# INFORMATION OF DISSERTATION

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**5. Admission decision number:** The direction topic No. 5143/QĐ-ĐHDT dated on 16/05/2017 signed by the Provost of Duy Tan University, Da Nang, Vietnam

**6. Changes in academic process:** Adjust the direction topic No. ........./QĐ-ĐHDT on

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**7. Official dissertation title:** Performance optimization solutions in Mobile Edge Computing network

**8. Major:** Computer Science

**9. Code:** 9.48.01.01

**10. Academic Supervisors:**

- Academic Supervisors 1: Assoc. Prof. Ha Dac Binh

- Academic Supervisors 2: Prof. Anand Nayyar

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**12. Summary of new contributions of the dissertation**

In this thesis, the author proposes two performance optimization solutions for MEC networks as follows:

(i) System-protocol-design-based: the combination of one or more techniques such as NOMA, RF EH, wireless access point selection technique, and transmit/receive diversity techniques of the multi-antenna user to create a system protocol that guarantees maximum SCP with a tolerance constraint. Specifically, operation protocols are developed for the single-input single-output uplink and downlink RF EH NOMA MEC system, the downlink RF EH NOMA MEC multi-antenna user system, and the uplink NOMA MEC WSN system with multi-antenna wireless access point supporting multiple sensor nodes.

(ii) Software-based solution: using a algorithm based on genetic algorithm, swarm algorithm, and one-way search algorithm to determine optimal operating parameters for the MEC model, ensuring optimal system performance. The results of the Monte-Carlo simulation show the effectiveness of the proposed solutions.

**13. Ability to apply in practice**

The numerical results in the thesis are the premise for future MEC network designs.

## 14. Further research

Based on the results of this thesis, the author proposes some promising future research directions as follows:

(i) Investigate the MEC model under imperfect channel state information and decoding conditions. In fact, due to environmental or hardware factors, it is challenging for the system to collect perfect CSI and decode the NOMA signal perfectly. Therefore, considering this issue helps the proposed system closer to reality.

(ii) Apply more effective meta-heuristic optimization algorithms such as the Artificial Bee Swarm Algorithm, Ant Colony Algorithm, and Cuckoo Bird Algorithm... to solve the SCP optimization problem for proposed systems. Besides, the research and application of machine learning algorithms for optimization problems must be studied more carefully. MEC APs integrated with artificial intelligence enable better computational offloading support and provide more effective offloading strategies.

(iii) Proposing the RF EH NOMA MEC model with advanced techniques such as unmanned aerial vehicles (UAV) intelligent, reflective surfaces (Reconfigurable intelligent surfaces - RIS).

(iv) Consider the data structure, program and correlations between tasks during the partial offloading.

## 15. Author's Publications:

[1] **Van-Truong Truong** and Dac-Binh Ha, "Secured Scheme for RF Energy Harvesting Mobile Edge Computing Networks based on NOMA and Access Point Selection," *2020 7th NAFOSTED Conference on Information and Computer Science (NICS)*, 2020, pp. 7-12, doi: 10.1109/NICS51282.2020.9335833.

[2] **Van-Truong Truong**, Minh-Thong Vo, Dac-Binh-Ha, "Performance Analysis of Mobile Edge Computing Network Applied Uplink NOMA with RF Energy Harvesting". *In: Vo NS., Hoang VP., Vien QT. (eds) Industrial Networks and Intelligent Systems, (INISCOM), 2021*. Lecture Notes of the Institute for Computer Sciences, Social Informatics and Telecommunications Engineering, vol 379, pp. 57-72, Springer, Cham. https://doi.org/10.1007/978-3-030-77424-0_6.

[3] Dac-Binh Ha, **Van-Truong Truong**, Tan-Loc Vo, Duy-Hung Ha, "*On Performance of Mobile Edge Computing Network with Nonorthogonal Multiple Access and Radio Frequency Energy Harvesting*," 2020, 02(39), pp. 37-45, DTU Journal of Science and Technology.

[4] Ha, D. B., **Truong, V. T.,** & Ha, D. H., "A Novel Secure Protocol for Mobile Edge Computing Network Applied Downlink NOMA," In *International Conference on*

*Industrial Networks and Intelligent Systems,* 2020, pp. 324-336, Springer, Cham. https://doi.org/10.1007/978-3-030-63083-6_25

[5] **Van-Truong Truong**, Anand Nayyar and Dac-Binh Ha, "Secured Schemes for RF Energy Harvesting Mobile Computing Networks with Multiple Antennas based on NOMA and Access Points Selection," In *Wearable and Neuronic Antennas for Medical and Wireless Applications*, 2021, pp. 105-133, Scrivener Publisher (WlLEY), http://www.scrivenerpublishing.com/cart/title.php?id=708#desc.

[6] Ha, D. B., **Truong, V. T**., & Lee, Y., "Performance Analysis for RF Energy Harvesting Mobile Edge Computing Networks with SIMO/MISO-NOMA Schemes," *EAI Endorsed Transactions on Industrial Networks and Intelligent Systems*, 2021, 8(27), e2. DOI: 10.4108/eai.28-4-2021.169425

[7] **Van-Truong Truong**, Van Nhan Vo, Dac-Binh Ha and Chakchai So-In, "On the System Performance of Mobile Edge Computing in an Uplink NOMA WSN With a Multiantenna Access Point Over Nakagami-*m* Fading," 2022, vol. 9, no. 4, *IEEE/CAA J. Autom. Sinica,* DOI: 10.1109/JAS.2022.105461

[8] **Van-Truong Truong**, Dac-Binh Ha, Tien-Vu Truong, and Anand Nayyar, "Performance Analysis of RF Energy Harvesting NOMA Mobile Edge Computing in Multiple devices IIoT Networks", In *International Conference on Industrial Networks and Intelligent Systems,* 2022, Springer, Cham, https://doi.org/10.1007/978-3-031-08878-0_5

[9] **Van-Truong Truong**, Dac-Binh Ha, Anand Nayyar, Muhammad Bilal, Daehan Kwak, "Performance analysis and optimization of multiple IIoT devices radio frequency energy harvesting NOMA mobile edge computing networks", *Alexandria Engineering Journal*, 2023, Vol. 79, pp. 1-20, ISSN 1110-0168, https://doi.org/10.1016/j.aej.2023.07.025.