CS4628 - P5 - PUTTING IT ALL TOGETHER  
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Question P5 [4 MARKS]: Decision Making

The IoT-based heating system described in the practical makes heating decisions at the sink node. It would also be possible to make such decisions in the back-end infrastructure (such as a cloud service). Discuss possible advantages and disadvantages of both approaches.

Let's compare the aspects affected by whether the decision-making occurs at the sink node or in the back-end infrastructure:

* **Latency.** Decision making in the sink node reduces latency, since the data is processed locally, while decision making in a server adds the latency of the data traveling to and from the server.
* **Data processing.** The resources of the sink node are limited, limiting the complexity of algorithms it can execute. The server can handle more complex algorithms.
* **Scalability.** Decision making in the sink nodes is more scalable, as it distributes the workload among nodes, each nodes processes the data of the local nodes. Centralized decision making in the server introduces a single point of failure, if the back-end infrasture goes down, the entire system may become non-functional.
* **Offline operation.** The sink nodes can work offline with their local nodes because they are connected. In case of using a server, the whole system would require internet connection at all times to be able to receive and send the data.
* **Algorithm updates.** If there is an update in the decision making algorithm, implementing it in the server would be much quicker since it would only require one update, whereas updating the algorithm in each and every of the sink nodes would be a much longer process.

In conclusion, the decision between using sink nodes and back-end infrastructure for decision making depends on the specific needs of each IoT system. Sink nodes are more suitable when decision making needs to be fast and localized, and highly complex algorithms are not required. On the other hand, back-end decision making suits systems where the latency is not crucial and complex algorithms, such as large-scale data analysis, are needed.