Smart Homes using Internet Of Things issues

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Abstract:

The main functions that are realized are as follows: the PC can display temperature and humidity data collected by a node board via a browser and control the switching state for the LED Light in the control node board via a browser; and the PC can also display temperature and humidity data collected by a node board via an APP and control the switching state for the LED Light for the gusset plate via a browser. Because communication between the PC and the node board, as well as communication between the APP and a node board, must go via the gateway board, it functions as the system's communication bridge.

Introduction:

A smart home is a complete system that includes things like a visual intercom, home security, remote tracking of household equipment, remote video surveillance, telemedicine diagnosis and care structures, online learning systems, and home movie stars. The idea of the internet of things has changed what people thought they knew. Before, the idea was to keep airports, roads, buildings, and IT infrastructure like data centers, PCs, and the internet separate from real infrastructure like airports, roads, and buildings. In the age of the Internet of Things, processors, cables, and reinforced concrete will all be put together to make a single system.

The NB-IOT standard freeze in June of this year made it possible for the newly approved NB-IOT to be used on a large scale in business. The NB-IOT network will be used for the first time in a business setting in 2017. NB-IOT has gotten a lot of attention in the industry since it was introduced as a low-power WAN technology backed by Huawei and many carriers. No one has stopped the talk about LoRa and NB-IOT. A few members of Vodafon's NB-IOT Alliance, including one of its leaders, have said that "NB-IOT will help bring down LoRa."

Methodologies used

System design

Based on how the system is designed and what it needs to do, it has a gateway board, a node board, a PC, and an Android phone. The LPC1769 chip is the main control MCU for the nuclear gateway board. The xbee module is the BN-IoT module, and the wifibee component is the wifi module. The LPC1114 chip is the main control chip for the NB-IoT node, and the DHT11 sensor measures temperature and humidity. Figure 1 shows the general layout of the system's modules.

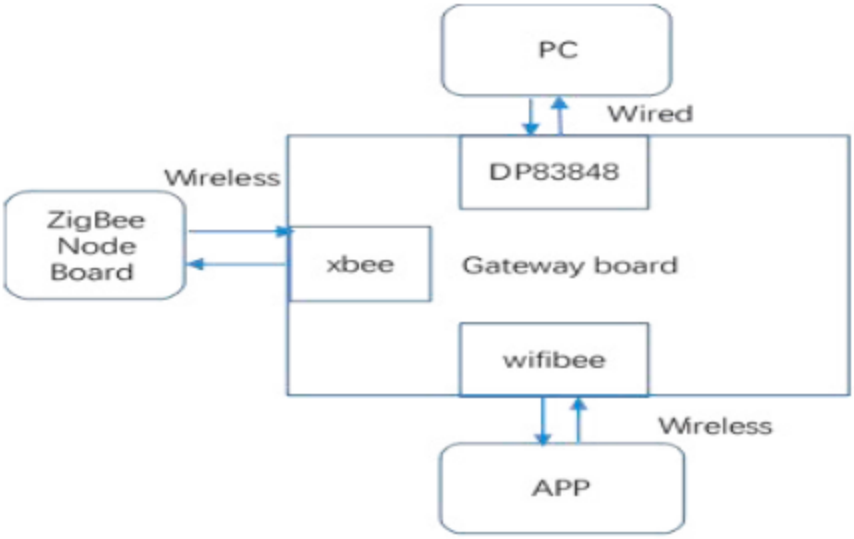

Fig. 1. The framework of the overall system module

Xbee module: The Digi xbeeS2 module is a short-range, low-power data transmission module with a 2.4GHz band, an integrated NB-IoT protocol stack, and all peripheral circuits that can be set up using the PC setup program X-CTU. You can tell the module to send details about the power channel and other network topology parameters. The integrated gateway board has an xbee module that is the NB-IoT coordinator. This module talks to the MCU through a serial connector. When the xbee module's networking is done, information sent is sent out through its port, and information received is sent in through the serial port.

Overview of the Gateway Board Design

The LPC1769 main control chip, the W25Q18FV chips, the xbee component, and the wifibee module make up most of the gateway circuit. LPC1769 is the brain of the machine. The W25Q18FV microchip stores webpage info, while the xbee module builds the NB-IoT network and the wifibee module talks to the APP. Figure 2 shows the peripheral layout of the entry point

board.

Fig. 2. Gateway board peripheral structure

The Ethernet port features of the LPC1769 are used a lot in this design. The Ethernet module has a full-featured 10Mbps or 100Mbps Ethernet MAC (Media Access Controller) that improves speed by using DMA hardware acceleration. The Ethernet unit has a lot of control bits that make it possible to switch between half-duplex and full-duplex operation, control flow control frames, speed up resending, screen incoming packets, and wake up the LAN. It saves CPU work because its Scatter-Gather DMA automatically sends and receives frames. The Ethernet module drives the AHB bus grid as an AHB host. Through its matrix, it can get to all of the ram memory on the chip.

The parts of the CPU that have to do with the CPU are written in assembly language, and the part of the assembly language that has about 200 lines is compressed to make it easy to use on any other CPU. Users who have an ANSI C cross processor and software tools like an assembler and connector can add uC/OS-II to the product they are making.

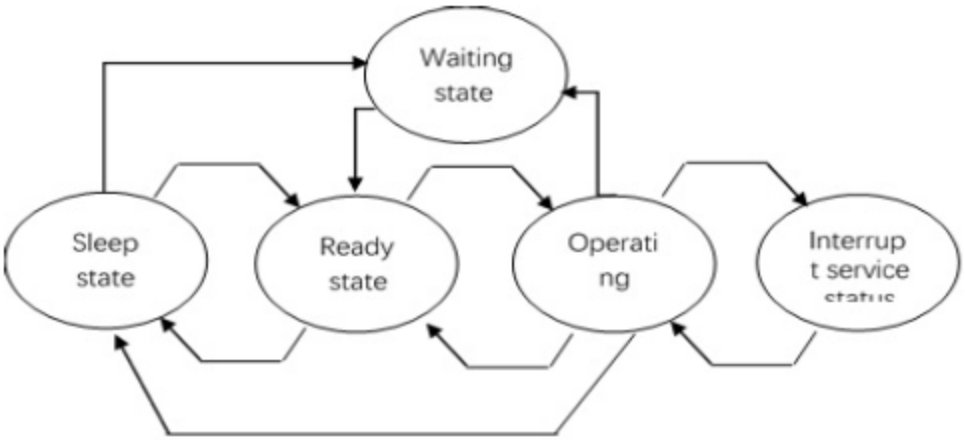

Fig. 3. Task statues switching of uC/OS-II

Result:

Putting in place xbee communication

The xbee module is set up with the help of the X-CTU host program. The X-CTU host computer interface is shown in Figure 4.

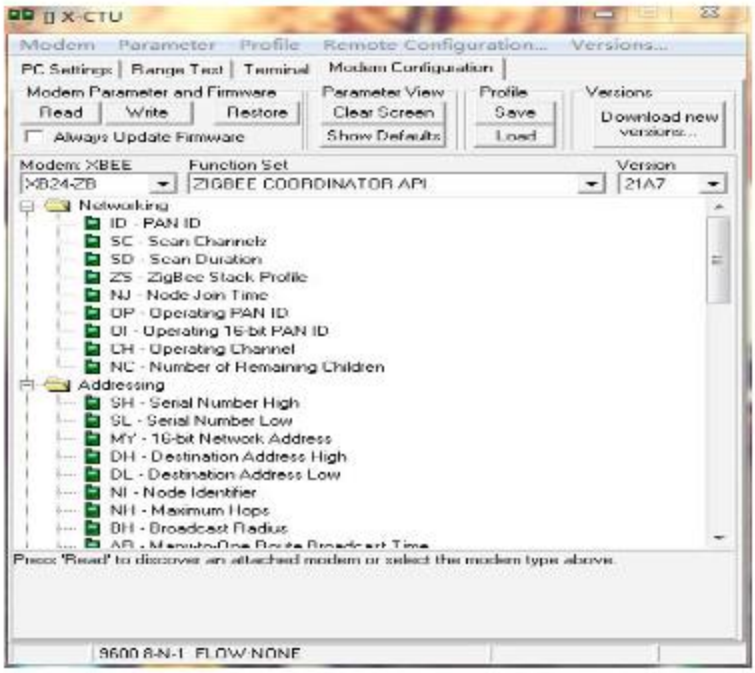

Fig. 4. X-CTU interface

The xbee network needs a coordinator module, so the xbee module on the gateway board is set up as a coordinator using X-CTU, and the xbee module on the node board is set up as a terminal using X-CTU.Once the xbee units have been set up, they can talk to each other.

Checking out the PC entry gateway board

After setting up the PC network adapter properly, open the browser and type 192.168.150.200 to get to the gateway board, as shown in Figure 5.

Fig. 5. Login interface

Fig. 6. Home Screen

Mobile app access gateway board evaluation

Cell phone To use the contact feature of the APP and wifibee, you must first connect to the wifibee hotspot in the setup center. wifibee has been set up as a SANFI wifi hotspot, so the mobile APP should be linked to wifibee. In the phone's wifi options, you must connect to the SANFI wifi hotspot in order to talk. Once the mobile APP is connected to a wifi hotspot, open it and click the "Start Connect" button. The APP will go into the "listening" state, and the "Start Connect" button will change to the "Connected" state.The temperature and humidity data that the gateway board receives are also shown in real time.The listening setting is on for the APP interface.

Conclusion:

The Internet of Things-based smart home is a complex and thorough project that does more than just use embedded technologies. When we do study on embedded systems, we have to deal with other system problems, such as network, ecology, and environmental protection. A lot of the information needed is distant from my professional knowledge, such as architecture, household appliances, and so on, and is more concerned with human content. The smart home and campus shown in this article are made with cutting-edge hardware, software, and other innovations, but they haven't yet broken away from old ideas.

References:

1. Bahmanyar, D., Razmjooy, N., Mirjalili, S.: Multi-objective scheduling of iot-enabled smart homes for energy management based on arithmetic optimization algorithm: A node-red and nodemcu module-based technique. Knowledge-Based Systems 247, 108762 (2022). https://doi.org/https://doi.org/10.1016/j.knosys.2022.108762, https://www.sciencedirect.com/science/article/pii/S0950705122003574
2. Chopvitayakun, S., Jantamala, S.: Iot smart home for elderly and unattended residence. In: Proceedings of the 11th International Conference on Education Technology and Computers. p. 322–326. ICETC '19, Association for Computing Machinery, New York, NY, USA (2020). https://doi.org/10.1145/3369255.3369284, https://doi.org/10.1145/3369255.3369284
3. Chouaib, B., Lakhdar, D., Lokmane, Z.: Smart home energy management system architecture using iot. In: Proceedings of the 9th International Conference on Information Systems and Technologies. ICIST '19, Association for Computing Machinery, New York, NY, USA (2019). https://doi.org/10.1145/3361570.3361593, https://doi.org/10.1145/3361570.3361593
4. Demir, S., S¸evval S¸im¸sek, G¨ur, S., Levi, A.: Secure and privacy preserving iot gateway for home automation. Computers and Electrical Engineering 102, 108036 (2022). https://doi.org/https://doi.org/10.1016/j.compeleceng.2022.108036, https://www.sciencedirect.com/science/article/pii/S0045790622002993
5. Johri, A., Bhadula, S., Sharma, S., Shankar Shukla, A.: Assessment of factors affecting implementation of iot based smart skin monitoring systems. Technology in Society 68, 101908 (2022). https://doi.org/https://doi.org/10.1016/j.techsoc.2022.101908, https://www.sciencedirect.com/science/article/pii/S0160791X22000495
6. Labbi, Z., Senhadji, M., Maarof, A., Belkasmi, M.: Iot smart homes based on rfid technology: Localization systems review. In: Proceedings of the Fourth International Conference on Engineering amp; MIS 2018. ICEMIS '18, Association for Computing Machinery, New York, NY,

USA (2018). https://doi.org/10.1145/3234698.3234700, https://doi.org/10.1145/3234698.3234700
7. Li, B., Yu, J.: Research and application on the smart home based on component technologies and internet of things. Procedia Engineering 15, 2087–2092 (2011). https://doi.org/https://doi.org/10.1016/j.proeng.2011.08.390, https://www.sciencedirect.com/science/article/pii/S1877705811018911, cEIS 2011
8. Robles, R.J., Kim, T.h.: Applications, systems and methods in smart home technology: A. Int. Journal of Advanced Science And Technology 15, 37–48 (2010) Smart Homes using Internet Of Things issues 3
9. Ruiz, E., Avelar, R., Wang, X.: Protecting remote controlling apps of smart-home-oriented iot devices. In: Proceedings of the 40th International Conference on Software Engineering: Companion Proceeedings. p. 212–213. ICSE '18, Association for Computing Machinery, New York, NY, USA (2018). https://doi.org/10.1145/3183440.3195101, https://doi.org/10.1145/3183440.3195101
10. Sisavath, C., Yu, L.: Design and implementation of security system for smart home based on iot technology. Procedia Computer Science 183, 4–13 (2021). https://doi.org/https://doi.org/10.1016/j.procs.2021.02.023, https://www.sciencedirect.com/science/article/pii/S1877050921004877, proceedings of the 10th International Conference of Information and Communication Technology