Chapter 8

Challenges and Issues of IoT Application in Heating Ventilating Air Conditioning Systems:
Energy Conservation Using IoT

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ABSTRACT

The internet of things (IoT) is a system consisting of computing, mechanical, and electronic devices, which are having ability to transfer data in network without human interaction. The sensors used in IoT collect and transfer the data to the cloud, which is further processed using software to perform an action. The IoT is one of the fastest growing industries, and in recent years, it is most widely used in HVAC systems in residential and commercial applications to reduce the energy consumption as building consumes by approximately 40% of total energy. The IoT reduces the energy consumption of the building by optimizing the process variables of HVAC system components, increases life of system components, enhances the comfort of the occupants, and provides remote control of the system. However, there are challenges in data security and privacy, and also there is a lack of IoT platforms specifically oriented towards the proper processing, management, and analysis of such large and diverse data.

Figure 1. Schematic of the HVAC system
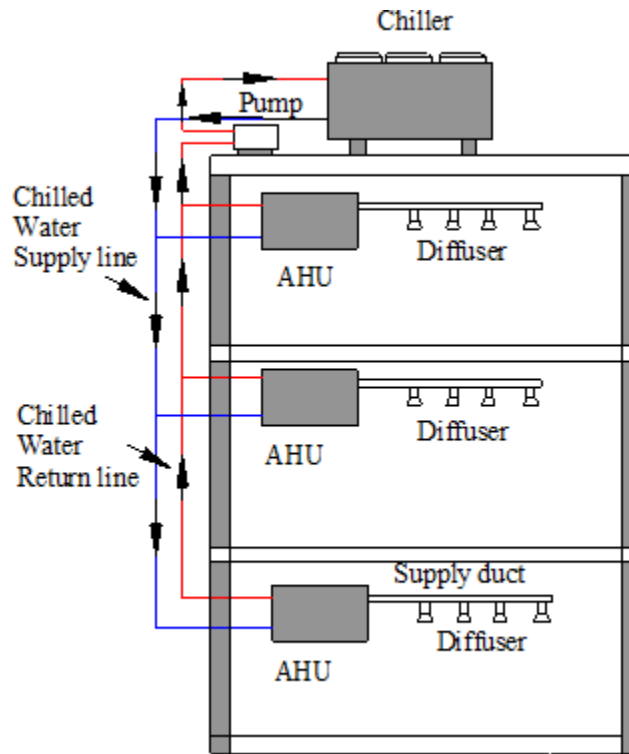
INTRODUCTION

The heating, ventilation, and air conditioning (HVAC) system is the mechanical air handling systems used in building to provide necessary indoor air quality by controlling temperature, humidity, purity, velocity etc. by conditioning the air to provide comfort indoor space for the occupants. The indoor air is replaced with outdoor air at regular intervals to dilute and remove contaminants and to remove odour. The infiltration or exfiltration may affect the quality of the indoor air. The important parts of the HVAC are chiller, air handling unit, air distribution system, air exhaust system etc. Figure 1 shows the schematic of the HVAC system. The chiller produces the cooling effect and it is transferred to the water. This chilled water is circulated to the air handling unit (AHU) using a pump. The room air is drawn to the AHU and is filtered to remove dusts, mold etc., cooled using cooling coil, humidified or dehumidified and finally circulated to the room. The humidifier and dehumidifier control the humidity of the air. In winter, heating coil is used to heat the air. Some percentage of room air is replaced with the outdoor air to control the carbon dioxide level. The air distribution system consists of fans, filters, dampers, ductwork etc. supplies the conditioned air to the room to maintain required indoor conditions. The return air system draws the room air and is send it to the AHU for conditioning. This return air is mixed with outdoor air and is re-conditioned using filter, cooling coil, humidifier / dehumidifier and re-circulated to the indoor space. Figure 2 shows the schematic of the AHU.

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