AA Coursework- 19013163

Task 3.2 (Sustainability):

Sustainability for computer systems mainly focuses on reducing the carbon footprint of said technology, this can be broken down in to two main areas: energy usage and computational resource requirements.

Energy usage focuses on keeping the power usage of system as low as possible to reduce their effect on the environment. When developing systems for the national railway service this could include having timeouts that shutoff the system after an idle timer has elapsed hereby greatly reducing power usage. Systems installed could use low power processors and storage methods to reduce energy usage even further, this leads on to the next point of sustainability in computer systems.

Computation resource requirements refer to the resources such as processing power and storage needs for a system. Reduction of them is directly correlated with the energy usage of a system and therefore helps to increase sustainability. There are many ways to reduce the processing power of a system, some of these include: dynamically allocating the number of processors depending on the size of input data, limiting CPU speed during periods of lower activity, and using search methods with lower time complexity such as binary searches with complexity O(log n). The storage needs of a system can also be reduced in several ways with the main method being sharing memory between parallel processes. This reduced memory used, and therefore computational requirements, as all processes running in parallel can access a shared portion of memory containing required data. In our case this shared memory could contain network data, station data or data about search items. Memory requirements can also be reduced be removing duplicate data or variables. This could be done by either using the same variables for all program functionality and passing them by address rather than by value or by working directly from file inputs instead of duplicating the files into arrays. Recent search items, station data and common routes from the minimum spanning tree function could also be stored in cache memory to reduce the need to process these requests multiple times unnecessarily. Doing this would benefit both the computational and memory requirements and therefore reduce energy consumption.

In conclusion, there are many ways to increase the sustainability of a system designed for national railway services and these should be considered when implementing such a system.