

# Opinion

on a dissertation work

for the acquisition of an educational and scientific degree “**doctor**”

Author of the dissertation: *MSc.Eng. Iliyan Grozdanov Iliev*

Title of the dissertation: “*Optimization of the transition from asset management to service management in complex federated systems in the public sector*”

Professional field: *5.3. Communication and computer equipment*

Doctoral program: “Computer systems, complexes and networks”

Scientific jury member: *Assoc. Prof. Dr. Eng. Ivan Dinkov Ivanov*

## **1. Relevance of the problem developed in the dissertation in scientific and scientific applied terms**

Today's digital transformation in the public sector does not end with the implementation of individual technologies, but represents a rethinking of the way in which digital services are planned, delivered and managed. This transition is particularly complex in federated systems, where multiple autonomous administrative, communication, and computing domains must interact under different governance rules, heterogeneous infrastructure, and limited control over connectivity, security, and capacity.

The aim of this dissertation is to develop approaches to optimize the transition from asset management to service management in complex federated systems in the public sector. In this dissertation, optimization is defined as the engineering and organizational improvement of the life cycle of digital assets/assets. It covers their effective combination and provision as services in order to achieve minimum latency, high reliability and security, as well as maximum applicability in the real practice of the public sector.

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

The presented material shows that the doctoral student has thoroughly studied a large number of significant scientific publications in the field of optimization and the transition from asset management to service management in complex federated systems in the public sector. The total number of cited literary sources is 127, with a large part of them being published in the last ten years, which is a consequence of the topicality of the topic. Based on this, the goal of the dissertation work and the tasks for its achievement have been correctly formulated.

## **3. Correspondence of the chosen research methodology and the set goal and tasks of the dissertation with the achieved contributions**

In the context of this study, a service-oriented approach is considered, in which computing, network and organizational assets are provided on demand, dynamically combined and managed through architectural mechanisms oriented to the level of service, rather than to the individual hardware or software component. In this sense, the dissertation is dedicated to rethinking the approach to using digital technologies in their penetration into all spheres of economic and social life.

The dissertation is structured in **five chapters**, introduction, conclusion, list of used literature sources and appendices.

The **first chapter** examines the historical, technological and organizational prerequisites

for the digitalization of services in federated systems in the public sector. The development of the communication infrastructure is traced, the main classes of services relevant to the study are analyzed, and the need for a transition from asset management to service management is justified. At the end of the chapter, the goal, tasks, object, subject and methods of the study are formulated.

The **second chapter** examines the issues related to the security and reliability of communication services in a distributed environment. The limitations of RSA in the case of insufficient entropy are analyzed, the choice of ECC for the services considered in the dissertation is argued, and the perspective for development towards post-quantum cryptographic approaches in the context of secure digital services is outlined.

The **third chapter** examines approaches for access to protected content, protection of personal data, and secure provision of multimedia services. Architectural solutions for web streaming, authentication and encryption mechanisms, as well as models for local and regional content distribution in an environment of distributed networks and regional Internet providers are examined.

The **fourth chapter** examines the transition to the provision of digital services in the public sector through three interconnected directions: a platform for administrative services, high-performance computing services, and a federated service for the collection and pre-processing of streaming telemetry in real time. API-based access to services, processing of large volumes of structured and geospatial data, the use of GPU assets as a basis for providing on-demand computing services, as well as the architectural principles of a federated AIS cloud for service provision are considered.

In the **fifth chapter**, architectural solutions are proposed to optimize the transition from asset management to service management in complex federated systems. A hybrid VoIP solution for communication in an environment with NAT restrictions and a federated AIS cloud as a model for optimizing the provision of navigation telemetry as a service are presented. The emphasis is placed on the formalization of the resource effect, on the problems that the solutions address in a real environment, and on their systemic effect, including in the context of maritime security and future applications such as DANRISS 2.

Based on the above, I believe that there is full compliance between the chosen research methodology and the set goal and tasks of the dissertation.

#### **4. Scientific and/or scientific-applied contributions of the dissertation**

Scientific, applied and practical contributions:

1. A general model for the transition from asset management to service management in complex federated systems in the public sector has been developed. The model unites digital, network and computing resources into integrated services with guaranteed quality. This optimizes the reliability and security of processes, while improving their efficiency and organizational applicability in data management.

2. The choice of ECC (Elliptic Curve Cryptography) is argued as a more suitable cryptographic basis for the distributed services with limited resources considered in the dissertation. This has been achieved through a detailed analysis of the deficiencies of RSA at low entropy and the formulation of practical guidelines for increasing cryptographic robustness. In ECC, the entropy requirements for generating a secure key are significantly lower than in RSA (due to the smaller key size for the same level of security), which is critical for IoT devices and “edge” services, where sources of true randomness are often limited.

3. Methods for secure provision of multimedia services have been developed by separating the content distribution processes from the user authentication. This approach limits the processing of personal data by the distributor, ensures regulated redistribution and increases the cyber resilience of the service.

4. An architecture for providing administrative and computational services on-demand has been developed. It includes API-based access to geospatial data processing and a specialized insightd daemon for centralized GPU-accelerated computing. This approach minimizes the

dependence on expensive local hardware and significantly facilitates integration with external systems. The use of GPU-accelerated processing through a specialized daemon is a key advantage in the context of geospatial data (GIS). The combination of API access and GPU daemon architecturally separates the management interface from the heavy calculations. Due to the high parallelization requirements for spatial data sets, centralized structures offer significantly higher efficiency and computing power compared to the capacity of standard local workstations.

5. A hybrid VoIP architecture for communication services in environments with infrastructure constraints has been developed. The model combines centralized SIP signaling with direct media traffic transport, which minimizes latency and eliminates the negative impact of technical limitations at regional providers. This helps to circumvent problems with NAT traversal or bandwidth limitations by providers.

6. A federated AIS cloud architecture is proposed for providing navigation telemetry as a service. It is based on a strict separation between control and information functions and introduces specialized roles for processing data streams. Deduplication, cleansing and normalization mechanisms are integrated, which ensure the coordinated provision of reliable telemetry services. The federated cloud can unify data from different sources without forcing it to be centralized. The normalization and deduplication module effectively filters out the "noise" generated by the duplication of telemetry packets in dense sensor networks. This allows for the construction of a single, consistent picture of traffic in real time.

I believe that these contributions correctly reflect what the author has achieved in the process of the research conducted and will undoubtedly find their practical applicability.

## 5. Evaluation of the publications on the dissertation

On the topic of the dissertation work, 6 publications are presented. Three scientific publications are in publications that are referenced and indexed in world-renowned databases of scientific information and three scientific publications in non-refereed journals with scientific review or in edited collective volumes. Two citations are also noted.

All this shows that the work has received the necessary publicity. The essence and volume of the publications and reports fully reflect the problems developed by the dissertation.

## 6. Opinions, recommendations and notes

The following recommendations and critical remarks can be made to the presented dissertation:

- The text of the dissertation contains a certain number of foreign words, spelling, stylistic and typographical errors;
- I recommend that the doctoral student continue his development in his chosen field.
- How would you comment on one of the main weaknesses in ECC, namely: "Lack of public key validation" in the context of your work?

## 7. Conclusion

Despite the remarks made, I express a positive opinion about the dissertation work provided to me. The requirements for awarding the educational and scientific degree "doctor" have been met. The results obtained in the dissertation work represent an original scientific and applied contribution.

Based on the materials provided for the dissertation work, their relevance, and the scientific and applied contributions presented, I consider it reasonable to propose to the Honorable Members of the Scientific Jury to support the awarding of the educational and scientific degree "doctor" to M. Eng. Iliyan Grozdanov Iliev.

Date: 14.06.2026

Scientific jury

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