

Design and Implementation of Business Process Management Module in Logistics Unified Information System

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Abstract: Though the analysis on business services, work processes and system structure, according to the characteristic of computer telecommunications integration, Internet and other technologies, combining the modern logistics requirements and creative thinking, the author puts forward a novel system design and implementation of logistics unified information interactive voice response, interactive unified messaging and unattended automated business process management module system design and implementation of innovative methods. Logistics unified information system business process management module. The business process management module of logistics unified information system is a new fusion type logistics information system application with integration of technologies such as CTI, Internet and IVR. The system is with simple, accurate, fast and automated business process services strategy and solutions. Without too many restrictions of time, space and equipment, the users can handle interactive business processes by business process management module though mobile text messages, interactive voice response, Web, etc., The business process management module of logistics unified information system is proof to be sound in the realization models and methods.

Keywords: Logistics; Unified Information System; Business Process Management Module

1. Introduction

The purpose of the logistics business workflow management is to reach a certain logistics business objective and to cope with the value activity process, to optimize the logistics enterprise business workflow, and to enhance the core competence of the enterprise. The business workflow is neither the simple office workflow nor pile-up of all the business processes and its tools. It's a reform of management thinking based on the unified logistics information system(UMS) and also an integration of Computer Telecommunication Integration(CTI) and the Internet. The logistics business workflow management includes a new modeling of integration of CTI and network, I.E., to combine all the information service such as telephone\ cell-phone, PDA, palmtop computer and the Internet, and to build up a service chain of unified user identity together working with the unique signal in the whole logistics business workflow process[1-3]. UMS is working based on the information technology and to shape the behaviors in people's digital life with an interactive service model. The user can access to UMS anytime, anywhere, and receive the instant voice, SMS notifying signal in the intelligent collaboration of all the business process [4]. The business workflow management in UMS adopts a graphics interface for better Reengineering of the business process[BPR], it needs little coding to define a complex process logics and data exchange, and let the whole system process work more scientifically and smartly[5].

2. The Architecture of the UMS Business

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Workflow Management

UMS is a B / S modeling with hardware and interface using NGN (Next Generation Network) , CTI server, ISMG (Internet Short Message Gateway) and GSM modem, etc. It can deliver API and SP characterized value-added service in dynamic data exchange interface development by ways of interactive voice callback, video. The system service architecture is as follows below (Figure 1):

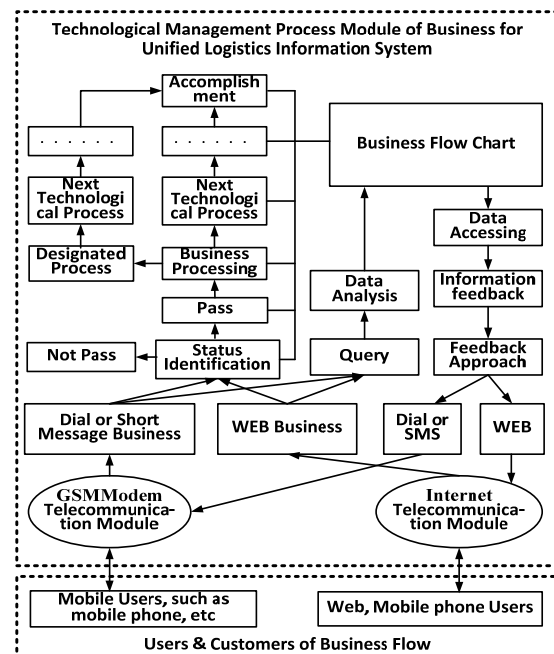


Figure 1. Logistics business process

The criterion of system business workflow management adhere to XLANG, WSFL, BPEL regulations and workflow technology standards based on web service. The fundamental entities of workflow model include centralized activity, use role, relevant data, workflow engine and transition condition[6-9]. That means when certain condition is given, then the UMS calls the relevant procedures automatically to push the whole business process forward [10-21].

The designing of the workflow management in the logistics business: The internet user sends request to UMS by way of the client PC, web login page, Email, PDA and etc(For example, the user of the cell phone based on GSM Modem, or the user of PHS issues request by sending SMS message and by dialing separately) → the request input will be submitted to the Internet module or GSM Modem module(User Authentication, the content of the message will be recognized by the identifying label code and will be categorized into the database) → execution of the basic workflow → submitting to the next workflow(analyzing the user defined communication message) → submitting to the Internet module or GSM Modem module → Issuing message or opening voice communication to the target user in the business workflow.

3. The designing of the telecommunication module in the logistics business workflow management

A) SMS Processing Module

SMS processing module in UMS aims at sending and receiving SMS signal in monitoring the business process and retrieval to notify the user. The designing of the SMS receiving: a method of Action Listener in java application program works for serial port and event-class listening, I.E., when GSM Modem receives a SMS signal, the system activates an instance of add Event Listener in Serial Port class to response the event happened and then reads the SMS signal from the module.

Some part of the coding shows as follows below.

```
public void serialEvent(SerialPortEvent e) {
    StringCache inputCache=new StringCache ();
    int newUMSDData=0;
    switch (e.getEventType()){
```

When UMS receives a SMS (DATA_UMS) , it reads the data, the main part of the coding is as follows:

```
case SerialPortEvent.DATA_UMS:
    while (newUMSDData != -1){
        try{
            newUMSDData = this.inStream.read();
        }
        if (newUMSDData == -1){
```

```
        break; }
    if ('r' == (char) newUMSDData){
        inputCache.append("\n"); }
    else {
        inputCache.append((char) newUMSDData);}
    } catch (IOException ex) {
        System.err.println(ex);
        return;}
    }
```

When UMS receives a new String(inputCache), it calls a method of operateMSG(new String(inputCache)):

```
operateMSG(new String(inputCache));
.....
```

When UMS sends data, it calls a method of sending MSG(), firstly it opens the serial port by getting Serial Port and initialized by setup Serial Port, secondly, calls out Stream writing, using AT command to test GSM Modem, setup the data format and sending characters by UCS2 model and relevant parameters, finally enters a status of sending data, AT commands is listed in Table 1:

Table 1. AT the instructions that use list

Instruction Name	Usages
AT+CMGF	Setting up SMS Coding Ways(1 for word pattern, 0 for PDU pattern)
AT+CSCS	Setting up code, GSM is character UCS2 mode
AT+CSMP	Setting message pattern parameter, +CSMP: < fo > < vp > < pid > < dcs > ; For example: 1,167,0,0
AT+CSCA	Setting up a number for Short Message service Center
AT+CNMI	SMS Output mode, its usages, such as AT + CNMI = 2,2,0,0,0 , in which the second bit decides SMS whether it is output directly or saved in "SM"
AT+CMGS	Sending SMS, it can be in the way of Word or PDU

```
public void sendMSG(String MSG,String TelNu){
    .....
    if(!MSG.equals("") && !TelNu.equals("")){
        outputStream.write("AT+CMGS="+TelNu+"\r", );
        outputStream.write(MEStrng);
        outputStream.write((char) 30);
    }
    } catch (IOException ioe){
        closeIOStream();
        closeSerialPort();
        setToNull();
    }
```

B) Data Processing

One of the most difficulties in the implementation of UMS business workflow management is the data processing from SMS and etc. business information. The system will interpret the character string from SMS request content in a SQL data processing flowchart. On one side, the output of the interpretation will retrieve some data from the database and merge it in the result record set. The other side is to insert into a database table from the dismantled field value. In database programming, it defines string type for characters. The functions for operation of string type include Remove(), Index of (), Split(), to merge characters by Concat () and etc. To match up the dismantled SMS characters with the predefined field value in the original database goes to a method by relevant insert and query operations. Some sample code for operation of string type data in the SQL programming shows as below:

```
CREATE function [dbo].[StringSplit](@str nvarchar(max),@spliter nvarchar(10))
returns @tb table(ch nvarchar(256))
AS
BEGIN
DECLARE @Num int,@Coding int, @Content int
SET @Num = 0
SET @Coding = 1
WHILE(@Coding <= LEN(@str))
BEGIN
SELECT @Content = CHARINDEX(@spliter,
@str, @Coding)
IF (@Content = 0 OR @Content IS NULL)
SELECT @Content = LEN(@str) + 1
INSERT INTO @tb VALUES(RTRIM(SUBSTRING(@str,
@Content - @Coding)))
SELECT @Coding = @Content + 1
END
return
END
```

C) Business Call Center

Interactive Voice Response (IVR) works as the center unit in the unified business workflow management module in the logistics voice service. The hardware adopts CTI voice card integrated with VoIP direct-dialing and call-back, interactive voice notification and answer back, information retrieval and etc. [22-25]. The call center based on the framework of J2EE Web Service adopts SIP protocol, that aims to create, update and terminate sessions by several users, this will help simply the consolidation of user operation in their own business. The system will built in TTS (Text to Speech) and ASR (Automatic Speech Recognition) while supporting MRCP interface, it also can integrate the third voice engine. For UMS is constructed on the basis of XML and web technology, UMS delivers a integrated web interface,

so the users can easily and simply do well their own logistics business by merely operation of the control console desktop. The system receives the input signal from the telephone dial pad, and interactively operates the data in the database end, this leads to realize a free-duty business doing. The architecture of a call center shows as Figure 2.

4. Test Result Output

Test environment: Windows server 2003, SQL Server2005, 8-way GSM Modem, SIM card, CTI voice card, UMS and etc. Whether the Automatic voice calls, call waiting signal, call delay, or Seat connection signal can simultaneously be connected to the 8-way GSM Modem successfully, no Off Line, Deadlock, Crossed Line are tested. The single channel of the GSM Modem processes every SMS message in 4 seconds. The 8-way GSM Modem provides 8 channels to work simultaneously, each channel digests about 750-1000 SMS message per hour (depends on the heavy traffic in the service provider's station), averagely between 6000 and 8000 SMS message per hour. The test result shows as table 2 after testing all the 8 channels by SMS, CALL, ACD, Turn and Arrive for 100 tests per channel.

When sending a character string of '101#90089#100708026' into the system, it's separated by character # into several field value. I.E., business query code is 101, customer code reads 90089, commodity code goes to 100708026, then the system replies to a SMS on cell-phone, it reads 'The commodity is on way half, it will

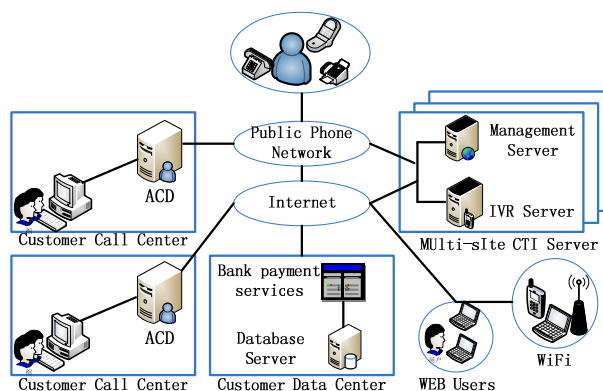


Figure 2. Architecture of Call center

Table 2. List of Test Result

Channel	SMS	CALL	ACD	Turn	Arrive
CH01	3.12	0.11	1.17	1.72	100%
CH02	3.96	0.23	1.32	1.31	100%
CH03	3.93	0.14	1.53	1.57	100%
CH04	4.11	0.21	1.76	1.96	100%
CH05	4.05	0.17	1.26	1.83	100%
CH06	3.76	0.15	1.11	1.74	100%
CH07	3.69	0.11	1.32	1.43	100%
CH08	3.93	0.13	1.19	1.61	100%

Unit: Second

arrive at 16:00 July 10⁷. After the above tests, it proves that the deployment of workflow management, voice response, SMS notification, auto voice call, business logics processing on the web, the query of the workflow process, GSM Modem's performance, all matters work effectively and stably. The system also provides a real-time log about all the circle of the business workflow and its process, the objective of the management is rightly achieved.

5. Conclusions

The business workflow management of UMS explains an obvious vision from a state of art that is mysterious, unpredictable and uncontrollable 'brain-storming' into a interpretable, technical, controllable, and predictable business process. It symbolizes the meaning of RE-Engineering. The business workflow management module is a new service model based on the reality in information society. The manner, methodology and measure in the enterprise application all reflect the modern life behaviors in the information society, are also suitable to people's information thinking model. They break down the barrier due to information blocked and provide a new way out of delaying decision-making. UMS not merely presents a integration in the heterogeneous information resource and networks, but also leads to a new development in the dual-interactive characteristics enterprise culture activity, and further promotes business expanding and service deepening. Therefore, the business workflow management of UMS is not only a renovated application, but also a reform of management in the information society. It is an integration of information thinking and modern science and technology, surely becomes a sustainable development direction of the information system.

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