



Research on Low Code Development Platform Based on Business Middle Platform Technology

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Abstract. In recent years, various enterprises have built various information systems, realized effective management of production data, provided information support for individual businesses, and promoted the overall improvement of management level. With the development of digital transformation and intelligence, it is difficult to meet the personalized needs of standardized software, and the project cycle and cost are not easy to control, resulting in high fixed cost expenditure of the operation and maintenance team, It brings relatively large operating cost pressure to enterprises. Therefore, the traditional chimney enterprise application architecture, data island, thick application architecture and integration relationship lead to the difficulty of personalized demand development, long cycle, high cost, poor resource reusability, and low development efficiency, which cannot quickly respond to market changes. Through the establishment of standardized, shared, componentized and reusable technical resources, we will create a visual development environment, a drag and drop development method, and a simple and easy-to-use low code development platform to reduce development difficulty and improve development efficiency.

Keywords: reusability; Visual development; Low code development

1 Introduction

In the digital construction of enterprises, the lack of overall planning of the construction led to multiple application access portals, the process and data between various systems were not connected, and there was a problem of repeated construction. When the business model, business needs and management processes brought about by changes in the market and customer needs are constantly changing, information systems are required to adapt to enterprises and compete in the market through the differentiation of services and management^[1]. It is difficult to meet the personalized needs caused by standardized software, and the project cycle and cost are not easy to control, resulting in high fixed costs for the operation and maintenance team, It brings relatively large operating cost pressure to enterprises. Therefore, the traditional chimney enterprise application architecture, data island, thick application architecture and integration relationship lead to

the difficulty of personalized demand development, long cycle, high cost, poor resource reusability, and low development efficiency, which cannot quickly respond to market changes^[2]. A universal development and customization framework that is quick to use, efficient and easy to maintain is urgently needed to improve the rapid development of business applications, solve a lot of repetitive work in software development, so as to achieve the goal of cost reduction and efficiency increase, and let business personnel pay more attention to business logic.

2 Research background

So far, the application of low code has been more and more widely, more and more enterprises hope to through the use of low code platform to improve software research and development efficiency, there are more and more software manufacturers launched their own low code platform, due to domestic low code technology started late, the current low code technology support for software development more for front-end web / APP / small program development, to form driven SaaS configuration platform and aPaaS platform. Figure 1 below. Low code development platforms can accelerate and simplify the development of applications from small departments to large complex tasks, and can be deployed across platforms once the development is completed, but this is only part of its capabilities. The low code development platform also speeds up and simplifies the integration of applications, cloud, local databases, and recording systems. Therefore, the low code development platform can realize the application demand analysis, interface design, development, delivery and management of enterprise digitalization, and make it fast, agile and continuous. The key to the survival of an enterprise depends on its products and business capabilities^[3]. In order to make it easier for enterprises to respond to a large number of demands initiated by business departments, the low code platform enables IT personnel and business personnel to develop software in a more efficient way based on different scenarios and enterprise human resource configurations.

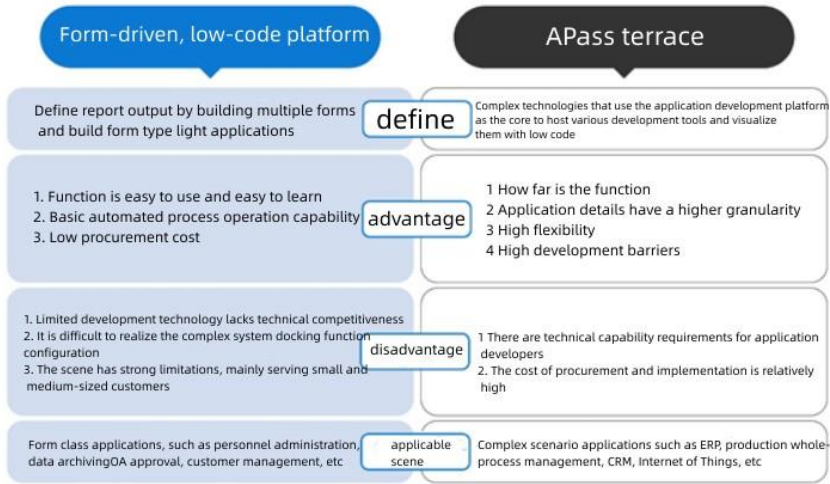


Fig. 1. Low-code technology development Platform

3 Design of low code development platform

3.1 Microservice technology

In order to ensure the realization of general business functions, the planning and design shall complete five types of modular services, namely, shareable, reusable, customizable and reconfigurable business functions, graphics, data, algorithms and processes, support the co construction and sharing of subsequent development application scenarios, and support the deepening reform of business and business process reengineering through management process and function modularization. Microservice is an important basic service in the business platform, which will provide atomic, reusable and shareable basic support capabilities for various business applications.

3.2 Low code development platform architecture design

Provide a graphical development interface for developers, and use drag components and model driven to complete functional design. Generate resolution pages through the resolution engine (variables, datasets, etc.), consolidate, package and compress components, styles, script resources, etc., automatically generate functional modules, publish them to the cloud platform, and complete the application display. At the same time, we will build a collaborative management and development environment, create a visual, component drag and drop low code development environment through prefabricated templates, service customization, process customization and module preview, and achieve development sharing and efficient collaboration. At the same time, it establishes the ability of project management, resource sharing, modular development, component customization and code writing of complex logic, rapidly completes interface

design, development, delivery, release and management, and creates a collaborative development environment. Rely on the support ability of microservices. Customization: In the customization environment, project management capabilities are implemented through collaborative development capabilities, including creating projects, organizing project members, assigning positions and permissions, and drag and drop module development customization for developers (including layout placement, drag and drop components, and attribute interaction settings, and low code injection for complex logic), For the extension of composite functions, the extension capability analysis of composite components is provided: Seluban customized files are generated through development, saving, and analysis pages are generated through the analysis engine (variables, data sets, etc.). Publish: replace the formal environment through the provided publishing function for environment variables and configurations, consolidate, package and compress components, styles, script resources, etc., register module information, and publish it to the cloud platform^[4]. Operation: display on PC side relying on microservices.

(1) Technical architecture

Build a collaborative management and development environment, and create a visual, component drag and drop low code development environment through prefabricated templates, service customization, process customization and module preview to achieve development sharing and efficient collaboration. The underlying data layer supports non relational data and relational databases. Through the "cloud+microservice technology", more than 10 service centers have been built to provide service support. The design includes collaborative development, module design including customization of charts, processes, data services, etc. The technical frameworks that rely on include html5, dhtmlx, exjts, etc. The runtime is mainly the display and operation of modules, including the presentation of reports, curves, graphics, processes, and other modules.

(2) Functional architecture

Through project management, resource sharing, modular development, component customization and complex logic code writing capabilities, we can quickly complete interface design, development, delivery, release and management, and create a collaborative development environment.

3.3 Functional design of low code development tools

(1) Organization management

Through the organization, position, role, user and function permission, the management and control of collaborative work, collaborative sharing and resource reuse between projects are realized. Based on the position business requirements, the application resources, user positions and permissions are reasonably configured to form the position business menu, integrate the application resource building components, and establish a post based customized workbench to realize the automatic push and unified handling of daily business and office work, and form a business collaborative work mode of "looking for people" to improve office efficiency. Post based customized workbench, based on collaborative office work and efficient work, provides users with

to do, done, notice, announcement and other office information, as well as statistical charts, statistical tables and other business concerns, and builds a dedicated workbench suitable for each business position^[5]. Centralized management of reusable scripts, styles, pictures and other resources to form a resource center, realize resource sharing, establish standardization and unification of resources, improve the reuse rate of resources, and meet the needs of project development and application.

(2) Project management

For project R&D, establish project management, staffing, role division and other functions to achieve coordinated control of "developers and projects" in the development process.

(3) Module development

Through prefabricated templates, service customization, process customization and module preview, a visual, component drag and drop low code development environment is created to achieve development sharing and efficient collaboration.

(4) Component Services

Component services provide functional support for various development applications, representing the development capabilities of low code development platforms. In the development process, modules with similar functions and interfaces are encapsulated with common functions to form business components that can be shared and reused. Through continuous iteration and upgrading, the component library is established and improved. The reuse function of components can greatly shorten the development cycle and effectively improve the development efficiency. Micro service architecture is adopted in the technical architecture: the front-end uses Html5+DhtmlxGrid for grid presentation, the back-end uses Node.js+Qt for report template analysis and matrix calculation, and the front and rear end communicate through Rest interface.

(5) Report Component

This component depends on the report microservice. In the visual environment, it can customize various types of reports such as grid, grouping, nesting, crossing, column splitting, sharding, multi-level serial number, condition paging, tree display, and report filling by dragging. The query report customization process can be divided into six parts: data service writing, report template selection, data binding, form design, event logic definition, and operation display. Take the grouped report with condition area as an example to explain the process of report customization. Data tables, fields and other information used in report customization are all from data access services. First, you need to write and test the data access service. After the test is correct, start the report customization. Data tables, fields and other information used in report customization are all from data access services.

(6) Curve components

Through flexible dynamic interaction effects and personalized chart attribute configuration, it can meet the needs of different types of data reading and support the reuse and sharing of user-defined charts. The curve customization process can be divided into six parts: data service writing, curve template selection, data set binding, curve style setting, event logic definition, and operation display. Take the curve with condition area as an example to explain the curve customization process. The data tables and fields used in curve customization are all from data access services. First, you need to write

and test the data access service. After the test is correct, start the curve customization. Rich visual charts, including dozens of chart styles such as column chart, broken line chart, scatter chart, radar chart, etc; Drag and drop to design free layout: determine the analysis layout according to the business analysis scenario, and realize the diversification of layout methods through free drag and drop; Adaptive PC/mobile terminal: the analysis template designed for adaptive display on PC terminal, mobile terminal, large screen and other devices; Data Drilling Linkage Analysis: OLAP analysis operations such as linkage, drilling, and jumping can be performed between data to quickly build visual theme analysis.

(7) Collection components

You can flexibly adjust the interface layout, entry sequence, verification rules, user-defined shortcut keys, user-defined newline fields, etc. Single table collection: the most basic and widely used collection demand. The data comes from a single table and belongs to a single table, as shown in Figure 2. Joint Table Collection: joint entry of multiple tables. It is often used to collect data from multiple tables and store it in multiple tables. It is applicable to one to many data collection scenarios. It usually refers to the collection of multiple tables with primary and foreign keys. Through the primary and foreign key relationship, data linkage and data saving between primary and secondary tables are realized; Add Data: save the data in the primary table first, and then save the data in the secondary table. Delete Data: first delete the data in the secondary table, and then delete the data in the primary table; Modify Data: modify the primary table data first, and then modify the secondary table data. It is applicable to one to many data collection scenarios. It usually refers to the collection of multiple tables with primary and foreign keys. Through the primary and foreign key relationship, data linkage and data saving between primary and secondary tables are realized. Vertical tables are mostly used in the application scenarios where business logic data items such as equipment data and indicators are transposed. Vertical table data for row and column transposition is built through the middle virtual table. Data collection can be completed by binding a virtual table in the collection component. Forms used in business are displayed directly by filling in, and data collection is completed without changing user habits^[6]. Excel like operations such as copying, pasting, and style adjustment are supported.

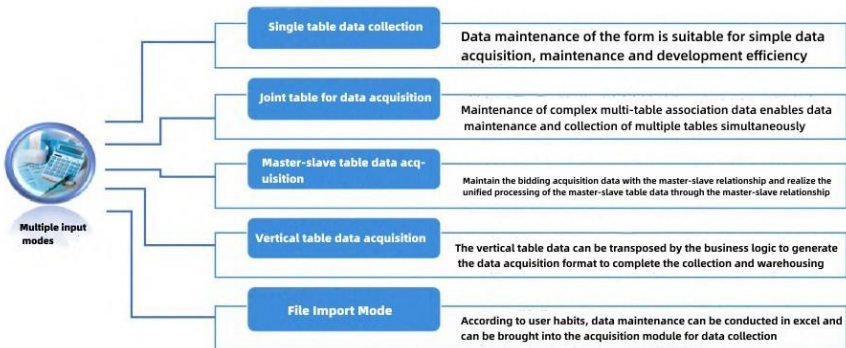


Fig. 2. Schematic Diagram of Acquisition Components

(8) Project release

The low code development platform has the ability of image building and code submission. Through the image building function, Docker images are generated and pushed to the image warehouse. Submit the developed module code to the code warehouse through the code submission function. With the help of devops pipeline, the module image is built. Finally, the deployment capability, scheduling capability and orchestration capability of the cloud platform are used to achieve project operation, as shown in Figure 3.

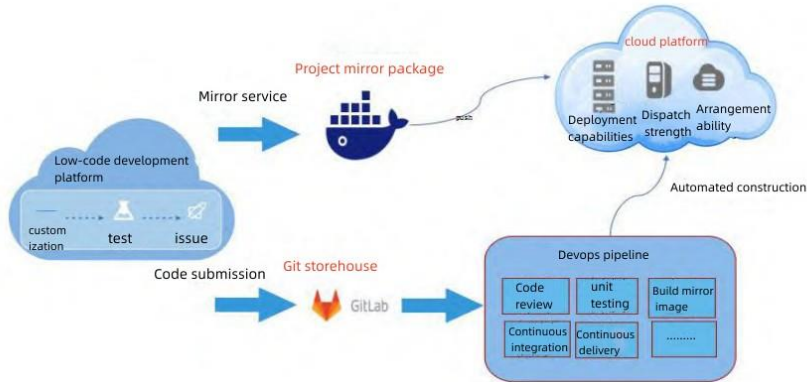


Fig. 3. Project Release Flow Chart

(9) Composite component customization

According to the application requirements, composite components are built through components. At the same time, this component can also participate in the construction process of other components, form reusable component resources through component iteration, and improve the development capability of the platform. Main features: composite component development is realized by means of tools and visualization, and the technical threshold for development is low. Through the iterative combination of basic components, "advanced" composite components are established to form reusable resources and improve the development efficiency of business modules. Shield the technical details of the development process, form a standard code mode, reduce the dependence of developers on development technology, and focus more on business requirements and logic processing.

4 Conclusion

Productive tools have different advantages due to their different market positioning. It is the absolute principle to apply them to the most suitable place and play the largest role. Through the low code development platform, various visual analysis application functions are established to realize the complex report analysis application, which is integrated into the analysis platform. Finally, the unified management and integrated application of production and operation data in all business links are realized, laying the foundation for future big data analysis.

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