ISSN 1330-3651 (Print), ISSN 1848-6339 (Online)
https://doi.org/10.17559/TV-20200220091709
Original scientific paper

Design and Research of Intelligent Traffic Cloud Platform Based on Flexible Customization of User Identity

Hua PAN

Abstract: With the advent of artificial intelligence and big data era, the application scenarios of smart transportation are becoming more and more extensive, and the transportation industry is also undergoing intelligent upgrades. According to the flexible customization requirements of Intelligent Traffic Cloud Platform business function, this paper presents a flexible customization of User Identity, which has been applied to a specific business system. Intelligent Traffic Cloud Platform as a new information processing infrastructure model and business model has been widely recognized. The model-driven strategy based on user identity uses the C# delegation mechanism. The storage of business function customization designs the driving strategy of flexible customization model and realizes the flexible customization of platform. This paper uses Load Runner v8.1, an industry-standard load-testing tool that predicts system behavior and performance, to predict system behavior and optimize system performance. Finally, the feasibility and effectiveness of the proposed scheme is verified by a specific service function on the Intelligent Traffic Cloud Platform.

Keywords: flexible customization; intelligent traffic cloud platform; load runner; XML

1 INTRODUCTION

With the development of virtualization and network technology, the current application is no longer installed locally, but deployed in the "cloud" side. It has entered the "cloud computing" [1]. Intelligent Traffic Cloud Platform is not only technical integration. It integrates software deployment, operation and maintenance into one integrated PaaS service and submits to the developer as SaaS model [2, 3]. It also reflects the cloud computer operating ideas. Developers can quickly deploy, run and scale software development on the platform without having to build and maintain hardware or installing software middle ware. Therefore, it can free the developer from software deployment, operation and maintenance.

At present, the customization of software has become the trend and the customization function of personalized service is more and more popular. A large number of research scholars have carried out researches on the customization technology of Intelligent Traffic Cloud Platform business function and made many research results [4], such as being based on meta-data customization technology, being based on business rules customization technology and so on. In the practical application, there have been many applications for customized processes such as business process customization, business rules customization and interface customization. Foreign companies have studied some of them earlier. So Sales-force has long focused on developing online customer relationship management (CRM) Software [5, 6]. Google has also developed a large number of online office suites, launched in the online application services based on Google Apps PaaS service Google App Engine. Microsoft launched platform is both the deployment platform and the cloud computing platform such as Windows Azure Platform. Domestic companies, such as Ali, developed AEP (Alisoft ecommerce platform) platform. Eight hundred customers developed CRM and online Office; Servlet software introduced CServer PaaS platform.

The related literature of theoretical research mainly based on BPEL to study SaaS application service process. Each business function contains multiple choices but cannot be modified after the business function instantiation [7]. In literature, a dynamic form customization model for SaaS platform was established. It realizes the dynamic generation of form, display customization, and query customization. In this paper, the mapping relationship between business process and business function is established and the custom relationship between business group and business process is established. This paper constructs the customization model of business process for SaaS platform for multi-enterprise group and realizes the individual customization of business process in the enterprise cluster [8, 9]. In literature, a configuration model based on component assembly and customization service is proposed which allows users to model the service. According to their specific business process, the service flow is realized by defining different data association and constraint rules based on the same service component custom made [10]. In literature, the process of customization of SaaS mode based on SLA Intelligent Traffic Cloud Platform is studied. Literature is based on the Bl-PaaS platform to establish an interface customization system that supports a variety of data sources and displays information. It achieved the data display customization, page customization and other functions [11, 12]. Literature classifies the configurable requirements of the SaaS platform and studies the configurable technology solutions [13]. Literature studied the form customization platform for SaaS applications.

The above researches are mostly for a specific business function of custom research. It has specific business limitations, rather than studying the flexibility of customization from the overall business function [13]. Through the above research, this paper studies the flexible technology of the business function of the intelligent transportation cloud platform, and proposes a flexible customized solution for the formal business function of the intelligent transportation cloud.

2 FLEXIBLE SERVICE REQUIREMENTS

Intelligent Traffic Cloud Platform as a new information processing infrastructure model and business model has been widely recognized. People began to pay attention to the scientific problems behind them and the

unique core technology. Therefore, we can use cloud infrastructure more effective, efficient, economical, qualitative and constructional. In addition, software and resources were put into the cloud infrastructure and used in the form of services for consumers. Services become the basic way to access and amplify all kinds of infrastructure. Cloud computing and service computing are very close. The most commonly mentioned in cloud computing is software as a service (SaaS), platform as a service (PaaS) and infrastructure as a service (IaaS). The service is the core. The recent research on service computing also involves resource sharing and application integration on cloud infrastructure.

Intelligent Traffic Cloud Platform is a way for enterprises to access information resources. Companies do not need to build or deploy themselves. Via the Internet, it can be applied on-demand and paid on-demand [14]. Not all tenants can use the same function to meet the needs of tenants. This requires SaaS with flexible business configurability and scalability, so that it can be based on user needs. It supports the user in the application process of personalized customization and does not affect the use of other users. Therefore, each user has a personalized experience. The specific performance of Intelligent Traffic Cloud Platform business functions flexible customization is as follows.

(1) Intelligent Traffic Cloud Platform has different requirements for specific business functions for different users [15]. For example, in a specific area, unused application areas have their own specific business function requirements even with the same business order audit.

(2) Now the business has reorganized and the business changes rapidly. Business functions need to change frequently.

Current enterprises in order to survive in the fierce market space must continue to adjust their business. They must pay attention to the latest technological trends to catch up with every step of the technological reform and constantly optimize the industrial structure. They constantly adjust the business process to achieve the optimal development of business processes. Specific Intelligent Traffic Cloud Platform business function custom structure is given in Fig. 1.

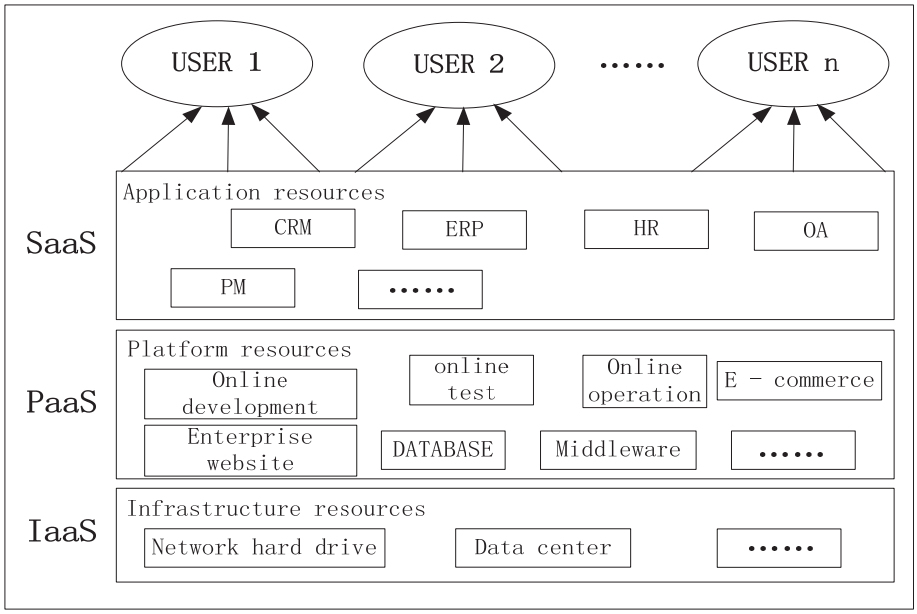

Figure 1 Intelligent Traffic Cloud Platform business function custom architecture

(1) SaaS provides application resources. It is used by enterprises outside the cloud environment. It has the ability to provide customized business functions. It mainly faces ordinary users which is a new situation for users to obtain software services. Enterprises can achieve unified management of computing resources, unified deployment, unified monitoring and unified backup through SaaS mode. It can greatly improve the efficiency of enterprise management. SaaS model has become an effective way for the implementation of information technology in small and medium-sized enterprises.

(2) The main user of PaaS, which provides platform resources, is the developer. The model not only uses cloud computing resources but also provides support for the construction and deployment of cloud services. It is a relatively low-cost solution and a business model that presents the infrastructure platform as a service to the user. It has a great attraction for the enterprises with limited funding and IT resources and the enterprises need to expand IT infrastructure [16]. PaaS as a cloud computing and business platform to provide the product can provide higher availability and scalability of application services.

(3) The users of the IaaS service model providing infrastructure-enabled services are primarily system administrators. In the field of IaaS, the representative enterprises are Ali cloud, Jingdong, blue flood, net places, UCloud, Albatron etc. It has become a part of rapid development of cloud computing.

3 FLEXIBLE SERVICE SOLUTIONS

3.1 Flexible Customization Model of Business Functions

According to the above customization requirements, the following flexible custom model is established and the elements involved in the model are defined as follows. Intelligent Traffic Cloud Platform for enterprises to

provide services [17]. At the same time, enterprises can also use the intelligent traffic cloud platform for their own subordinate enterprises to provide services. Its roles include the role of the platform enterprise and the corresponding role of the enterprise.

Definition 1: Intelligent Traffic Cloud Platform roles can be represented by $R_j = (U_{R_j}, R\_Set_j)$, U_{R_j} represents the role of the enterprise network corresponding to the Intelligent Traffic Cloud Platform;
$R\_Set_j = (R_1, R_2, ..., R_n)$ represents a collection of roles and n represents the number of roles.

Definition 2: The role of the platform in the implementation of business function customization is required to have specific permissions, the role of permissions can be represent by $A_i = (A\_ID_i, R \to A_i)$,
A_ID_i represents the permission ID, which is used to indicate unique permissions;
$R \to A_i$ represents the role of the corresponding permissions.

Definition 3: The traffic function provided on the Intelligent Traffic Cloud Platform can be expressed in terms of $F_k = (F\_ID_k, F\_N_k, F\_D_k)$,
F_ID_k represents the function ID;
F_N_k represents the function name;
F_D_k represents a specific description of the function.

3.2 Model Storage Based on XML

XML as a scalable language can further define the scope of use and document format based on its basic syntax for heterogeneous data between different applications integration and data exchange. XML also allows to develop special data formats according to actual needs. XML development program tool provides a large number of functions to deal with XML files. File exchange is relatively simple and it has become a standard for data exchange between different applications. The analytical performance has also been greatly improved [18]. So the business function type is implemented by XML storage. Through the business type to determine the business functions, business functions flexible customization models are stored by using XML Schema. Complete business function description information includes: interface framework, data objects and controls. The specific contents are as follows.

1) The interface framework mainly describes the interface structure information and defines the location of the control, the layout of the interface and so on in the XML file.

2) The data object is the data information corresponding to each control. In the content display process, the definition of how to bind the specific data into the control need to be bound with these data objects.

3) Controls: The interface frame has been defined for the location of the control. The control is of the style and attributes are defined. These include the length of the control, line thickness, and color and so on. The XML Schema exported from the system contains part of the fragment information that automatically generates the interface. There are TextBox controls, Label controls and ComboBox controls.

Interface generation process specific steps are as follows:

Step 1: Creating the xml schema file;

Step 2: Reading the corresponding control information on the interface;

Step 3: Determining the type of control, establishing the corresponding XML document elements;

Step 4: If you do not need to traverse all the controls, find the next control, otherwise go to step 5;

Step 5: Saving the XML schema file.

XML Schema and interface conversion using LINQ to XML technology. Clients read the interface template and restore the interface according to the interface layout and control properties stored in the template. In the XML file where the data is stored, one data is stored in one <element> and the specific information is stored in <attribute> of each field in <element>. In the process of data restore, the value of each <attribute> corresponds to the <name> of the control and the data in the XML file is displayed on the client. The specific code for getting the Excel file data table list is as follows:

```
public static ArrayList GetExcelTables(string
ExcelFileName)
{
    DataTable dt=new DataTable();
    ArrayList TablesList=new ArrayList();
    if(File.Exists(ExcelFileName))
   {
    using (OleDbConnection conn =
    new
OleDbConnection("Provider=Microsoft.Jet.OLEDB.4.0;
    Extended Properties=Excel 8.0;Data Source=
    " +ExcelFileName))
    {
     try{conn.Open();
     dt=conn.GetOleDbSchemaTable(OleDbSchemaGuid
.Tables,
      new object[] { null, null, null, "TABLE" }); }
      catch (Exception exp){throw exp;}
the number of data tables
    int tablecount = dt.Rows.Count;
    for (int i = 0; i < tablecount; i++)
    {
    string tablename =
    dt.Rows[i][2].ToString().Trim().TrimEnd('$');
    if (TablesList.IndexOf(tablename) < 0)
    {
     TablesList.Add(tablename);}}}}
     return TablesList;
}
```

3.3 The Model-driven Strategy Based on User Identity

There have been many studies on data acquisition software model based on event-driven [15] and the event-driven thinking was introduced into data acquisition-related application software development. In this paper, we use the model-driven strategy based on user identity and use the C# delegation mechanism to apply the strategy to model-driven. The flexibility of the business function of the custom model loading starts from U_{R_j}, resulting in

A_ID_i and we can find the corresponding business function model in the business function of the flexible custom model library [18, 19]. For the general tenants of the Intelligent Traffic Cloud Platform, only the model-driven strategy can be dynamically loaded by user authentication. The specific flexible custom model driving strategy and algorithm are as follows.

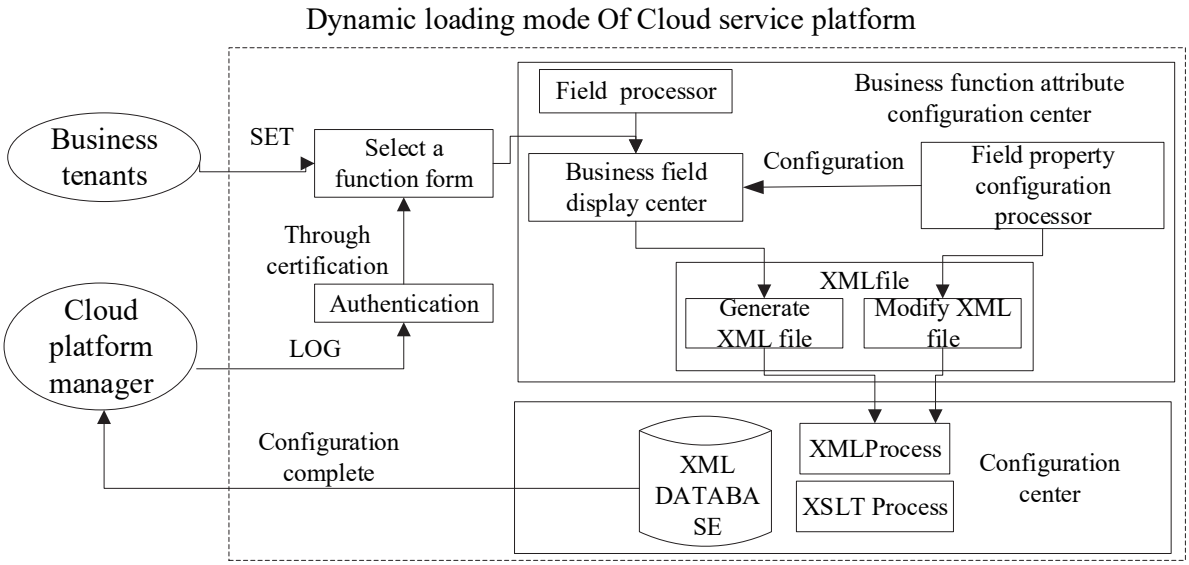

Figure 2 Dynamic loading model based on user identity

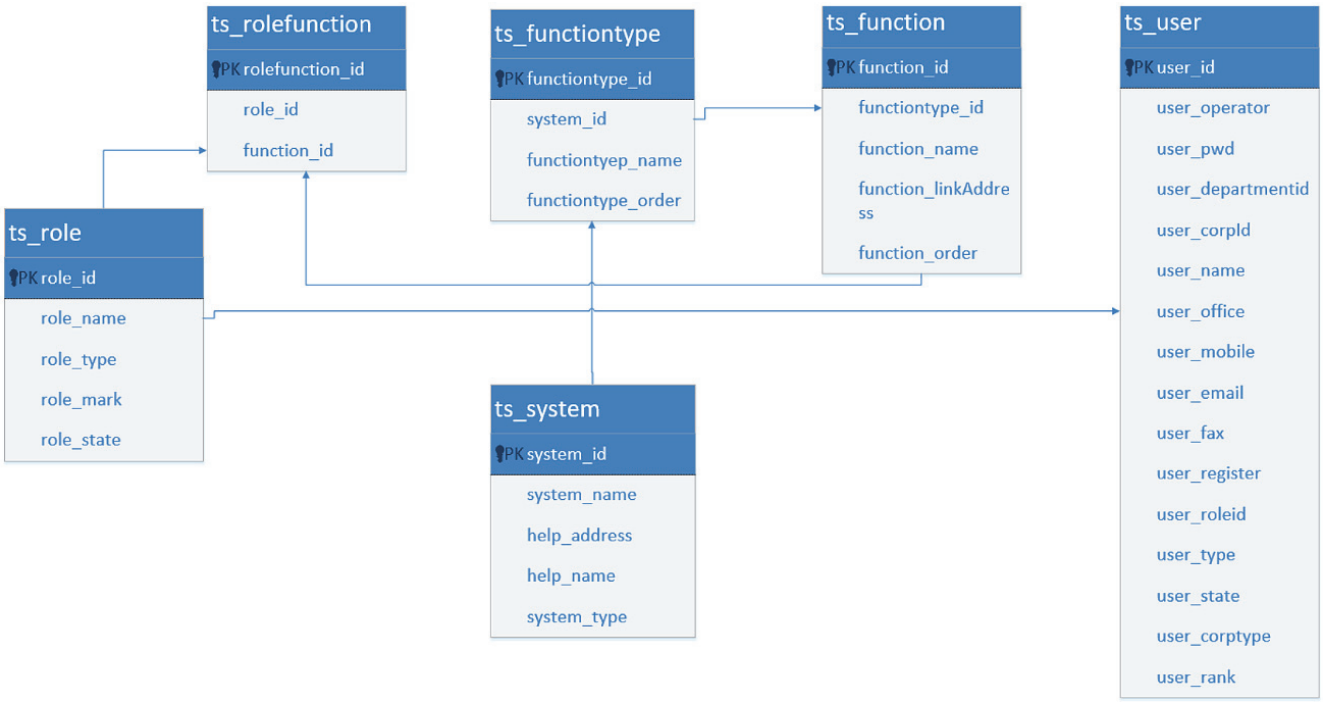

Figure 3 Logical diagrams of the business function table and user role table

Algorithm: Flexible Custom Model Driving Strategy
Enter: Enterprise logo
Output: Business process execution results
BEGIN

Step 1: Enterprise U_{R_j} login Intelligent Traffic Cloud Platform and send the user name and password to the cloud service platform;

Step 2: Cloud service platform completes the certification of the enterprise' identity. The enterprise passes the authentication then the system jumps to Step 3; otherwise the error message is prompted and exited from the system;

Step 3: Have the user role to get the corresponding permissions $R \rightarrow A_i$;

Step 4: According to the authority to enter the corresponding function custom model library and customize the corresponding business function F_N_k by F_ID_k.

END

4 APPLICATION AND VERIFICATION

Intelligent Traffic Cloud Platform provides SaaS rental service models for multiple businesses. This needs to be

tailored to your needs. The platform also provides PaaS service models of enterprise's secondary development of custom development tools. The development environment and deployment architecture may vary depending on the situation. This paper is simply to make a simple model system for the verification of business function flexible customization techniques.

4.1 Development Environment

This paper is NET development based. The main development tool is Windows 7 operating system and the integrated development environment is Microsoft Visual Studio 2010. The development language is C# and the database is SQL Server 2008.

4.2 Functional Verification

The Intelligent Traffic Cloud Platform business customization solution has been applied to the specific system of business function custom module and adds business functions and role permissions settings according to the specific business system dynamics. Among them, in order to ensure the flexibility of business functions customization we need a flexible business function custom database for design. The information in the main table and its logical relationship is displayed by Visual Studio 2010's SFunction.dbml. It is shown in Fig. 4.

4.3 Performance Testing

This paper uses LoadRunner v8.1, an industry-standard load-testing tool that predicts system behavior and performance, to predict system behavior and optimize system performance. The test object is the entire enterprise system by simulating the actual user's operating behavior and real-time performance to monitor. This paper is mainly used to test the performance of Window resources and the average transaction response time. According to the selection principle of performance test, a total of four typical test points were selected. They are shown in Tab. 1.

Table 1 Test points table

Numbers	Test points	Case ratio / %	Script name
1	Function added	25	Creation_1
2	Function delete	25	Modification_1
3	Role added	25	Query_1
4	Role delete	25	Deletion_1

Test Scenario Description:

According to the size of the system, the five times pressure scene test:

- 50 virtual users

The scenes of the test process are as follows:

- Pressurized mode: loading all users at the same time;
- Stable running time: user script running 90 min;
- Decompression mode: at the same time uninstall all users;
- Thinking time setting: randomly selected for the time recording time of 50%-150%;
- Other settings: a complete simulation of IE browser behavior; simulated browser cache.

In order to make the test process and test results as accurately as possible to reflect the reality of the system scene, the test process selected four representative businesses. In addition, according to the preliminary analysis, each number of concurrent users under the conditions of the business assigned to a certain number of virtual users. We can see Tab. 2.

Table 2 Test Scenario and Virtual Concurrent User Assignment Table

Numbers	Test points	User number
1	Function added	12
2	Function delete	12
3	Role added	13
4	Role delete	13

The report on resource usage and average transaction response time generated by LoadRunner is shown in Fig. 4 and Fig. 5 below, where the following figure shows the following indicators and their specific values.

- Disk Time (PhysicalDisk_Total)
- Idle Time (PhysicalDisk_Total)
- Interrupt Time (Processor_Total)
- Privileged Time (Processor_Total)
- Processor Time (Processor_Total)

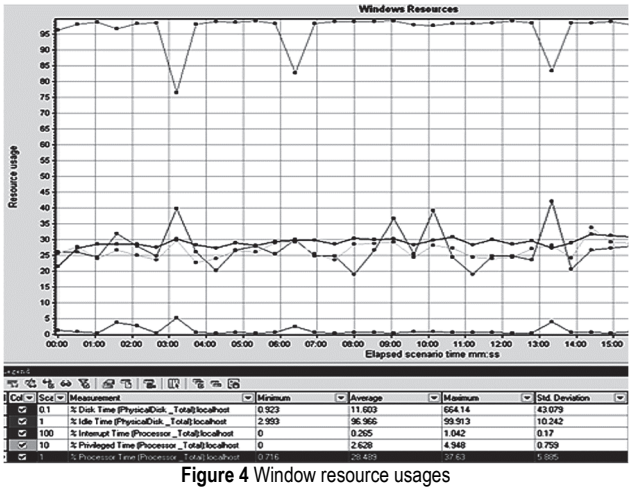

Figure 4 Window resource usages

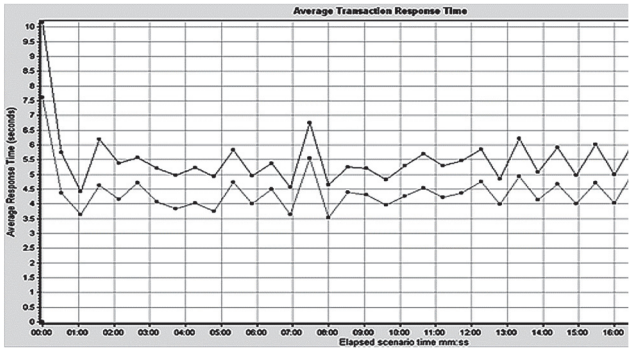

Figure 5 Average transaction response time

Fig. 5 shows that the average event response time is around 6.5 seconds. This basically meets the performance requirements of the software.

5 CONCLUSION

This paper presents a flexible customization solution for Intelligent Traffic Cloud Platform. This solution has been applied to a specific business system. Different users can flexibly customize the business functions they need

according to their own authority. The system can provide business function configuration Interface. Through various types of configuration templates, administrators can configure business functions without programming and generate new features. This paper lacks research on security issues in the customization of business functions. So how to control the wisdom of traffic cloud platform business function customization of the authority is the next research direction.

6 REFERENCES

[1] Mwilu, O. S., Comyn-Wattiau, I., & Prat, N. (2016). Design science research contribution to business intelligence in the cloud - A systematic literature review. *Future Generation Computer Systems*, *63*, 108-122. https://doi.org/10.1016/j.future.2015.11.014

[2] Wood, T., Ramakrishnan, K. K., Hwang, J., Liu, G., & Zhang, W. (2015). Toward a software-based network: integrating software defined networking and network function virtualization. *IEEE Network, 29*(3), 36-41. https://doi.org/10.1109/MNET.2015.7113223

[3] Shang, X., Liu, X., Xiong, G., Cheng, C., Ma, Y., & Nyberg, T. R. (2013, July). Social manufacturing cloud service platform for the mass customization in apparel industry. *Service Operations and Logistics, and Informatics (SOLI)*, *2013 IEEE International Conference on*, 220-224. https://doi.org/10.1109/SOLI.2013.6611413

[4] Thakare, U. S. & Borkar, S. M. (2017). Implementation of WSN's Device Addressing, Data Aggregation and Secure Control in IoT Environment. *International Journal of Engineering Development and Research (IJEDR)*, *5*(1), 580-584.

[5] Li, B., Hou, B., Yu, W. et al. (2017). Applications of artificial intelligence in intelligent manufacturing: a review. *Frontiers of Information Technology & Electronic Engineering*, *18*(1), 86-96. https://doi.org/10.1631/FITEE.1601885

[6] He, Y., Li, W., Zhang, L., Wang, J., & Qi, Q. (2016, July). ECCN: An Elastic Customized Cloud Network Platform. *Networking and Network Applications (NaNA)*, *2016 International Conference on*, 429-432. https://doi.org/10.1109/NaNA.2016.62

[7] John, W., Pentikousis, K., Agapiou, G., Jacob, E., Kind, M., Manzalini, A., Meirosu, C. et al. (2013, November). Research directions in network service chaining. *Future Networks and Services (SDN4FNS)*, 1-7. https://doi.org/10.1109/SDN4FNS.2013.6702549

[8] Wu, W., Shi, L., & Liu, X. (2016). Research on the architecture of cloud computing ground information port based on SDN. *Communications and Information Technologies (ISCIT), 16th International Symposium on*. IEEE, 469-473. https://doi.org/10.1109/ISCIT.2016.7751676

[9] Liu, F. & Hao, F. (2015). Web Service Integrated Cloud Computing Management Information System. *7th International Conference on Intelligent Human-Machine Systems and Cybernetics*, Hangzhou, 288-293. https://doi.org/10.1109/IHMSC.2015.209

[10] Morariu, O., Borangiu, T., & Raileanu, S. (2015). vMES: Virtualization aware manufacturing execution system. *Computers in Industry*, *67*, 27-37. https://doi.org/10.1016/j.compind.2014.11.003

[11] Wang, X. & Li, Z. (2016). Traffic and Transportation Smart with Cloud Computing on Big Data. *IJCSA*, *13*(1), 1-16.

[12] Wang, P. Y., Shen, J., Guo, W., Zhang, C., & Zhang, B. (2015). Cloud-based Government Procurement Information Integration Platform. *Journal of Digital Information Management*, *13*(3), 147-155.

[13] Desai, N. S. (2016). Mobile cloud computing in business. *International Journal of Information*, *6*(1/2). https://doi.org/10.5121/ijist.2016.6221

[14] Chen, M., Zhang, Y., Hu, L. et al. (2015). Cloud-based wireless network: Virtualized, reconfigurable, smart wireless network to enable 5G technologies. *Mobile Networks and Applications*, *20*(6), 704-712. https://doi.org/10.1007/s11036-015-0590-7

[15] Tang, J. P. & Li, L. L. (2014). Big Data Sensing Information Processing Platform for Intelligent Traffic. Conf. Applied Mechanics and Materials. *Trans Tech Publications*, *667*, 324-327. https://doi.org/10.4028/www.scientific.net/AMM.667.324

[16] Liang, C. & Yu, F. R. (2015). Wireless network virtualization: A survey, some research issues and challenges. *IEEE Communications Surveys & Tutorials*, *17*(1), 358-380. https://doi.org/10.1109/COMST.2014.2352118

[17] Fengyi, Y., Haining, W., Chengli, M. et al. (2015). A flexible three clouds 5G mobile network architecture based on NFV & SDN. *China Communications*, *12*(Supplement), 121-131. https://doi.org/10.1109/CC.2015.7386160

[18] Yi, M., Wang, Y., Yan, H. et al. (2016). Data Acquisition and Analysis from Equipment to Mobile Terminal in Industrial Internet of Things. *International Conference on Industrial IoT Technologies and Applications*. Springer International Publishing, 24-35. https://doi.org/10.1007/978-3-319-44350-8_3

[19] Wang, J., Zhang, L., Duan, L., & Gao, R. X. (2017). A new paradigm of cloud-based predictive maintenance for intelligent manufacturing. *Journal of Intelligent Manufacturing*, *28*(5), 1125-1137. https://doi.org/10.1007/s10845-015-1066-0

Contact information:

Hua PAN
Guangxi Beitou IT Innovation Technology Investment Group Co., Ltd.,
Nanning, Guangxi, 530000, China
E-mail: linqupanhua@yeah.net