**Chapter 9 Problems and Exercises Tips**

**1**) **Describe the IoT system/application that has had the greatest impact on your life. Identify what you like about it and how it has affected you. Identify/describe changes that could be made to improve it or make it more useful. Identify an IoT system that you would like to have and explain why it interests you.**

**Tips for Success**: This is an open-ended exercise that allows you to describe your personal experience with IoT systems and applications. Be sure to clearly identify the system/application and to describe what you like about it and how it has affected your life. Identify and briefly describe how the system/application could be changed to make it more useful or valuable. Be sure to also identify another IoT system/application that you would like to have and briefly explain why you would like to have it and how it could improve your life. Be sure to proofread your document to ensure that it is professionally formatted and free of spelling and grammatical errors.

Your instructor may use a grading rubric like the following to evaluate your wori.

|  |  |
| --- | --- |
| **Grading Dimension** | **Points** |
| Submitted by due date | 10 |
| Has correct format and length | 10 |
| Identifies most impactful IoT system | 10 |
| Identifies likeable features | 10 |
| Describes IoT system’s impact | 15 |
| Identifies and describes how IoT system could be improved | 15 |
| Identifies another IoT system that student would like to have | 10 |
| Explains why the other IoT system is interesting | 10 |
| Response is free of spelling errors and grammatical and formatting shortcomings | 10 |
| Total | 100 |

**2) You have been tasked with designing an IoT wearable app that would:**

* **Sense when you are too impaired to drive**
* **Launch a ride sharing app (e.g., Uber/Lyft), notifying drivers of your location and your home address**
* **Use a digital wallet to pay the driver**

**Describe how the app would work and identify IoT devices and communication networks involved in supporting the app.**

**Tips for Success**: You will probably have to think about this to come up with a feasible way to deploy the app. Because your system is likely to include a sensor and actuator, you are encouraged to review Section 9.3.1 and Figure 9-15. Section 9.2 may also be relevant. Be sure to proofread your document to ensure that it is professionally formatted and free of spelling and grammatical errors.

Your instructor may use a grading rubric like the following to evaluate your work.

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| --- | --- |
| **Grading Dimension** | **Points** |
| Submitted by due date | 10 |
| Has correct format and length | 10 |
| Describes how wearable IoT app would work | 40 |
| Identifies IoT devices and networks used to support the app | 30 |
| Response is free of spelling, grammatical, and formatting shortcomings | 10 |
| Total | 100 |

**3)** **The Waze app (from Waze.com) enables app users (Wazers) to report accidents, traffic jams, speed and police traps, and other traffic information to Waze servers, where the data is aggregated to update maps, recommended routes, likely travel times, and turn-by-turn directions, as well as provide real-time traffic alerts. Do some online research on Waze and answer the following questions:**

* **Are Wazer cell phones IoT devices? Why or why not?**
* **What communication networks are used to support Waze?**
* **Do active Wazers constitute an IoT network?**

**Tips for Success**: This exercise enables you to consider a popular application through the lens of concepts discussed in Chapter 9. Sections 9.2.1, 9.2.3, and 9.3 are relevant. Use online sources to get a better understanding of how Waze is deployed before developing answers to the questions. Think about Waze from an M2M perspective. Be sure to proofread your answers to ensure that they are professionally formatted and free of spelling and grammatical errors. Use MLA or APA formatting for any online sources used to develop your answers.

Your instructor may use a grading rubric like the following to evaluate your work.

|  |  |
| --- | --- |
| **Grading Dimension** | **Points** |
| Submitted by due date | 10 |
| Has correct format and length | 10 |
| Explains why phones with Wazer are or are not IoT devices | 25 |
| Identifies communication networks used to support Waze | 20 |
| Addresses whether active Wazer users are an IoT network | 20 |
| Includes citation for at least one online source | 5 |
| Response is free of spelling, grammatical, and formatting shortcomings | 10 |
| Total | 100 |

**4)** **After starting your vehicle, you establish a Bluetooth connection between your cell phone and the in-vehicle entertainment system, launch your Google Maps app, display the app on the entertainment system’s display screen, and use the app to direct yourself to an out-of-town destination.**

* **Use Visio or another network diagramming tool to create a diagram of the connections being used to support the Google Maps app. It should include the in-vehicle entertainment system, the Bluetooth connection, your mobile device, your device’s connection to your cellular provider’s network, the cellular provider’s connection to the Internet, and a Google Maps server.**
* **Explain how/why the displayed map changes in response to your changing location as you proceed along your route, using the components in your diagram to identify the device-to-device, device-to-cloud, and cloud-to-device data flows as they happen in real time.**

**Tips for Success**: This exercise challenges you to consider GPS apps from an IoT and M2M perspective. You may want to do some online research on location services (such as “find my device”) before completing the exercise. Make sure that your diagram includes all the specified elements. Completing the diagram should assist with developing your explanation for why the map display changes when you are enroute to your destination. Be sure to identify the real time device-to-device, device-to-cloud, and cloud-to-device data flows that occur when the app is being used. Proofread your diagram and explanation to ensure that they are complete and do not include spelling or grammatical errors. If you identify an online information source, use APA or MLA reference format for your citation.

Your instructor may use a grading rubric like the following to evaluate your work.

|  |  |
| --- | --- |
| **Grading Dimension** | **Points** |
| Submitted by due date | 10 |
| Has correct format and length | 10 |
| Includes fully labeled diagram of connection from vehicle to server | 25 |
| Explains how displayed map changes in response to movement | 25 |
| Identifies device-to-device, device-to-cloud, and cloud-to-device data flows | 15 |
| Includes citation for at least one online source | 5 |
| Response is free of spelling, grammatical, and formatting shortcomings | 10 |
| Total | 100 |

**5) You have been tasked with designing a smart agriculture app that uses a moisture sensing system to monitor soil moisture and detect dry soil. The system/application should also activate a watering system when soil moisture is too low for an extended time, and the watering system should shut off when moisture levels return to acceptable levels. The system/application should be monitored and managed by a smartphone app. Design how the system would be implemented/deployed. Draw a sketch of the system and explain how it will work. Also draw a sketch of the smartphone display that monitors the system. Summarize your app in a PowerPoint presentation or 500- to 750-word report.**

**Tips for Success**: You will probably have to think a little about a feasible way to deploy the app. Because your system will include a moisture level sensor and a watering system actuator, you are encouraged to review Section 9.3.1 and Figure 9-15. Section 9.2 may also be relevant. Be sure to include a sketch of how the system would be deployed, including its cloud connections (since it includes a smartphone app). Think about what should be included in the smartphone display before you sketch the display’s layout. Be sure to provide a clear explanation of how the IoT system/application would work. Be sure to proofread your presentation or document to ensure that it is professionally formatted and free of spelling and grammatical errors.

Your instructor may use a grading rubric like the following to evaluate your work.

|  |  |
| --- | --- |
| **Grading Dimension** | **Points** |
| Submitted by due date | 10 |
| Has correct length | 10 |
| Includes a sketch of the IoT system | 20 |
| Explains how the system would work | 30 |
| Includes sketch of smartphone display for the app | 20 |
| Response is free of spelling, grammatical, and formatting shortcomings | 10 |
| Total | 100 |

**6) You have been challenged to design a patrol robot to guard your residence whether you are at home or away. The patrol robot should be equipped with a night vision camera that can perform a 360-degree scan, and it should follow a predefined path (patrol route). When it detects human faces and movements, it will, at a minimum, send an alert and an image of the intruder to the application user. Draw a labeled sketch of your patrol robot. Briefly describe how it would work and the programming you would include to protect your residence.**

**Tips for Success**: You should think about this for a while when developing a feasible plan for your patrol robot IoT system/application. Think about how the robot would move, perform 360-degree scans, detect human faces and movements, and communicate with application users. Be sure to include a labeled sketch of the patrol robot. Also be sure to provide an explanation of how the patrol robot would be trained/programmed to follow a route through your residence as well as an explanation of how it would send alerts and images to the application user. Proofread your sketch and explanations to make sure they are complete and free of spelling and grammatical errors.

Your instructor may use a grading rubric like the following to evaluate your work.

|  |  |
| --- | --- |
| **Grading Dimension** | **Points** |
| Submitted by due date | 10 |
| Has correct format and length | 10 |
| Includes labeled sketch of patrol robot | 20 |
| Describes how the patrol robot would work | 30 |
| Describes the programming needed for patrol route in residence | 20 |
| Response is free of spelling, grammatical, and formatting shortcomings | 10 |
| Total | 100 |

**7) Do some online research on SCADA systems and their integration with the IIoT. Identify articles that describe SCADA systems, their components, and their protocols and how SCADA systems interface with other IIoT applications and systems. Also identify articles that focus on SCADA security vulnerabilities and remedies used to address them. Summarize what you learn in a PowerPoint presentation that includes at least seven slides and multiple images that bolster your research findings and observations. Your final slide should be a References slide that includes the titles and URLs of at least four online sources.**

**Tips for Success**: This exercise enables you to take a closer look at SCADA systems and the IIoT. Section 9.1.1 and Figure 9-2 are especially relevant, so are parts of the Chapter 9 Appendices. Strive to find four or more substantive online articles that discuss SCADA systems within an IIoT context as articles that identify SCADA system security vulnerabilities and how they are being addressed. Be sure to include multiple images in your presentation that help to illustrate the points that you are trying to make; consider including informative, but easy to understand, images from your online sources. Be sure to proofread your presentation to ensure that it is professionally formatted and free of spelling and grammatical errors. Use MLA or APA reference format for the articles listed on your References slide.

Your instructor may use a grading rubric like the following to evaluate your work.

|  |  |
| --- | --- |
| **Grading Dimension** | **Points** |
| Submitted by due date | 10 |
| Has at least 7 slides | 5 |
| Identifies and describes SCADA components | 15 |
| Identifies protocols used to support SCADA systems | 10 |
| Explains how SCADA systems interface with other IIoT systems | 20 |
| Identifies SCADA security vulnerabilities and remedies | 20 |
| Includes a References slide with at least four citations with URLs | 10 |
| Presentation is free of spelling, grammatical, and formatting shortcomings | 10 |
| Total | 100 |

**8) Digital twins are examples of digital business applications. Suppose you had a digital twin of the Wi-Fi network in your residence that you could use to simulate its performance under different conditions. Identify and briefly describe the simulations and performance tests that you would run and briefly explain how you would use the results to improve your network.**

**Tips for Success**: Digital twins are discussed in section 9.1.4. Think about what a digital twin of a Wi-Fi network would be like and the types of simulations that could be run. You are encouraged to revisit the Chapter 7 Problems and Exercises and review some of the Wi-Fi tests that they include. Don’t overlook the potential to use the digital twin to test Wi-Fi network security. Be sure to proofread your descriptions and explanations to ensure that they are professionally formatted and free of spelling and grammatical errors.

Your instructor may use a grading rubric like the following to evaluate your work.

|  |  |
| --- | --- |
| **Grading Dimension** | **Points** |
| Submitted by due date | 10 |
| Has correct format and length | 10 |
| Identifies and describes simulations and performance tests | 40 |
| Explains how simulation and test results would be used to improve the network | 30 |
| Response is free of spelling, grammatical, and formatting shortcomings | 10 |
| Total | 100 |

**9) Artificial intelligence (AI) and the IoT are converging in Industry 4.0 and in other ways to improve IoT system/application performance. Do some online research on how AI and machine learning (ML) are being used to improve IoT systems/applications in businesses. Identify three business applications combining AI and the IoT that you consider to be especially impressive and describe them in a 500- to 1000-word report that provides a clear description of each application and explains why you are impressed by it.**

**Tips for Success**: Strive to identify one or more substantive online articles that focus on how AI is being used to improve the performance of IoT systems/applications in businesses. Be sure to identify three IoT applications/systems that are supported by AI and describe how AI is being used to improve them. Be sure to proofread your document to ensure that it is professionally formatted and is free of spelling and grammatical errors.

Your instructor may use a grading rubric like the following to evaluate your work.

|  |  |
| --- | --- |
| **Grading Dimension** | **Points** |
| Submitted by due date | 10 |
| Is 500- to 1000-words in length | 5 |
| Describes how AI and ML are being used to improve IoT systems | 25 |
| Identifies and describes three impressive combinations of AI and the IoT | 45 |
| Includes at least one online citation | 5 |
| Report is free of spelling, grammatical, and formatting shortcomings | 10 |
| Total | 100 |