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PROSPECTIVE ONBOARD NETWORKS FOR NEW-GENERATION SPACECRAFT

Abstract

The paper provides the results of the analysis and research of the onboard networks for spacecraft that uses the SpaceWire\SpaceFibre standards for the information exchange. These technologies are good for space application, but still has a number of weaknesses. Current paper discusses how to fix the found problems. A number of upper-layer protocols was developed for SpaceWire\SpaceFibre networks. These protocols increase the quality of service and reliability of data exchange. Authors provide the analysis of the transport protocols and discuss which particular tasks they solve in the network: guaranty of data delivery, channel bandwidth usage, etc. Standards developed by different space agencies of the World are intended for different tasks and missions, some of them solve small particular tasks, the others covers all the possible transport protocols application areas. In addition, authors cover the problems of networks reconfiguration and tracking of deadlock-free routes. Developed concepts allow using plug-and-play methods for SpaceWire networks to reconfigure the network structure automatically. SpaceWire\SpaceFibre networks uses the wormhole routing, which could cause the deadlocks in the routing switches. For these purpose, there is a need for additional algorithms and methods for tracking of deadlock-free routes. Moreover, these methods could be combined with the scheduling quality of service. These aspects also would be covered in the paper. Finally, authors would provide the concept of universal mixed SpaceWire\SpaceFibre network. This approach would include the combination of standards, technologies and methods that make the onboard data exchange more effective.