

REVIEW

on a dissertation for obtaining the Degree Doctor of Philosophy

Author Eng. Iliyan Grozdanov Iliev

Dissertation Title: Optimizing the transition from asset management to service management in complex federated systems in the public sector

Member of the scientific jury: Prof. Teodor Iliev, PhD, University of Ruse “Angel Kanchev”, according to the order № 104/17.05.2026

doctoral programme: Computer Systems, Complexes and Networks

professional field 5.3: Communication and Computer Engineering

1. Relevance and significance of the scientific problem in the dissertation

The modern digital transformation in the public sector poses critical challenges to the management of complex IT infrastructures. The traditional model, focused on maintaining separate hardware and software components (asset management), faces serious limitations related to domain heterogeneity, increasing requirements for low latency, security and scalability. In this context, Iliyan Iliev's dissertation addresses an extremely topical problem - the scientific and applied justification and engineering improvement of the transition to a service-centric model within complex federated architectures in the public sector. The significance of the work is enhanced by the fact that the theoretical models are validated through real and diverse case studies from practice, including critical infrastructures on the Black Sea coast and the Danube basin.

Based on the above analysis of the current state of management of complex IT infrastructures and its compliance with the formulated goal and main tasks in the dissertation, I believe that the topic of the dissertation and the theses developed in it are relevant and challenging for scientific and applied development.

2. Structure and scope of the dissertation

The structure of the dissertation includes an introduction, five chapters, a conclusion, a list of contributions to the dissertation, a list of publications on the dissertation, a list of used references, a list of participation in projects.

The dissertation has a volume of 153 pages A4 and contains 49 figures and 6 tables. A total of 127 references were used in the development of the dissertation. Seventeen (117) of the references are in English, and ten (10) are in Bulgarian.

The dissertation includes a review of sources and materials published mainly in the last 10 years. I believe that the doctoral student has entered the essence of the researched subject area and I can conclude that through the analysis of the literary sources, a correct formulation of the purpose of the dissertation and the main tasks related to its achievement has been achieved.

The presentation in the first chapter of the dissertation sets the theoretical foundations of the study, providing a historical and technological overview of digitalization and justifying the transition from asset-centric to service-centric logic. Here, the regional deficits in Northeastern Bulgaria are very skillfully and unconventionally introduced as a starting point for the study. This knowledge has allowed the dissertationist to correctly assess the state of the problem and formulate the research goals in the dissertation work.

The second chapter of the dissertation is dedicated to methods for ensuring reliability and security in communication, with an emphasis on cryptographic algorithms (RSA and ECC) and the risks arising from sources of entropy.

In the third chapter of the dissertation, approaches for secure access to streaming content (HLS) and the prevention of personal data leakage by outsourcing authentication to external trusted domains are analyzed.

The fourth chapter of the dissertation explores the practical implementation of digital services in public administration, high-performance computing environments (GPUaaS with CUDA technologies), and the design of a federated AIS (Automatic Identification System) cloud.

In the fifth chapter of the dissertation, the engineering development is presented, presenting architectural solutions for optimization - a hybrid VoIP solution and a formalized resource effect model within the federated AIS cloud.

I believe that the doctoral student has adequately applied the relevant research methodologies and has correctly selected the necessary apparatus for conducting scientific and applied research on the dissertation.

3. Evaluation of scientific and applied scientific results and contributions

The main thesis of the dissertation was successfully defended: the transition from asset management to services requires a strict architectural separation of functions (management layer and data layer), provision of resources on demand and built-in security.

A reference containing 6 scientific and applied contributions is attached to the dissertation. In general, I accept the proposed formulations of the contributions in the dissertation, which can be summarized as follows:

1. Development of conceptual frameworks and architectural models: A unified approach for service management in federated domains has been created, which successfully unifies four heterogeneous classes of technology services (video streaming, cloud computing, real-time voice communications, and telemetry).

2. Cryptographic Optimization: A thorough analysis of vulnerabilities in random number generation for RSA keys has been performed and the engineering transition to Elliptic Curve Cryptography (ECC) for resource-constrained and distributed network structures has been argued.

3. Multimedia Privacy Architecture: A model for separating the video stream transport function (HLS) from the user identification process, reducing risks to personal data security in the public sector, has been proposed and validated.

4. Conceptual formalization and design of a Federated AIS Cloud: A mathematical and logical formalization of the resource effect of edge data deduplication has been developed. It has been proven that the federated approach prevents the overload of central resources with raw navigation data, ensuring a smooth increase in the load. This solution has direct applicability for national and regional maritime and river security (e.g. initiatives such as DANRISS 2).

4. Publications and citations of publications on the dissertation and participation in projects

A total of six publications have been submitted to the dissertation, one of which is to be reported at the international scientific conference International Conference on Electronics, Engineering Physics and Earth Science (EEPES 2026), taking place in the period 24-27 June 2026 in Bandara. Turkey. The published scientific publications provide 50 points and exceed the required 30 points in the scientometric indicators according to the minimum national requirements and the requirements of IICT for obtaining the educational and scientific degree "doctor".

The publications are in English and have been presented at the International Scientific Conference IEEE International Conference on Communications, Information, Electronic and

Energy Systems (CIEES) 2023 and 2025, two articles in the International Journal Information and Security 2021, 2022, and one report published at the annual meeting of SIAM.

The content of the publications corresponds to the topic of the dissertation work and largely covers and provides the necessary publicity for the main research and conclusions presented in the dissertation work.

A reference for participation in a project under the National Scientific Program (NSP) “Security and Defense” (NSP SO) is presented.

A reference for two citations of one publication of the author is attached to the dissertation. There is one citation in the Scopus database. All this proves the recognizability of the obtained results.

5. Personal impressions and style of the dissertation

The work makes an extremely strong impression with its academic, but at the same time strongly practical engineering-architectural language. The author demonstrates deep knowledge of a wide range of modern technologies (WebRTC, CUDA, Docker/Kubernetes, AIS systems, PON infrastructures). The integration of the geographical, historical and infrastructural specifics of the Black Sea and Danube regions into the research worldview gives the dissertation a unique character and high practical value.

6. Abstract and author reference

The abstract for the dissertation work of Eng. Iliyan Grozdanov Iliev is 38 pages long. It is well structured, reflects and presents precisely, clearly and completely the content of the dissertation work and complies with the requirements of the Act on the Development of the Academic Staff in the Republic of Bulgaria and the Regulations and its application. The qualitative assessment of the developed abstract is entirely positive.

The attached author's reference fully reflects the main stages of the conducted scientific research and work on the dissertation work.

The performed analyses enrich the existing knowledge on the issues of the topic, and the results of the dissertation research find real application in practice with an undeniable technical, economic and educational effect.

7. Critical remarks on the dissertation

I believe that the dissertation work is of sufficient volume and the necessary depth of research. The activity of the doctoral student is at a high level, and the results obtained are significant enough for the educational and scientific degree of "doctor". The publicity of the work is ensured and proven by publications of reports in refereed and indexed scientific conferences:

- Citing the literature used is not in accordance with the established requirements. It would be good if the literature sources were arranged – either alphabetically or in order of citation.
- It is not necessary to include the literature used in the abstract, it unnecessarily increases its volume.
- In the presented conceptual formalization of the resource effect in Chapter 5 (regarding the duplication coefficients at AIS receiving stations), it would be useful in the future for the model to be calibrated with a larger volume of real empirical data over a long period of time in order to verify the exact load parameters.
- I recommend that the author expand his research towards the practical implementation of the post-quantum cryptographic algorithms mentioned in Chapter 2, as they are quickly becoming a standard for protecting critical public infrastructure.
- I recommend that Eng. Iliyan Iliev, in his future scientific work, publish his results in scientific journals indexed by the global databases Scopus and WoS.

The recommendations and comments made do not diminish the merits of the developed dissertation and aim to assist the doctoral student in his future research activities.

Conclusion

The dissertation of Iliyan Grozdanov Iliev possesses all the necessary attributes required by the Law on the Development of the Academic Staff in the Republic of Bulgaria and its implementing regulations. It demonstrates in-depth theoretical knowledge, enviable engineering skills for the design of complex systems, and the ability to derive clear scientific and applied contributions.

Based on the above, I give my categorical positive assessment and propose to the esteemed Scientific Jury to award **Iliyan Grozdanov Iliev** the educational and scientific degree of "**Doctor**" in the doctoral program "Computer Systems, Complexes and Networks" in the professional field 5.3. "Communication and Computer Engineering".

12 June 2026 г.

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