

Research on Optimization of Wireless Sensor Network Architecture

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Abstract

By flexibly grouping and using sensor nodes to achieve maximum multiplexing of sensor resources, the flexibility and scalability of sensor networks can be achieved simultaneously. The virtual sensor network (Virtual Sensor Networks, VSN) is used to solve the multiplexing problem of the underlying physical equipment of the sensor network. This solution can save part of the cost and realize the reuse of underlying physical resources.

Keywords

SND; WSN; Network Architecture.

1. Introduction

At present, scholars and scientific research institutions abroad have devoted themselves to the development of software-defined wireless sensor networks and virtual wireless sensor networks.

Research, due to its flexibility and resource reuse, VWSN has aroused a large number of scholars' research enthusiasm. There are already

Many foreign research institutions have initiated research on this subject and have achieved some results, publishing a series of high-quality papers.

Research on software-defined wireless sensor networks mainly includes the following:

The domestic research on SDN is in full swing, and SDN has become a research hotspot in the network field and is considered by the industry to be the next generation

The development direction of the Internet has attracted much attention. Network virtualization is the basis for SDN to achieve network programmable. They have always been

It is the researcher's focus. Existing research on network virtualization is often based on virtualization instead of virtualization.

Too much consideration of the actual needs of SDN. So far, domestic SDN and virtualization technologies have been introduced into the field of wireless sensor networks

The research is relatively small.

Virtual sensor network is a hot spot in the field of wireless sensor network research. Many foreign scholars and teams have been very effective.

At present, domestic investment in this direction is relatively lagging behind, with innovative and breakthrough research results

Very few.

2. System model

Introduce Software Defined Network (SDN) and network virtualization technology to the field of Wireless Sensor Network (Wireless Sensor Network, WSN). The working mechanism of OPENFLOW and Software Defined Wireless Sensor Network (SDN- WISE) network architecture, separation of WSN data plane and control plane, virtual wireless sensor network (Virtual Wireless Sensor Networks, VWSN) construction, network data processing and forwarding are in-depth research, based on the existing architecture at home and abroad, Design and realize the virtual sensor network layout and construction plan, OPENFLOW derives the rule-action forwarding strategy of WSN state, and develops the DEMO system and simulates and tests the network.

The main research contents are as follows:

2.1 Research on decoupling of architecture, data plane and control plane.

The sensor node network model includes the physical layer, MAC layer, forwarding layer, topology discovery layer, network data processing layer and Application layer, in this architecture, the physical layer and MAC layer are proposed to use IEEE802.15.4. Convergence node network model and sensor node The point model is basically the same, but with an additional layer of adaptation. The server or PC-side network model includes: adaptation layer, VISOR layer, control Controller and application layer. Divide the network into a data plane and a control plane. The data plane is executed by sensor nodes and the control plane is controlled by Execute. There are two types of data forwarding: forwarding that requires data processing within the network and forwarding that does not require data processing within the network.

2.2 Research on the layout and construction of VWSN.

It mainly includes VWSN construction algorithm, virtual cluster construction and data processing and forwarding strategy research. For WSN private network Use, and the low reuse rate of node physical equipment, the introduction of virtual wireless sensor network technology, research and design better VWSN construction algorithm. It is planned to use virtual cluster tree algorithm to cluster sensor nodes and select appropriate cluster head nodes , On the basis of clustering, a virtual cluster tree construction algorithm combining top-down and bottom-up is used to shield WSN heterogeneous

Features to provide transparent applications.

2.3 Design VWSN multi-path forwarding mechanism and path recovery algorithm.

In wireless communication, the signal is unstable and the network topology changes frequently Complex, the network is dynamic, and a single path forwarding has certain risks. Propose VWSN multi-path forwarding mechanism and path recovery Complex algorithm. In this algorithm, the routing initiator stores multiple paths, and the multiple paths are sorted according to the path cost. When forwarding, Select the best forwarding, if the forwarding fails, start the path recovery algorithm, select the backup path for data forwarding.

2.4 Develop the DEMO program and perform simulation and testing, mainly on the ZTE hardware test platform.

Testing includes hard Software platform testing and simulation testing, hardware testing plans to use TI CC2530 development board components wireless sensor network, sensors It is planned to adopt temperature, humidity, light, flame, etc. Network simulation is OMNET++ simulation tool, it is planned to set 1000 random topologies , Analyze the performance parameters of this program and existing programs.

Feasibility and advancement of the scheme

- 1) Using IEEE802.15.4 physical layer and MAC layer, the technology is mature and feasible.
- 2) Adopt the open source SDN-WISE architecture and original development model, which reduces the difficulty of development and makes development feasible.

3) Use the bottom-up cluster tree construction algorithm to construct a virtual wireless sensor network, and realize it through JAVA language programming, The plan is feasible.

4) Using ZTE network communication platform and OPNET++ to simulate and test the system, the test is feasible.

The design and implementation of the entire program are based on corresponding theories, and the testing equipment is routine, feasible and advanced. The expected main innovations of the project:

Innovation point 1. Research on decoupling of architecture, data plane and control plane. There have been some results in this field abroad. Domestic research is scarce, with research methods and theoretical support. It is expected to apply for a patent and publish a paper.

Innovation point 2. Research on the layout and construction of VWSN, based on clustering, using top-down and bottom-up connections The integrated virtual cluster tree construction algorithm shields the heterogeneous characteristics of WSN and provides transparent applications. It is expected to apply for a patent and publish Two papers.

3 Innovation points, design of VWSN multi-path forwarding mechanism and path restoration algorithm, and 1 paper is expected to be published.

Innovation point 4. Develop DEMO program and carry out simulation and test, mainly test and run on the hardware test platform. The test includes hardware platform test and simulation test. The hardware test plans to use TI CC2530 development board component wireless sensor network, and the sensors plan to use temperature, humidity, light, flame, etc. The network simulation is like OMNET++ simulation tool, it is planned to set 1000 kinds of random topologies, and analyze the performance parameters of this scheme and existing schemes.

3. Conclusion

In recent years, people's research focuses mainly on those dedicated sensor networks designed for a specific application., It's just that it's too wasteful to deploy a dedicated sensor network for each application. All sensor nodes are regarded as a common infrastructure, and the most flexible grouping and application of sensor nodes is achieved. The maximum reuse of sensor resources can achieve both the flexibility and scalability goals of sensor networks. The emergence of the concept of Virtual Sensor Networks (VSN)

The multiplexing of the underlying physical equipment of the server network provides a good solution. This scheme can save part of the cost and realize the bottom layer Reuse of physical resources.

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