Flow Control and Optimization Technologies of Information System

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Abstract. On the basis of the description of information flow connotation, the paper describes the information flow system frame, proposes the flow construction method and information flow utilization mode, puts forward flow modelling technology, semantic comprehension technology, data excavating technology and process optimization technology, and presents related test analysis and flow improvement of the information system, so as to further strengthen policy decision function, and enhance the timeliness and accuracy of situation disposition and information processing of information system.

1. Introduction

Information flow is the representation of system operation mechanism. Organization summarizes procedures and approaches of cirs treatment, and makes use of flow instrument to arrange them into standardized and elaborate task flow that can be activated once abnormality comes forth, and improves the efficiency and veracity of cirs disposal.

Recently service oriented architecture is utilized to provide basis for overall framework of system operation layer in the design and realization of cloud computing, electronic business affairs, network of things, and contributes to the realization and control of system information flow.

Service oriented architecture connects various function units via defined interfaces, thus resources encapsulation and dynamic and alternated description are in favour of the analysis of dynamic connection relation, denotation of business model, and support of flow analysis, and provide new resources sharing mode [1] [2].

2. Information Flow Frame

Present functions of information system are processed to carry out interface reconstruction and coupling transfer, new requirements and functions are integrated to be developed and compiled, and the related services are assembled according to different assignments, in the meantime mutual relation, restriction condition and execution sequence are established among business function services so as to achieve service polymerization. Information flow system frame is illustrated in figure 1.

According to user requirements, the logic processes head in the task assignment direction, take turns to accomplish requirement analysis, flow modelling, flow partition and activity sequence ascertainment, and then map activity sequences into service sequences, and return the related illustration result via service transfer, service combination, service illustration and service execution, so that the task and requirements can be fulfilled with services and databases available to be employed [2] [3]. And basic information flow process is as follows:
Figure 1. Information flow system frame.

- Information obtainment. The business information is available via bulletin and monitoring means.
- Information processing. The business information is processed to form scheme and decision support information that is utilized to shape decision information, and the decision information is reprocessed to form plan and signal instructive information.
- Information distribution. The instructive information is transferred to correlative terminals by communications.
- Information feedback. The evolution and effect information feeds back into business works and transferred to related posts by communications.

3. Flow Construction Method
Flow construction method comprises flow establishment, flow application and flow evaluation [3] [4].

3.1. Flow Establishment
Flow establishment is for the purpose of flow formation of system business, and comprises requirement analysis, function realization and service arrangement. Requirement analysis is to card and form operation rules and models according to ordinance, business procedure and task criterion; function realization is to shape service process in the light of service framework, editing regulation and configuration interface; and service arrangement is to classify and combine operation activities, and associate them with application functions via rule and condition matching. Flow establishment process is shown in figure 2.

Figure 2. Flow establishment process.

3.2. Flow Application
Flow application is the process during which natural flow examples come into flow control on the basis of affair trigger, state alteration and business regulation, and comprises flow trigger, executing
and alteration. Flow trigger activates practical flow illustrations to operate with input of abnormality, assignment and business action; flow executing is to carry out flow layout content, assist to accomplish transaction processing, activity transfer, task cooperation and etc. according to state change, cooperation message and business instruction; and flow alteration is to add, delete and modify task items and related content, and alter executive flow sequence in light of flow state and function rules. Flow application process is shown in figure 3.

3.3. Flow Evaluation
Flow evaluation is the process during which organization implements activity flow analyses so as to achieve flow optimization, and comprises data collection, data analysis and flow optimization. Data collection is to record flow performance and time indexes; data analysis is to remount to flow process and display disposal result by means of condition and time interval setting; and flow optimization is to evaluate disposal method, occasion and effect, and scheme flow reconstruction so as to carry out closed loop and iteration of modelling, application and evaluation. Flow evaluation process is shown in figure 4.

4. Information Flow Utilization
Information flow utilization mode is shown in figure 5. Flow engine can directly refer to application services, and flow client can refer to application services and man-machine interface, and applications can communicate with flow engine via flow access interface. Application service comprises special business and mission modes. It corresponds to particular business requirements, implements a set of business logics and provides services by communication with users [3] [4] [5].

4.1. Flow Engine
Flow engine drives business flow execution according to fixed rules, and starts up business flow and notes operation situation when exterior affair and command are received. It sustains service control interface, multi-flow parallel execution, flow process monitoring, flow execution data storage, automatic service transfer, task message and activity state control and flow data playback and analysis.

4.2. Flow Arrangement
Flow arrangement supports graphics mode definition of business flow, combines function modules into flow definition templates by means of flow control models, provides such compiling elements as phases, sub flows, activities, items, trigger terms, restrictions, logics and etc., and associates related functions and establishes mutual relation according to business requirements so as to create various flow definition files.
4.3. Flow Support
Flow support service comprises flow data, flow relation, flow alternation and flow record services. Flow data service provides related flow data administration; flow relation service constitutes information transfer relation via system assignment, and supports cooperative disposal; flow alternation service provides information delivery, situation distribution and task allocation assistant; and flow record service sets down disposal act, result and related affairs, and supports flow playback.

4.4. Flow Client
Flow client provides unitive flow operation and supervision interface for duty personnel, and carries out flow parameter transfer and application module referring according to flow engine driving. It helps to complete task assignments and present related results within stipulated time.

4.5. Flow Interface
Flow interface consists of flow development interface and flow access interface. Flow development interface contributes to communication between business function and flow framework, and flow access interface comprises flow illustration start-up, application item obtainment, business data acquirement and setup.

5. Key Technologies
During the realization of information flow system, related technologies are practically applied [5] [6].

5.1. Flow Modelling Technology
Flow modelling technology is to analyse system orientation, distinguish main application flows, and extract system business activities. System orientation analysis is to make clear operation field, information sources, types, users and treat nodes; and business flow is a series of service activities and interrelation during the system application process, it can be recomposed by service substitution when flow disposing mechanism changes and divided into related sub-flows.

5.2. Semantic Comprehension Technology
Semantic comprehension technology is to translate natural language text into comprehensible and standardized content templates. Text characteristic element fetching is implemented via correspondence template comparison, and meantime syntax standardization is processed via concept
space model establishment and CT = {information type, unit, time, place ...}, so as to implement text syntax comprehensibility for the next data processing.

5.3. Data Excavating Technology
Data excavating is to bring data cleaning and classifying, decision tree, neural network, clustering analysis and relevancy analysis methods into exercise and extract meaningful information and knowledge that are connotative and denoted by conception, regulation, rules and modes, from plentiful data or data warehouse. It is utilized to achieve flow partition based on business affairs by means of knowledge store house establishment and practical data comparison.

5.4. Process Optimization Technology
Process optimization is to advance accuracy and timeliness of system information. Multilevel synchronization decision translates from single information processing to synchronous information processing over multilayer, so as to enhance decision accuracy and velocity; discrepancy feedback method is performed to carry out scheme only if the discrepancy between scheme and situation meets the need of business activity. And network link optimization is implemented to enhance channel bandwidth and information transfer velocity and carry through end to end error control policy.

6. Test and Improvement
During the system test, the average runtimes are noted down, reviewed and analysed to further improve system flow performances of information obtainment, information processing, and information distribution and information feedback [6] [7] [8]. And the average runtimes result is shown in figure 6.

![Figure 6](image_url)

**Figure 6.** The average runtimes of flow processes.

Considering that the time of information processing activity is relatively long during system execution time, processing algorithms can be optimized, processing nodes added and parallel processing mode adopted; and business requirements can be distinguished and adapted to status with respect to information obtainment activity. Thus the related average runtimes are respectively reduced by twenty and fifteen percent. Assignment instance average runtime is the quotient of the sum of assignment instance runtime and assignment instance number.
7. Conclusion
During the process of information system development, we establish the information flow system frame, investigate the flow construction method and information flow utilization mode, put forward the related technologies, such as flow modelling technology, semantic comprehension technology, data excavating technology and process optimization technology, and provide related test analysis and flow improvement of the information system; additionally flow control and optimization is one continual work that worth more exploration, so that we can substantially strengthen policy decision function, and effectively enhance the timeliness and accuracy of situation disposition and information processing of information system.

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