Covering Entire Business Process Based on Improved Minimum Link Load Balancing Scheduling Algorithm

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Abstract  
Financial management business includes modules of budget management, cost management, fund management, asset management, general ledger management and decision support. With the increase of company's business expansion, it appeared increasingly complex financial accounting and financial set of books, doubling the workload and other issues. To resolve the problem of rapid visit to the system in the same time, this paper design and implement an improved minimum link load balancing scheduling algorithm, evaluate the performance of the transmission speed, loading users number and disk read speed and other aspects in the redundant resource sharing. Using this algorithm implements financial information management system of covering the entire business processes to further regulate the financial management, reduce human intervention. The system complete integration of automated processes in the greatest degree, improve decision support, data sharing and improving financial management efficiency.

Key words: Financial Information Management, Information System, Covering Entire Business Process, Minimum Link Load Balancing.

1. INTRODUCTION  
In the financial management section presents gaps in terms of information technology, analyse the current financial status of the company management(Oh, Kim and Cho, 2016), according to the proposed joint-stock company unified deployment, design and implement financial information management solutions which covers the entire business processes, including centralized accounting, asset management system, financial management system platform, ERP systems, integrated information systems integration, seamless docking with information systems management and financial business operations; combing the financial reporting system, improve reporting formula, fully automated preparation of monthly financial statements; enabled company reimbursement platform, self-development contract settlement system, the original documents to the accounting documents throughout the network processing; achievement of the various information systems can do their job and cooperate with each other through data sharing, reducing the risk of manual control, improve work efficiency and the quality of accounting information.

2. THE SYSTEM TARGET  
It covers the entire business process through the establishment of financial information management solutions to achieve the following objectives:

1) Improve office efficiency: by means of information, solve different departments, different positions of office business processes, and effectively solve the information of quick communicating, sharing, enhance information flow; implement various posts through the system, the various departments of business collaboration to achieve cooperative office, information sharing provide accurate finance(Power, Sharda and Burstein, 2015). All related company for all levels of staff, and
comprehensive information support, thus enhance the corporate financial management and control (Fakhfakh, Kacem and Kacem, 2014).

2) Improve the execution: Because of the company management process ubiquitous operating system process is not standardized, resulting in differences in management behavior and inconsistency results, thereby resulting in inefficient management or even away from the goal (Baru, Bhandarkar, Namibi, Poess and Rabl, 2013). Through the financial information system will assist the organized management processes and management approach into information technology operating system (Balkesen, Teubner, Alonso and Özsu, 2013), the company's management information system to solidify, the operation of the system to ensure that systems, processes strictly enforced to protect corporate governance practices, efficiency, process control, process traceability and improve the overall execution capability (Sridharan and Patel, 2014).

3) Improve internal supervision capacity: The company’s Treasury financial control management rely on manual operations, resulting in the company's internal supervision of the Treasury in the working pressure is relatively heavy state (Atfeh and Khreich, 2015). Through internal control systems, which is required each time by starting the system of internal control testing, after completion of the test, perform different operations under different circumstances circulation, reach the target managed automatically (Aman, Simmhan and Prasanna, 2015).

4) Achieving "generalization to fine management" business strategy: by covering the deployment and use of financial information management system-wide business processes, support enterprise management to manage the company even generalization of the department of fine management transformation (Radermacher and Walia, 2013). Systematic existing duplication of work, financial officers transferred to the mental valuable work from which the computer cannot be completed the contents, and truly achieve the goal of fine management and financial management of scientific, standardized procedures (She and Tone, 2016).

3. THE SYSTEM DESIGN

3.1. The overall design ideas

Using technical means of information technology and perspective of systems engineering design the financial management of the whole process, integrates business data and related information and form a data sharing, covers the entire business processes of financial information management solutions. Through this system want to solve budget management, cost management, fund management, asset management, general ledger management and decision support business processes. The program consists of subsystems and modules are: budget management subsystem, subsystem reimbursement system, subsystem contract settlement, compensation management module, treasury management platform, monitor accounts and general ledger module, internal management subsystem, between sign and acknowledge management module, three gold resources management, investment project assistant management system, financial statements, management subsystem, account management subsystem and reporting and analysis management subsystem.

3.2. The system architecture

Based on the database and network technology, the full use of data fusion, integration and management techniques, with using of B / S and C / S model, combines the financial business data and other relevant data to associated and forms the basis of data fusion sharing platform, in this platform based on the completion of the financial services sector with all relevant nodes makes the efficient and stable network platform, the basic structure of the system shown in Figure 1.

The basic structure of the financial information management system which covers the entire business process is divided into three parts.

1) Data source layer: Data source layer provides data to support the application service layer. Data sources for business data includes sales data of head offices and branch office, Group C set, share data, Group data, 04–06 C set data and the external data source.

2) Basic data sharing service platform integration: Through data integration, data sharing and data fusion mechanism of heterogeneous data source data to associated with a data form the basis for the use of financial operations related systems integration services shared platform.

3) Covering the entire business process application service layer: On the basis of data fusion based on shared service platform, the establishment of a business-oriented departments and personnel to cover the whole of the business processes of financial information management application service layer. Including budget management, claims management system, auxiliary financial management system, contract settlement systems and asset management systems.

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Financial Information Management System Covering the Entire Business Process

Unified System
- User Authentication and Authorization
- Unified Extract
- Unified Upcoming
- Unified Submitted

Budget Management
- Budget Upcoming
- Budget Assessment

Reimbursement Management System
- Reimbursement Upcoming
- Reimbursement Assessment

Auxiliary Internal Management

Investment Grants Management

Accounts Assistant Management

Report Assistant Management

Auxiliary Financial Management System
- Financial Analysis
- Auxiliary Internal Management
- Investment Grants Management
- Accounts Assistant Management
- Report Assistant Management

Basic Data Sharing Service Platform Integration

![Diagram](image)

**Figure 1.** The basic structure of the system

4. RELATED ALGORITHMS DESIGN

4.1. Improved Minimum Link Load Balancing Scheduling Algorithm

To resolve the problem of rapid visit to the system in the same time, this paper design and implement a improved minimum link load balancing scheduling algorithm. evaluates the performance of the transmission speed, loading users number and disk read speed and other aspects in the redundant resource sharing.

The improved minimum link load balancing scheduling algorithm, expressed as follows:

**Definition 1.** Let $C_i$ is the i-th access request quantity, $R_i$ is the i-th quantity of resources service allocated to the request, $N_j$ is the j-th server in the network throughput is the bandwidth of the entire network, $P_j$ is the j-th server extreme value of processing power, then the j-th server load rate can be represented as in Eq. (1):

$$M(j) = \left(1 - \sum_{i=1}^{C} R_i / P_j \right) N_j + G$$

**Definition 2.** Let $p_{\text{min}}$ for the lowest extreme value of processing performance cluster servers processing power, this value characterizes the minimum value of the cluster server processing capacity, $p_{\text{min}} = \min(p_1, p_2, ..., p_n)$. Normalization Of An access request is Of the available load factor $L$ can be represented as in Eq. (2):

$$L = R_i / p_{\text{min}}$$
Load factor $L$ indicates the current server load status, the larger value of $L$ is, the smaller the server load is, the greater the surplus processing capacity, it represents processing ability of accepting the new access request is stronger. Also, indicates that the server can be assigned the greater the probability to accept the new request. The step of the algorithm (ILVS) is as follows:

Step1: Equalizer makes periodic assessments on the status of each server, including the load, the processing performance extremes and network status.

Step2: Calculate statements all servers available load factor by definition 1.1 and sorting, update load factor table.

Step3: Listen to the new request, Equalizer evaluate consumption of processing resources of a new request, by definition 2 and Eq.(2) to calculate the normalization of load ratio.

Step4: Evaluate the normalized load rate of a new request. Compare available load factor of the table, if the load exceeds the maximum available rate, an error message is returned to the user; otherwise, assigned to server service witch at the first row of available load factor the table.

Step5: Update served server load factor and switch to step1.

4.2. Performance Evaluation of Transmission Speed of System

Test the server system in two ways, namely multi servers clustering and load testing under the traditional model and improving model, both simulate a large number of concurrent users access. The comparison result between two status is shown in Table 1:

<table>
<thead>
<tr>
<th>No.</th>
<th>Number of Node</th>
<th>speed of transmission of traditional way (Mbit/s)</th>
<th>speed of transmission of improved way (ILVS) (Mbit/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>506</td>
<td>51</td>
<td>76</td>
</tr>
<tr>
<td>2</td>
<td>513</td>
<td>56</td>
<td>85</td>
</tr>
<tr>
<td>3</td>
<td>535</td>
<td>62</td>
<td>84</td>
</tr>
<tr>
<td>4</td>
<td>621</td>
<td>73</td>
<td>79</td>
</tr>
<tr>
<td>5</td>
<td>723</td>
<td>65</td>
<td>81</td>
</tr>
<tr>
<td>6</td>
<td>821</td>
<td>63</td>
<td>83</td>
</tr>
<tr>
<td>7</td>
<td>856</td>
<td>59</td>
<td>90</td>
</tr>
<tr>
<td>8</td>
<td>864</td>
<td>54</td>
<td>84</td>
</tr>
</tbody>
</table>

From the Table 1 find that the average throughout of traditional way is about 60Mbit/s, the data of the improved way(ILVS) is about 82. The latter more than the former about 30%. From the testing result can conclude that this financial system using the ILVS algorithm to achieve expected result.

5. CONCLUSION

In this paper using information technology to implement the financial information management system of covering the entire business processes to further regulate the financial management, reduce human intervention. The system complete integration of automated processes in the greatest degree, improve decision support, data sharing and improving financial management. Also, using the ILVS algorithm to improve the attribute of the system’s load balancing function.

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