

Opinion
re. feasibility of MISTER system implementation from the information technology viewpoint

The project proposed by Mr Olgierd Mikosza for a city transportation system, MISTER, assumes an extensive application of automatic control, supervision and logistics using an information system called SOCRATES. Based on the available description, one can discuss only the functional parameters and general architecture. Since, as is usual in such situations, one cannot comment about the final implementation of the functionality, reliability and safety from this initial material, therefore one can only evaluate the general feasibility of the IT part of the MISTER system – without going into the correctness of the proposed architecture or implementation suggestions (e.g. dealing with the communication channels or the use of GPS).

The proposed system should be considered as requiring the following properties:

- a) distribution – we are dealing with a system, where particular nodes retain certain functional autonomy (especially in the case of the vehicles' onboard computers) and co-ordinate their own operations based on mutual communication and communication with the stationary parts of the system, which provide supervision and logistics
- b) mobility – important part of the nodes are the vehicles' onboard systems, which demand consideration of the dynamic topology of the communication
- c) interaction – the system must react to events, of which sequence and timing cannot be predicted; and such events can be of external nature like a trip request of internal (e.g. malfunction)
- d) real time operation – system reaction time and by its particular nodes to the events, is subject to certain upper limits, which must be guaranteed
- e) scalability – number of active nodes within the system can vary in time in a substantial manner (e.g. due to the number of existing or active vehicles), but also, and what is more important, the project should cater for different max numbers of vehicles dependant on the type of potential implementations (from several dozen for a limited area – recreational, shopping or exhibition, to, perhaps thousands in the case of a large agglomeration), without the need for preparation of a new system for each numerically different variant.

Is such a system feasible? This question should be split into two parts:

1. Is there computer equipment available, which can sufficiently fulfil system requirements – especially in regard to the operating environment (temperature, vibrations etc.), reliability and performance?
2. Does the state of information technology allow for the design of the said system, especially from the programming perspective?

The answer to the first question is simple – YES, there is no problem in finding suitable hardware and drivers, which will fulfill requirements – although one cannot consider standard personal computers here. Modern computer equipment is also manufactured in versions prepared for work in very harsh conditions – examples are numerous military and industrial applications. Where reliability plays a crucial role (supervision, logistics), one can also use redundant solutions.

The answer to the second question is also YES – although it requires additional comments. The required system is complex and its correct functioning may decide about the entire projects' success. It does not seem possible for it to be designed and implemented without suitable tools and procedures, characteristically for large informatics projects, utilising programming engineering methodologies, particularly for real time applications. This, however, requires a suitable size of a team of specialists, time and money. The important element must be appropriate research, especially simulations, to consider various scenarios of system operation.

It seems, however, that the above mentioned conditions are acceptable, and potential benefits (assuming the correctness of Mr. Mikosza's calculations regarding implementation and operational costs of the MISTER system, which I am not in a position to verify) justify undertaking the project implementation.

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