OPINION

for a dissertation work for the acquisition of the educational and scientific degree "Doctor", in the doctoral program "Informatics", in the Field: 4. Natural Science, Mathematics and Computer Science, Professional division: 4.6. Informatics and Computer Science,

with author:

assistant Tasho Dimitrov Tashev,
Institute of Information and Communication Technologies -BAS

with title:

"ALGORITHMS FOR CONFLICT-FREE SCHEDULING OF A PACKET CROSSBAR SWITCH NODE"

By: Assoc. Prof. Dr. Stoyan Atanasov Poryazov,
Institute of Mathematics and Informatics– Bulgarian Academy of Scences,

appointed as a member of the Scientific Jury by the Scientific Council of the Institute of Information and Communication Technologies (IICT) on 22.02.2023 (protocol No. 2) and by Order No. 65/27.02.2023 of the Director of IICT.

The dissertation, submitted to me, contains 145 pages, of which 134 pages are main text with 5 chapters, Conclusion, Directions for future research, Publications of the author on the topic of the dissertation, Noticed citations, Declaration of originality of results, Bibliography.

1. Actuality of the problem developed in the dissertation in scientific and scientific-applied terms

The overall goal of the dissertation is the development of a methodology for the research and development of conflict-free scheduling algorithms for a packet switch with a matrix switch with input buffering.

The task is actual, on a global scale, due to the increasing need for reliable and high-speed communication of large volumes of information.

The specific tasks set and developed in the dissertation are:

1. To specify models using the Generalized Nets (GN) apparatus of classical algorithms for conflict-free scheduling in a matrix-switched packet switch.

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2. To synthesize a new algorithm for conflict-free scheduling in a packet switch with a matrix switch and obtain its specification in the form of a GN model.

3. To propose inbound traffic patterns realizing uniquely different loads for computer simulations of the throughput of conflict-free scheduling algorithms.

4. To develop a procedure for calculating an accurate upper bound on the throughput of conflict-free scheduling algorithms in a matrix-switched packet switch, to unambiguously adequately compare the throughput of conflict-free scheduling algorithms.

2. Degree of knowledge of the state of the problem and creative interpretation of the literary material.

The doctorant has demonstrated deep knowledge of the extensive literature on the topic of the dissertation. 130 publications were used, from world-renowned researchers and international standardization organizations, including from recent years.

3. Correspondence of the chosen research methodology with the set goal and tasks of the dissertation work.

The means and methods of the Generalized Nets theory and of the computer simulation, using modern high-performance computer systems, such as the grid-structure of IICT-BAS and the supercomputer "Avitohol" of BAS, as well as the software package Vfort, of the Institute of Mathematical Modeling of the Russian Academy of Sciences, are correctly selected and expertly used.

4. Scientific and/or scientific- applicable contributions of the dissertation:

The contributions are scientific- applicable and consist of:

1. A new MiMa (Minimum of Maxima) algorithm for conflict-free scheduling in a matrix switch packet switch is synthesized and investigated.

2. Four classic algorithms for conflict-free scheduling in a matrix switch packet switch were modeled with the Generalized Nets apparatus and investigated.

3. Four families of templates for 4 classical types of inbound traffic are synthesized, intended for large-scale computer simulations of the throughput of conflict-free scheduling algorithms, at 100% load of the inbound lines.

4. A numerical procedure is developed to calculate an exact upper bound on the throughput of conflict-free scheduling algorithms in a matrix switch packet switch. The procedure is applied to the results of the computer simulations of the throughput of the synthesized GN-models.

5. Significance of contributions for science and practice.

The developed methods and algorithms can be used both in the design of switches for broadband telecommunication networks, and in determining the methods and parameters for controlling the switches.

6. Evaluation of the publications on the dissertation work and their reflection in science.

The obtained results are reflected in 7 publications, of which 3 are individual. I have not been provided with a separation protocol for the contributions of co-authors in the dissertant's publications.

Based on the provided individual publications, on the content and style of the dissertation, as well as on my evaluations of T. Tashev's reports, which I have attended, I estimate that the personal contribution of the dissertant is significant and sufficient.

Publications are of high quality, one with impact factor, 2 with SJR, 2 published in IEEE publications, 2 in American Institute of Physics publications, 5 referenced in WoS and/or Scopus, 1 in eLibrary.

Six citations of publications by dissertation results were noted.

7. Assessment of the compliance of the author's reference with the requirements for its preparation

The abstract adequately reflects the main points and contributions of the dissertation work.

8. Notes of the member of the Scientific Jury:

1. There are a significant number of technical typesetting errors in both the thesis and the author's summary of his dissertation, which can be easily fixed.

2. The issue of computer simulation of Generalized Nets models is not addressed, which is important having in mind the several unsuccessful attempts to develop such simulators. The dissertant has solved this problem using the Vfort system, but this system is not currently available at the sites indicated.

3. The resources required by the proposed algorithm in its use in real switching devices are not sufficiently discussed.

9. Conclusion with a clear positive or negative evaluation of the dissertation work.

The dissertation shows that the candidate has in-depth theoretical and practical knowledge and the ability to conduct independent research.

I accept that the requirements of the Law on the Development of the Academic Staff in the Republic of Bulgaria, the Regulations for its implementation and the relevant regulations of IICT-BAS have been met. After familiarizing myself with the dissertation work and the publications to it, analyzing their significance and the contributions contained in them, I give my positive assessment and recommend to the Honorable Scientific Jury to award the educational and scientific degree "doctor" to assistant Tasho Dimitrov Tashev in the Field: 4. Natural Science, Mathematics and Computer Science, Professional division: 4.6. Informatics and Computer Science.

Date: 27.04.2023

Member of the Scientific Jury: На основание ЗЗЛД