Scholar Publishing Group
Distributed Processing System
https://doi.org/10.38007/DPS.2022.030303
ISSN 2790-0916 Vol. 3, Issue 3: 18-25

Implementation of Device Joining Technology in Distributed System Based on Information Transfer Algorithm

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Keywords: Information Transfer Algorithm, Distributed System, Device Joining Technology, PMPA Algorithm

Abstract: With the continuous development and popularization of computer network applications, various ideas, theories, technologies and products related to the network emerge in an endless stream. The application of network in many fields such as industrial control, commercial activities, and daily life is becoming more and more frequent, and its role is becoming increasingly important. The purpose of this paper is to research and implement the technology of adding distributed system equipment based on the message passing algorithm, and propose a receiver scheme that introduces parallel computing in the clustered message passing algorithm (CMPA), optimizes the pruning rule and iterative update rule. According to the idea of reducing the number of iterations of the edge message passing algorithm (PM-MPA), a method is proposed by verifying that the confidence information of a certain codeword is much larger than that of other codewords. When the number of iterations of the receiver is reduced, the video monitoring equipment is added to the distributed system, and the remote and multi-point network video monitoring of the scene is realized. Through the simulation results, it can be found that Max-Log PMPA can reduce the complexity of Max-Log MPA by 65% when the overload rate is 200%. Therefore, when the overload is high, the advantages of Max-Log PMPA parallelism are even greater.

1. Introduction

With the development of mobile communication systems from 1G to 5G, as the basic physical layer technology of mobile communication systems, end users can be multiplexed on the same wireless resources and the base station can effectively distinguish users [1]. As a next-generation mobile communication system, 5G must meet the needs of users for wireless networks. From the past language calls to diversification and multimedia, it must further improve spectrum utilization and provide reliable and low-latency services. Changes in network reliability, data transmission rate

and the number of terminals that can be supported [2].

Scholars at home and abroad have carried out various researches on the joining technology of distributed system equipment. Efimenko D is committed to the priority transfer management of the urban bus dispatch system based on the multi-agent interaction with the traffic light control system. It is mainly aimed at the priority transfer of urban passenger transport at signalized intersections. The authors developed a priority transfer management algorithm based on the interaction of traffic light control and public transport dispatch systems. The author considers the role of the agent in the interaction process of traffic light control and bus dispatching system to realize the priority of bus traffic. Decision criteria that takes into account the time savings and losses of all traffic participants at the intersection. The simulation modeling results of priority bus lanes at signalized intersections are given [3]. Bhardwaj R proposed a large-capacity two-image reversible data hiding algorithm. The highlight of the proposed method is to embed $\lfloor \log_2(2\times n+1)\times NZ-1 \rfloor$ binary bits of patient information without overflow problem during embedding. For authentication analysis of Electronic Patient Information (EPI) at the receiving end, a fragile watermark is also embedded in the EPI, respectively. To demonstrate the effectiveness of the proposed method, experiments have been conducted on different test images. The average embedding rate for all test images is 2.36 bpp, which shows that this method is able to embed high payloads compared to other methods [4]. Khani A aims to bridge the gap between frequency-based and schedule-based bus allocation models and proposes a routing algorithm with random vehicle arrival times to simulate the adaptive behavior of users in response to unreliable services. Path reliability is modeled by link failure probability, and an online shortest path algorithm is developed to find a routing policy with minimum expected travel time given a preferred arrival time to a destination. Complexity analysis and computational tests show that the model has the potential to be applied in large-scale transportation networks. Numerical tests validate that the model assigns passengers to more reliable routes and lower transfer rates without large transfer losses [5]. To sum up, some research results have been achieved in the field of distributed network equipment at home and abroad, which have great inspiration and important reference significance for the development of this paper.

This paper designs and implements a configurable and extensible message middleware based on in-depth analysis of the message passing requirements in distributed streaming computing systems, which can meet the requirements of distributed streaming computing systems for low Delay, high throughput requirements, and has good scalability. At the same time, it has a good programming interface, so that developers can get rid of the traditional use of network programming, and do not have to care about the complex and cumbersome development details at the bottom, but have more energy to focus on the development of business logic and improve the efficiency of network application development. Reduced system maintenance and development costs. This is a research topic with practical significance and theoretical value, which not only promotes the development of intelligent control theory, but also enriches the application of distributed optimization, intelligent computing and other theories, and promotes the intersection of disciplines and has important engineering value.

2. Research on Device Joining Technology of Distributed System Based on Information Transfer Algorithm

2.1. CMPA Algorithm

The main idea of the CMPA algorithm is to obtain multiple sub-factor graphs (also called

sub-graphs) by pruning the factor graph (also called the parent graph) (this can reduce the df value during the calculation of the sub-graph), and perform MPA on the sub-factor graph. Algorithm iterative calculation [6-7]. The branch here refers to the connection between two nodes. The deletion of the branch is not completely deleted, but can only transmit information in one direction. For example, if the branch is deleted, V1 can send information to g2, but g2 cannot send information to V1 [8-9].

$$I_{v_2 \to g_1}(m_2) = normailize(ap_{v_2}(m_2) I_{g_3 \to v_2}) \tag{1}$$

$$I_{v_2 \to g_3}(m_2) = normailize(ap_{v_2}(m_2) I_{g_1 \to v_2}) \tag{2}$$

When the computer user node v_j sends the trust information to the node g_k, it must use the unknown information received by the source node to update the information that the computer needs to send $I_{v_1 \leftrightarrow g_2}(m_j)$. When d_v=2, it is similar to the out-of-trust information forwarding process [10-11].

2.2. PMPA Algorithm

This section proposes an algorithm that reduces the number of connections on each resource and can use parallel computing between subgraphs, which is called PMPA, and its complexity is lower than that of CMPA. Combined with each sub-graph, each user is pruned in only one sub-graph, other sub-graphs are complete, and the minimum ring length of the sub-graph is larger, and finally the confidence of the three sub-graphs is determined by the decision formula. The information is combined to make the bit error rate performance of the algorithm better than that of the CMPA algorithm [12-13]. The MPA algorithm performs decoding by transmitting confidence information on the factor graph. The performance of the algorithm depends to a large extent on the length of the loop in the factor graph. If the length of the loop is too small, it will make the decoding confidence information height for continuous information transmission. So the second rule: Maximize the minimum cycle length of the subgraph [14-15].

PMPA is to combine the confidence information of the three subgraphs, and use the following formula to determine the user codeword:

$$Q_v(m) = I^1_{g_1 \to v} + I^1_{g_2 \to v} + I^2_{g_1 \to v} + I^2_{g_2 \to v} + I^3_{g_1 \to v} + I^3_{g_2 \to v} \tag{3}$$

In the formula, Qv(m) represents the confidence information of a certain codeword of a certain user.

2.3. Features of Distributed Systems

(1) Resource sharing

Resources here can be anything, such as printers, computers, files, storage devices, websites, and networks.

(2) High system reliability

The distributed nature of a power distribution system makes it imply a kind of fault tolerance, if your work session makes the entire system at least partially available and working to a certain extent; while on one machine, when a computer fails, The entire system will not continue to work [16-17].

(3) Parallelism

Due to the limited processing power of computer systems, due to many factors (such as time difference), the availability of each computer is not equal. The distributed system can make multiple computers in the same network work together, process in parallel, improve the efficiency of the whole system, and use the load balancing algorithm to balance the load of each computer and improve the performance of the whole system [18].

3. Design and Research of Distributed System Based on Information Transfer Algorithm

3.1. Structure of Distributed Database System

The distributed database system can be roughly divided into two parts: the following is the conceptual system of the central database, which represents the basic structure of the local database system in various places; the above is the schema layer database added by the shared database.

Non-Global Modes: These are views of the global application user and are part of the Global Conceptual Mode.

Global schema: defines the overall logical structure of data in a distributed database. The data is as if there is no distribution at all. The data model used in the global schema should map easily to other levels of the system, usually using a relational model. Hence, the relational model is used here as well. Thus, a world concept is the definition of a set of world relations.

Sharding function: Each global relationship can be divided into several independent parts, each part is called a shard. The partition function defines the fragment and the global relationship to the fragment image. This mapping is one-to-many, a part comes from a global relationship, and a global relationship can be mapped to multiple parts.

3.2. System Network Structure Design

The distributed system is the channel for the exchange of information within the company. According to the specific business needs of the company, a system network structure with distributed characteristics can be designed. The network development architecture of the system is the enterprise intranet. It can be seen that the first sharing system has the following characteristics:

Distributed system users Users can use the system by sending http requests to the designated distributed system servers.

Distributed system server The business logic of this system is all completed by the distributed system server (ie: agent), and the program is deployed in the server. At the same time, the server can also store user information and topic persistent data published/subscribed by users.

Distributed system server with ActiveMQ service enabled The ActiveMQ framework is used in this system to realize the message transmission function between the server and the server. Therefore, we need to configure the ActiveMQ service in our program to open the address information.

3.3. System Function Module Division

According to the demand analysis of the distributed distributed system, it provides corresponding service interfaces for various users regarding the main business processing flow. Accordingly, the functional modules of the system are divided as shown in Figure 1.

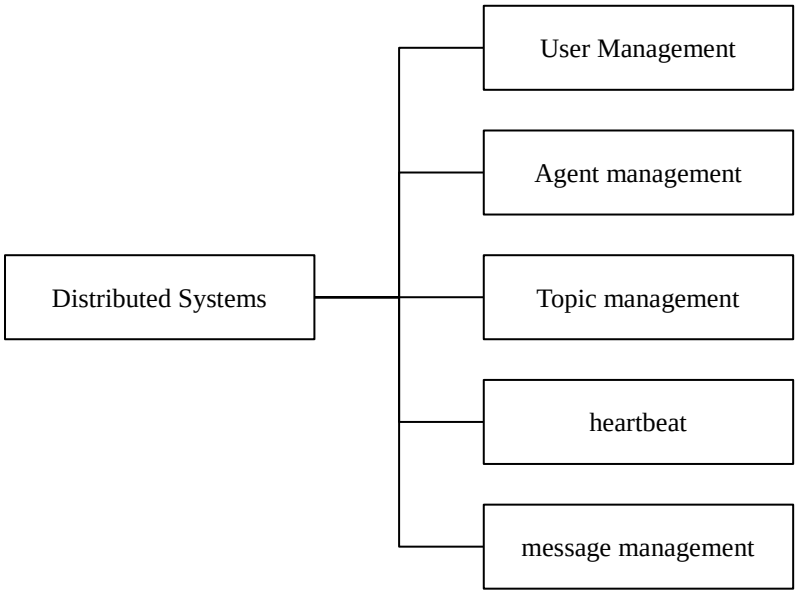

Figure 1. Division of functional modules of distributed systems

The system is divided into five functional modules: user management, agent management, topic management, heartbeat and message management. The user management part is divided into user login part, user registration part and user deletion part; the proxy management part is divided into proxy registration part, proxy deletion part and proxy list collection part. Topic management is divided into topic publishing section, topic subscription section, topic search section, topic removal section, topic list collection section, and shared topic collection section. Data push section and data collection section.

4. Analysis and Research of Device Joining Technology in Distributed System Based on Information Transfer Algorithm

4.1. Algorithm Complexity Analysis

When the C84 codebook is used for Max-Log MPA and Max-Log PMPA with 200% overload rate, according to the meaning and value of the parameters, Table 1 can be obtained:

Table 1. Max-Log PMPA and Max-Log MPA complexity comparison

Complexity (number)	Max-Log MPA	Max-Log PMPA
Addition of real numbers	2476387	264549
real comparison	491037	327359
real multiplication	33058	33058

Figure 2 analyzes the performance of the Max-Log PMPA algorithm at 200% overload. Through the simulation results, it can be found that when using 200% overload rate, Max-Log PMPA can guarantee the performance loss within 1dB, and can also reduce the complexity of Max-Log MPA by 65%. Therefore, the Max-Log PMPA algorithm can reduce the complexity more when the overload rate is high, that is, when the overload rate is high, the parallel advantages of Max-Log PMPA are more obvious.

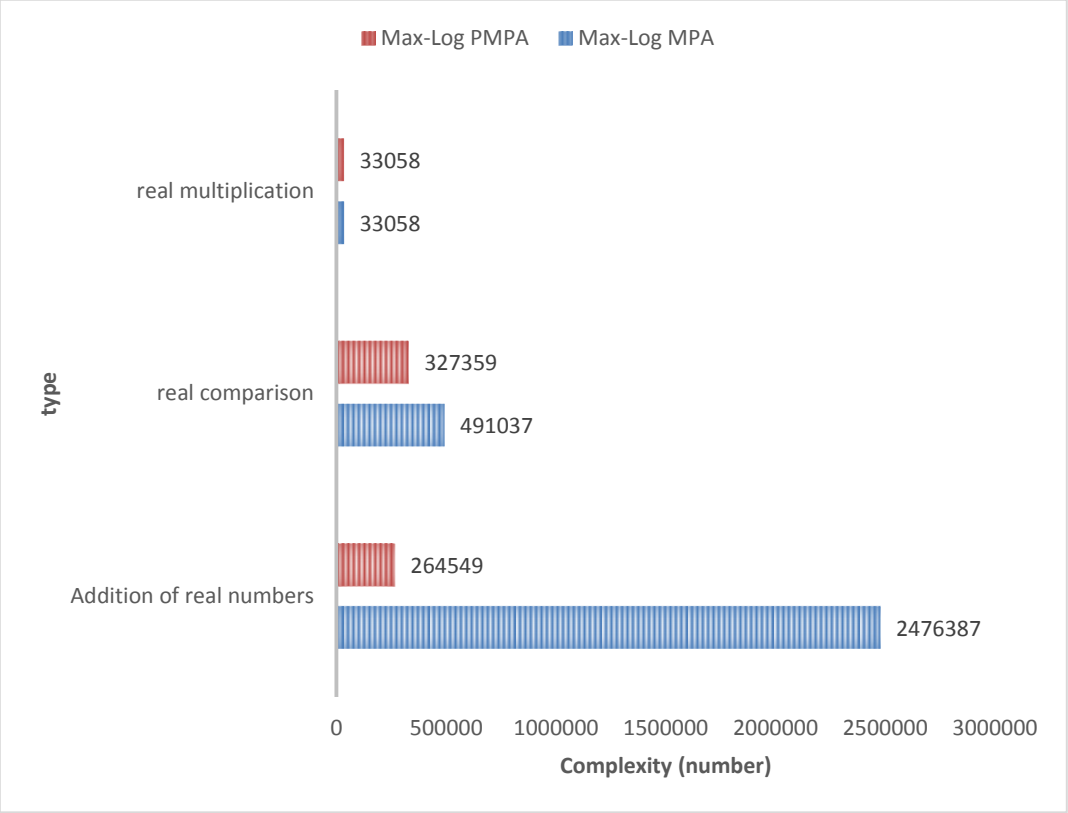

Figure 2. Comparison of the complexity of Max-Log PMPA and Max-Log MPA

4.2. Experimental Results

In this paper, the video surveillance equipment is successfully added to the distributed network, so as to realize the remote video surveillance of the industrial site, and has the advantages of easy installation and deployment, fast and reliable video transmission and so on. In order to verify the running effect, this paper uses 4 computers in the local area network to experiment. The IP addresses of the four computers are distributed from 192.149.0.1 to 192.149.0.4. The experimental data on service publishing and video acquisition time overhead and system operating resource consumption are shown in Table 2.

Table 2. Video delivery reliability and publish/discover service time consumption

Service provider	Service release time (ms)	Get video time (ms)	Do you get the video
192.149.0.1	354	1326	Y
192.149.0.2	862	1238	Y
192.149.0.3	359	2900	Y
192.149.0.4	864	2854	Y

The data in Figure 3 are the average of 15 experimental results. The average CPU usage of the service provider computer is 10%, and the average CPU usage of the client computer is 6%. It can be seen that the resource consumption of the system is very low, thus ensuring the reliable transmission of video streams.

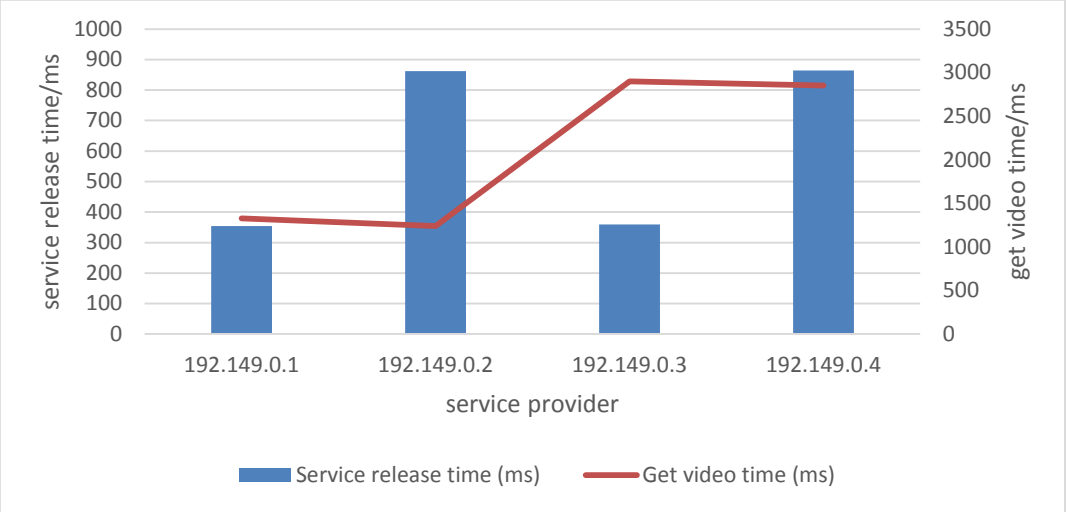

Figure 3. Video delivery reliability versus publishing/discovery service time consumption

5.Conclusion

This paper discusses many important key technologies of distributed database, such as data sharing, distributed query optimization and distributed transaction processing, and firstly studies the optimization algorithm of distributed data query processing and concurrent data distribution engine algorithm. Semi-integrated technology is used to increase demand output. Based on the analysis of traditional semi-integrated algorithms, a semi-integrated optimization algorithm considering multiple real-time parameters is proposed in advance. It has practical value in the field of massive information retrieval and complex query. Due to the complex distributed data environment and rich technical content, there are still many problems in demand optimization technology to be further studied and solved. With the rapid development of computer network technology, it is believed that distributed data technology will also develop rapidly and become more and more perfect.

Funding

This article is not supported by any foundation.

Data Availability

Data sharing is not applicable to this article as no new data were created or analysed in this study.

Conflict of Interest

The author states that this article has no conflict of interest.

References

[1] Kakita R, Palukuri V B. IJRTE-ICETESM21-2019. International Journal of Recent Technology and Engineering, 2021, 7(ICETESM18):86-90.

[2] Shafiabadi M H, Souri A, Ghasempour A, et al. A security-based asymmetric cryptographic

algorithm to improve IEEE802.11i protocol. International Journal of Information Technology, 2019, 11(4):821-827.

[3] Efimenko D, Bogumil V, Vlasov V, et al. Priority Transfer Management Algorithm, Based on Interaction of the Public Transport Dispatch Systems Information and Traffic Lights Control. Transport and Telecommunication Journal, 2018, 19(4):315-324.

[4] Bhardwaj R. Hiding patient information in medical images : an encrypted dual image reversible and secure patient data hiding algorithm for E-healthcare. Multimedia Tools and Applications, 2022, 81(1):1125-1152.

[5] Khani A. An online shortest path algorithm for reliable routing in schedule-based transit networks considering transfer failure probability. Transportation Research Part B: Methodological, 2019, 126(AUG.):549-564.

[6] Grassi M, Loewenstein D A, Caldirola D, et al. A clinically-translatable machine learning algorithm for the prediction of Alzheimer's disease conversion: Further evidence of its accuracy via a transfer learning approach. International Psychogeriatrics, 2018, 31(7):1-9.

[7] Gaddam S, Lobial D K, Lal M. An Efficient Intelligent Time Slice Based Round Robin Scheduling Algorithm for ATM Using ISBP. Wireless Personal Communications, 2022, 122(1):1-21.

[8] Choi Y, Shin D B, Kim J, et al. Passive Microwave Precipitation Retrieval Algorithm With $A~Priori$ Databases of Various Cloud Microphysics Schemes: Tropical Cyclone Applications. IEEE Transactions on Geoscience and Remote Sensing, 2020, 58(4):2366-2382.

[9] Hyeon-Kyun, Lee, Yong-Jun, et al. A clipping algorithm on non-conformal interface for heat conduction analysis. Journal of Mechanical Science and Technology, 2019, 33(11):5537-5546.

[10] Janakiraman S. An enhanced hybrid Pareto metaheuritic algorithm-based multicast tree estimation for reliable multicast routing in VANETs. APTIKOM Journal on Computer Science and Information Technologies, 2020, 3(3):100-105.

[11] Amini S M, Karimi A. Two-level distributed clustering routing algorithm based on unequal clusters for large-scale Internet of Things networks. The Journal of Supercomputing, 2020, 76(3):2158-2190.

[12] Gheisari M, Alzubi J, Zhang X, et al. A new algorithm for optimization of quality of service in peer to peer wireless mesh networks. Wireless Networks, 2019, 26(7):4965-4973.

[13] Burggraf J, Uhrmann T, Pires M. Collective Die Bonding: An Enabling Toolkit for Heterogeneous Integration. ECS Transactions, 2020, 98(4):173-180.

[14] Hood R L, Johnson S A, Lauby R S, et al. A Market Review of Available Airway Suction Technology. Prehospital and Disaster Medicine, 2022, 37(3):390-396.

[15] Fehri C E, Baccour N, Kammoun I. Performance evaluation of the Over-The-Air activation procedure in a large scale LoRaWAN. Wireless Networks, 2022, 28(6):2455-2470.

[16] Farias G, Fabregas E, I Mart ́nez, et al. Nuclear Fusion Pattern Recognition by Ensemble Learning. Complexity, 2021, 2021(3A):1-9.

[17] Eneman G, Veloso A, Favia P, et al. (Invited) Stress Simulations of Fins, Wires, and Nanosheets. ECS Transactions, 2020, 98(5):253-265.

[18] Salama R, Uzunboylu H, Alkaddah B. Distance learning system, learning programming languages by using mobile applications. New Trends and Issues Proceedings on Humanities and Social Sciences, 2020, 7(2):23-47.