National University of Computer and Emerging Sciences

Assignment # 1

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Section:

Internet of Things (BCS-8A)

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Report

Device of Choice:

I have chosen Air-Conditioner which was a non-IoT device but later on, became IoT device going by the name “Smart AC”.

Smart AC allows you to control its functions via an app that you can download to your phone or tablet. Plus, it can connect to smart home systems and language assistants. Smart air conditioners are smarter than traditional air conditioners because they can connect to the internet and other devices.

Features:

- **Geolocation:**
  Helps determine the geographic location of an object such as a mobile phone connected to the Internet. Giving your smart air conditioner this access helps it recognize your exact location, and it can be set to trigger actions based on your location. An example is, you can use the geolocation feature to have your air conditioner automatically turn off as soon as you leave the house. This feature is essential for added convenience, comfort and energy savings.

- **Intelligent weekly planning:**
  You can set a schedule. If you work and come home at a certain time, you can schedule it so that only your device works at that time. If your routine changes at any point of the day or week, you can easily edit your schedule from anywhere.

- **Smart home integration:**
  Smart AC can also be integrated into smart home systems and controlled by voice commands such as Google Assistance, Alexa and Siri Shortcuts are part of the smart home system that can be paired with Smart AC. A smart home system allows you to combine heating and cooling with other smart devices.

- **Intelligent trigger and smart mode:**
  All air conditioners have different modes such as cooling, fan, drying, heating and eco. Smart AC has another set of modes that offer additional features and convenience. The main purpose of these additional modes is to provide automation that increases comfort and convenience. Examples include “Comfy mode” that are part of programmable air conditioners, controllers, or thermostats. In this mode, you can set your preferred room temperature setting and the air conditioner automatically adjusts the setting as the weather changes. These settings can also be used for pets at night or on vacation.

- **Usage details:**
  Power consumption details are important information and can be used to make intelligent decisions about cooling or heating consumption. By scheduling the use of air conditioning, you can obviously save energy and manage your bills. By becoming more aware of your usage, you can better

understand what changes you need to make to your consumption patterns. You can see the date and time of irregular usage along with a full audit of the actions taken on your AC. Additionally, usage can also indicate the need for AC tuning, which helps track air conditioning maintenance.

Comparison:

Functionalities	Conventional Air-Conditioner	Smart Air-Conditioner
Connectivity	No	Yes
Intelligence	No	Yes
Affordable Price	Yes	No
Easy-Installation	Yes	No
Low-Maintenance	Yes	No

Advantages:

- **Convenience**:
  You can turn the air conditioner on and off with your smartphone or other device at home or on the go. This means you have complete control over the ambience of your home as the temperature rises and falls.

- **Smart home connectivity**:
  If you have other smart devices in your home such as automatic blinds or automatic lighting. You can connect these devices to better control the temperature in your home. For example, if you live in a hot climate, you can program it to turn on the air conditioner, close the blinds, and dim the lights to make your home cooler.

- **Cost and energy efficiency:**
  Smart air conditioners help you save energy as you can set your preferred temperature and automatically slow down when the desired temperature is reached. It can also use geolocation to automatically turn off based on your distance from home in case you forget to turn it off. You can even schedule your air conditioner to get your desired temperature daily or weekly and leave the system off when you don't need it. You don't have to remember everything every time. The app you use to control your air conditioner allows you to track your system's energy usage and preset energy usage limits. In addition to cost and energy savings, these air conditioner features also help increase efficiency and extend life.

- **Error diagnosis and preventive maintenance:**
  With this app, you can track your smart air conditioner usage and predict when it needs cleaning or maintenance. The forecast is based on your AC usage, and the app will send you notifications and

reminders whenever your AC needs adjustment. It can also generate a performance report and sending it directly to the company so that they can send maintenance personal when needed.

- **Reduced carbon footprint:**
  Air conditioning systems emit carbon dioxide during operation, which is harmful to the environment. Smart ACs also emit carbon dioxide, but they have a lower carbon footprint than traditional air conditioners. You can even program Smart AC to run only when you need it, and set fan speeds to the lowest possible to reduce your carbon footprint. By using smart AC as a thermostat, you can save your CO2 footprint and thus reduce your carbon footprint.

Disadvantages:

- **Price**:
  Smart air conditioners are new devices on the market, so they are expensive. Depending on the size of the unit you choose, smart air conditioners can cost anywhere from $300 to thousands of dollars.

- **Multiple units are required**:
  Smart air conditioners do not work centrally, requiring multiple units to cool the entire home.

- **Installation**:
  Installing a smart air conditioner can be difficult depending on the unit you choose. They also take up valuable space in your home. For example, the lower half of the window must be fitted with a window unit, making the window unusable.

Limitations:

These are some of the limitations that the smart Air-Conditioners have still yet to counter:

- **Dry skin**
  Prolonged exposure to air-conditioned rooms can dehydrate your skin, making it sensitive and dry. Irritation and dryness of mucous membranes may also occur.

- **Exacerbation of respiratory problems**
  Sudden changes in temperature have been shown to exacerbate symptoms of various respiratory diseases. Luckily, you can greatly reduce the risk of this problem by setting the temperature high and then decreasing it gradually.

- **Respiratory infections and allergies**
  If you don't clean your air conditioner, dust, bacteria, and pollen can accumulate in the air filter. This greatly increases the risk of asthma attacks and respiratory infections.

Privacy & Security Issues:

IoT devices such as smart air conditioner sensors are not designed for web browsing, but need to connect to the internet for data collection, remote control, and analytics. Unintentional direct access to the

Internet makes them prime targets for cyber attackers and poses a significant security threat to smart buildings.

ForeScout Technologies, a cybersecurity company, found thousands of vulnerable in IoT devices such as AC systems vulnerable to cyberattacks. Their research found that around 8,000 connected devices, mostly installed in hospitals and schools, provided unauthorized access and were highly vulnerable to cyberattacks. Hackers operating smart AC systems can potentially gain access to personal financial information and potentially hold unauthorized data in large companies. In special locations like hospitals, malfunctioning intelligent air conditioners can harm patients who need to rest under certain temperatures and airflows. This type of attack scenario even has a codename of “HVACKer”.

Price Comparison:

Due to all the additional functionalities and convenient controls, Smart Air Conditioners are somewhat more expensive that the Conventional Air Conditioners.

For Example, the Conventional Air Conditioners of the company “Haier” can cost from Rs 40,000 to Rs 150,000, whereas, the Smart Air Conditioners range from Rs 200,000 to Rs 400,000. So, it’s fair to say, in terms of price, Smart Air Conditioners can cost 2 to 4 times more than the Conventional Air Conditioners.

If we include the monthly or yearly service/maintenance/tuning charges, we can say it’s easily 2 times the price as in Conventional Air Conditioners, we only have to worry about the hardware, whereas, in the modern Smart Air Conditioners, we have to keep the hardware well-maintained and keep the software updated to the latest to avail optimal performance.