SPACEWIRE NETWORK FUNCTIONAL MODEL

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Short Paper

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ABSTRACT

The complex of simulation programs for building models of SpaceWire distributed systems and investigation of their characteristics is presented. It includes a specification of basic SpaceWire network elements like node, routing switch and link, allows to assemble a SpaceWire interconnection system of required structure, implements wormhole routing, time flow and distributed interrupts mechanisms, generation and transmission of data packets. This configurable tool enables to estimate an efficiency of SpaceWire based interconnection systems.

The tool – the configurable software complex, consists of several programs. Software complex for implementing system model is written in SystemC. It could be used in different modeling environment where SystemC is supported, for example, in IUS5.4 environment (Cadence Design Systems), under Linux Red Hat.

Each type of network elements is implemented as an independent module, so the network of required topology could be composed from these modules without changing their programs . For each node intensity and parameters of data flow, parameters for generating and handling distributed interrupts are set. Routers pass data packets and control-codes according to the SpaceWire standard, using routing table, path, logic and group adaptive addressing and header deletion. Transmission rate for every link can be set separately. To define the SpaceWire system structure and parameters the MS Visio based interactive graphical tool is used.

This model allows to estimate a load for every router, node and link caused by data flow and control-codes flow with different intensity, to estimate propagation time of control-codes, find different dependences of obtained time characteristics from input settings, which could be interesting for investigated SpaceWire based system. We can use model to choose system structure and their parameters (like distributed interrupts timeouts, routing table and so on) in a way, that required system characteristics correspond to the requirements specification, to research network protocols, and to validate distributed system analytical models.