of Automated Work Flow

The key issue that needs to be addressed in this timed triggered work flow is the grouping of certificate data according to team name. Multiple certificates that are about to expire belonging to the same team need to be sent via only one email instead of one email per certificate.

By serious research and design, the work flow is created as follows:

- 1) Determine the type of work flow. As this work flow needs to be run everyday, a 'planned cloud flow' is created with the Name LALGMailReminding. And it is set to run automatically at 8am every day.
- 2) Read the data in the Warning table and get the number of data rows in the table. This step is used to verify whether there is certificate data in the Warning table. If there is no data, subsequent operations can be omitted; Otherwise, it is necessary to continue with the subsequent steps of the process. The expression for obtaining the number of rows in the Warning table is as follows: `length(outputs('list the rows that exist in the table')?['body/value'])` (see Fig. 1).
- 3) Initialize two variables, named Temp and TEAM respectively. Among them, Temp is an array variable used to store records read from the Warning table. The expired certificate information needs to be sent as the email body to the team leader. TEAM is a string variable used to store all TEAM name, and it will be used to filtering data in the Temp array for only one email will be sent for data belonging to the same group.
- 4) Add a new step for condition judgment. If the data row in the table is not 0, subsequent operations need to be continued.
- 5) In the "If Yes" branch of the conditional judgment, that is, when the number of data rows is not 0, the data in the table will be appended to the array variable Temp(see Fig. 1).

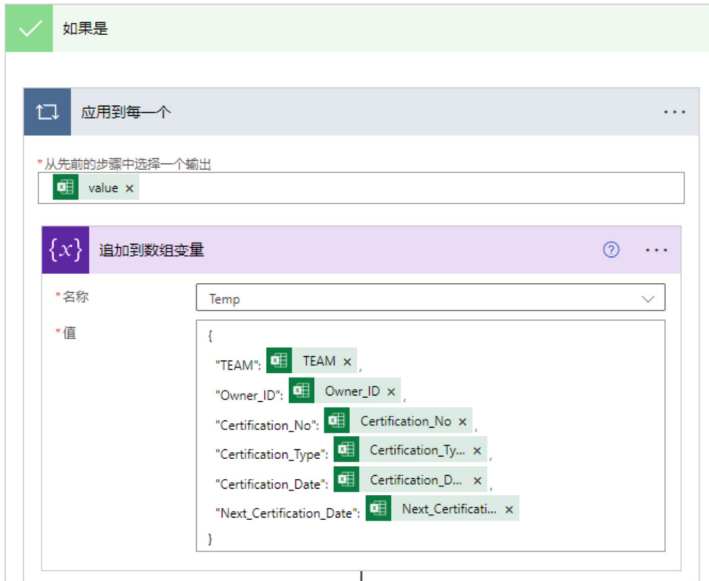


Fig. 1. The step to append data read from Warning table to array variable Temp

- 6) Determine whether the TEAM value of each read record is included in the TEAM variable. If not, append it to the string variable TEAM and add “;” at the end to separate the TEAM values.
- 7) Add a new step to create an HTML table. This step will use the values of the Temp array variable to create an HTML table as the content of the email body.
- 8) Add a new step to edit variables. This step is used to remove the last semicolon in the TEAM variable. Otherwise, when splitting the string by “;”, there will always be a TEAM with an empty name. The expression used is as follows: Substring (variables (‘TEAM’), 0, sub (length (variables (‘TEAM’), 1)).
- 9) Add a new step to edit variables. This step is used to split the content in the TEAM string according to the “;” separator.
- 10) For each TEAM obtained by splitting, use it to filter data in the Temp array. Using the filtered data, recreate the HTML table, and based on the obtained TEAM value, filter the email address of the team leader from the Team list in SharePoint (see Fig. 2).

Add a new step to obtain data items from the previous step and send emails to team leader (see Fig. 3).

With all these steps, the work flow is finished, and it will automatically run every day at the scheduled time. If there is certificate information about to expire in the Warning table, an email will be automatically sent to the TEAM manager through Outlook, realizing the function of automatic reminding. Testing illustrates that when multiple device certificates of the same team are about to expire, only one email with multiple devices information being sent, which meets the requirements of the project (see Fig. 4).



Fig. 2. The step to recreate HTML table with filtered data based on the obtained TEAM value

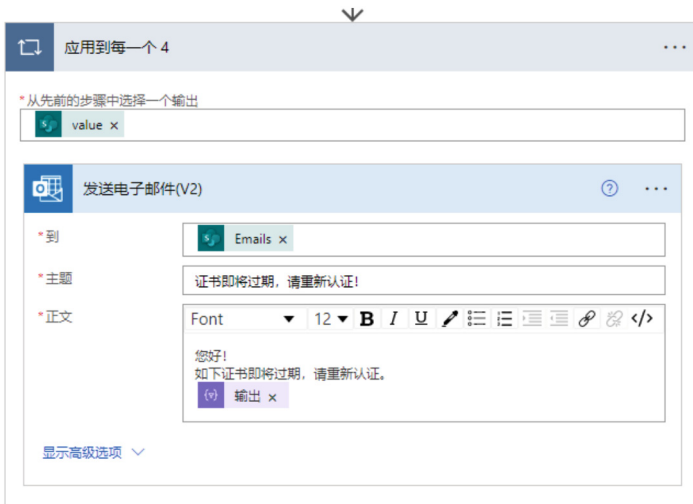


Fig. 3. The step to send Email.

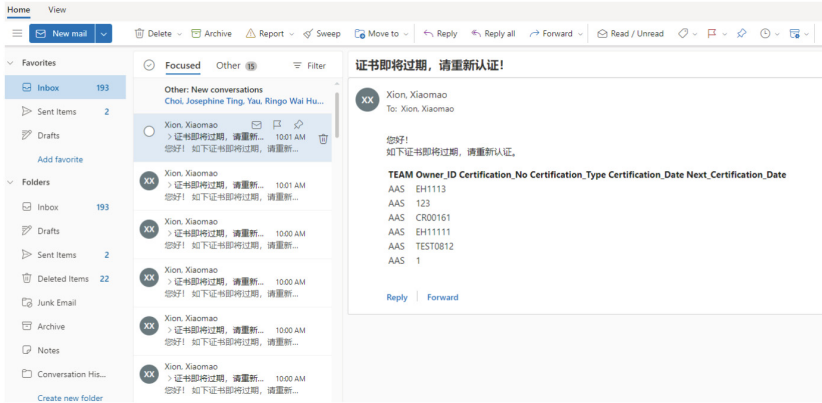


Fig. 4. Email with multiple devices information that are sent automatically.

5 Conclusion

With the increasing trend of enterprise digitization and cloud deployment, more and more customized SaaS applications require faster and more efficient development. A low code development platform can accelerate and simplify application development from small departments to large complex tasks. It simplifies the development process and provides rich component libraries, enabling developers to efficiently build applications. It also accelerates and simplifies the integration of applications, cloud, local databases, and recording systems. In addition, Power Automate can help users create automated work flows and reduce the complexity of manual operations. It provides a variety of operation and trigger options, allowing users to customize work flows according to their needs. With the advent of RPA (Robotic process automation), low code development will get more and more attention [3].

References

1. Representative products of low code. <https://zhuanlan.zhihu.com/p/585154435>. Accessed 20 Nov 2022
2. Wei, Q., Zhao, J., Wang, Z., Cui, H., et al.: Practical Low Code, pp. 371–373. Mechanical Industry Press, Beijing (2021)
3. What is a low code development platform. https://baike.baidu.com/reference/23661682/5316VgfGPAIHGupyBCzfCCL4clKWHfETsU6hdiYEeiLR49bUYYSIKRnVpNdqM_eZjPPIhYAiao00gnzQYE0KYa9hmfHbceQJ421dD6Ob6fyQ. Accessed 22 Dec 2019