



THESIS ASSIGNMENT

Name and Surname: Bc. Pavel Semenov
Study programme: Applied Computer Science (Single degree study, master II. deg., full time form)
Field of Study: Computer Science
Type of Thesis: Diploma Thesis
Language of Thesis: English
Secondary language: Slovak

Title: Kubernetes security assessment

Annotation: Kubernetes has been gaining popularity rapidly in recent years as more and more enterprise solutions are subjected to cloud transformation and more companies are looking for the ways to increase development efficiency and reduce development costs. This brings new concerns from clients and stakeholders about the security of Kubernetes and its exposure to cyber-attacks.

Aim: This thesis studies, compares and evaluates the state-of-the-art tools designed to discover vulnerabilities concerning the cluster configuration, running pods or cluster itself. Assessment is carried out in both local cluster setup predisposed with multiple vulnerabilities and real-world enterprise cloud infrastructure. Based on the assessment results we intend either to improve one of the existing tools or develop a Kubernetes security framework of our own, which will be able to provide better results in addressing the cluster security.

Literature: V. B. Mahajan and S. B. Mane, "Detection, Analysis and Countermeasures for Container based Misconfiguration using Docker and Kubernetes", 2022 International Conference on Computing, Communication, Security and Intelligent Systems (IC3SIS), 2022, pp. 1-6, doi: 10.1109/IC3SIS54991.2022.9885293. <https://ieeexplore.ieee.org/document/9885293>
D. B. Bose, A. Rahman and S. I. Shamim, "Under-reported Security Defects in Kubernetes Manifests", 2021 IEEE/ACM 2nd International Workshop on Engineering and Cybersecurity of Critical Systems (EnCyCriS), 2021, pp. 9-12, doi: 10.1109/EnCyCriS52570.2021.00009. <https://ieeexplore.ieee.org/document/9476056>
Castillo Rivas, D.A., Guamán, D. (2021). "Performance and Security Evaluation in Microservices Architecture Using Open Source Containers". In: Botto-Tobar, M., Montes León, S., Camacho, O., Chávez, D., Torres-Carrión, P., Zambrano Vizuite, M. (eds) Applied Technologies. ICAT 2020. Communications in Computer and Information Science, vol 1388. Springer, Cham. https://doi.org/10.1007/978-3-030-71503-8_37
Clinton Cao, Agathe Blaise, Sicco Verwer, and Filippo Rebecchi (2022). "Learning State Machines to Monitor and Detect Anomalies on a Kubernetes Cluster". In Proceedings of the 17th International Conference on Availability, Reliability and Security (ARES '22). Association for Computing Machinery, New York, NY, USA, Article 117, 1–9. <https://doi.org/10.1145/3538969.3543810>



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