Research on Distributed Operation Mode of Internet of Things

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Abstract: The application of distributed system in the Internet of things makes the system control completely networked, realizes the connection of point-to-point and star data transmission control, makes the system highly scalable, convenient for centralized management, and is suitable for multi-functional Internet of things applications. In the distributed architecture, data is distributed on multiple servers. A distributed database is composed of multiple logically related databases distributed on the Internet of things. Each node on the network has independent processing ability, so it is necessary to find a suitable distributed system solution between code and database.

1. Distributed system description and features
Distributed system is a network structure and software system built on the network. Due to the characteristics of software, distributed system has a high degree of cohesion and transparency. Distributed applications in the Internet of things belong to high-level software. High degree of autonomy refers to the local database management. Transparency means that every database distributed node is transparent to the user's application.

There are many paths between each node in the network, which constitutes a distributed structure.

Figure 1 composition and architecture of distributed system
Distributed architecture has no fixed connection form. There is more than one path from the sending point to the receiving point. When communicating, the network chooses the actual path according to the dynamic situation of each node. The control function of communication is distributed in each node. It is very complex to manage the data resources scattered on each node. Due to the existence of multiple paths between nodes, when some nodes and links fail, it is still possible to ensure communication with high reliability.
The distributed connection scheme of Internet of things is established, which can realize the network session from client application to database. It provides distributed database and distributed process management for services by using widely supported communication protocol or application program interface (API).

A distributed system is a collection of independent computers, but to the users of the system, the system is like a computer. It has two meanings:

- In terms of hardware, each computer is autonomous;
- From a software point of view, users see the whole system as a computer.

The main characteristics of distributed system are as follows:

- **Distribution**
  There is no master or slave between multiple computers in the system, that is, there is no master or slave to control the whole system.
- **Transparency**
  System resources are shared by all computers. Users of each computer can not only use the resources of this computer, but also the resources of other computers in the distributed system (including CPU, files, printers, etc.).
- **Identity**
  Several computers in the system can cooperate with each other to complete a common task, or a program can be distributed on several computers to run in parallel.
- **Communicability**
  Any two computers in the system can exchange information through communication.

2. **Distributed structure description**

Distributed architecture is the application and tool of distributed computing technology, which involves a wide range of contents. Distributed architecture uses LAN to realize point-to-point transmission, switching, control and storage.

![Figure 2: Distributed system structure of Internet of things](image)

Distributed structure network is a kind of network form which connects computers distributed in different places through lines. Distributed structure Internet of things has many advantages.

Using decentralized control, even if a part of the whole network fails, it will not affect the operation of the whole network, so it has high reliability.

Because of the shortest path algorithm in the network, the network delay time is less, the transmission rate is high, but the control is complex. Each node can establish data link directly, and the information flow is the shortest. It is convenient for resource sharing in the whole network.

3. **Implementation model of distributed system**

The most commonly used model in distributed application system is client / server model. The client / server model allows the effective division of tasks, and multiple different applications work together to improve system efficiency and balance network load. The client / server model may also be subdivided by its connectivity, and if the application is connected to a database or network in use, it is the connected client. If an application is used but not connected to a database or network, it is a disconnected customer.

In the client / server model, there are four main architectures and connection methods:

- **A Traditional architecture in traditional client / server applications, one database server implements**
data management functions, and another client application implements other functions. Business logic is often partitioned in stored procedures and triggers of client applications and database hosts.

B The three-tier structure database server realizes the data management function, the middle tier application realizes the common business logic, and the interface component provides the user interface. When several applications access the same data, it makes sense to encapsulate the relevant business logic into a component. When the access rules change, only the middle tier components need to be changed.

C A connected client application is an application that maintains a connection to a database or network at all times. The application responds to the user's request of processing information in real time, and updates the processed information to the database.

D A disconnected application is an offline application that allows users to process data without directly connecting to a network or company's data warehouse. Enables data to be processed in a different way than using real-time transaction processing. The usual way is to receive data in a given period of time and batch processing, transaction processing in the local data warehouse, the warehouse must be able to achieve some form of replication operations. Two tier applications usually don't adapt well to a large number of users. When the number of users increases, the implementation of business logic in stored procedure will lead to database competition. Customers also need to connect to the database server at high speed.

Three tier applications generally have better scale than two tier applications. In the middle layer, business logic is implemented instead of triggers or stored procedures, which greatly reduces the number of database queries and database competition. When the database operation passes through the middle tier, the user response time will increase. However, although the initialization of the middle layer will reduce the initial operation, the subsequent operation will be much faster.

The three-tier model is more complex and has better scale variable ability and flexibility. Because triggers do not enforce business logic, insert and update operations are fast and efficient, and the database server can handle heavier loads with less contention. With a connected client architecture, middle or second tier components can be executed remotely, and users do not need to put them together on their own machines, which helps to reduce the complexity on the remote machines.

4. Application of distributed technology in Internet of things

The advantages of distributed application in the Internet of things are as follows:

- Rare resources can be shared.
- Distributed computing can balance the computing load on multiple computers.
- It's the best program to run on a computer.
- Distributed computing is a problem that needs huge computing power to solve. It is divided into many small parts, and then these parts are allocated to many computers for processing. Finally, the final result is obtained by integrating these calculation results. The concept of distributed computing and centralized computing.
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Figure 3 Schematic diagram of distributed system operation mode

The main purpose of the distributed system is to realize the site autonomy and the global transparent sharing of data, without using the nodes in the network to improve the processing performance of the system. In order to meet the needs of application and the characteristics of Department distribution, the nodes are generally connected by LAN or WAN, so the network bandwidth is low, and the communication overhead of reversal point is large. In query processing, the data transmission between nodes should be reduced as much as possible. In the distributed database system, each node can complete the global transaction through the network, and each node has the autonomy of the site, and each site is an independent database system. Each site has its own database, client, CPU and other resources, runs its own DBMS, executes local applications, and has a high degree of autonomy.

5. Conclusions

In the Internet of things system, distributed data processing is used. Distributed data processing means that two or more software share information with each other. The software can run on the same computer or on multiple computers connected through the network.

The computing used in distributed system belongs to the category of high performance computing, and its main purpose is to analyze and process big data.

Distributed system uses network to connect each data processing node. All nodes in the network form a logical unified whole, and users can access the data on each node transparently.

The purpose of using distributed system computing in the Internet of things system mainly includes availability, reliability and physical distribution, and accessing distributed system from many different places.

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