Implementation of Fault-Resilient Network Slicing using GNS3-Mininet Hybrid Testbed

Hyeon Ho Lee*, Won Seok Choi*, Hyeong Bin Choi*, Seong Gon Choi*

* Information & Communication Engineering, Chungbuk University, Cheongju-si, Chungcheongbuk-do, Korea

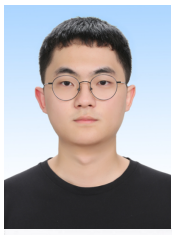
hhl9438@chungbuk.ac.kr, choiws@chungbuk.ac.kr, choibin2463@gmail.com, choisg@chungbuk.ac.kr

***(Pt9)Abstract*— We implement and validate an SDN based fault-resilient network slicing mechanism on a GNS3-Mininet hybrid testbed. URLLC services demand guaranteed QoS and ultra-low latency, yet current implementations lack swift and reliable slice recovery solutions when network failures occur in resource constrained dynamic environments. Therefore, we utilize an SDN controller and RESTCONF to ensure slice service continuity through centralized topology monitoring and dynamic traffic rerouting to backup paths. The mechanism monitors changes in network topology state, identifies missing nodes via topology snapshot comparison, triggers path reconfiguration algorithms, and installs backup flow rules. Our testbed combines GNS3 for realistic network device behavior with Mininet for scalable host emulation, enabling comprehensive end-to-end verification. We demonstrate the feasibility and effectiveness of the fault-resilient slicing mechanism through experimental validation in a laboratory environment.**

Keyword— Software Defined Networking (SDN), Network Slicing, GNS3, Mininet, Fault-Resilient

Hyeon Ho Lee received B.S. degree in college of Information & Communication Engineering from Chungbuk National University in 2024 He is currently pursuing the M.S. degree in Radio Communication Engineering. Chungbuk National University His research interests include network security, IoT, SDN and NFV

Won Seok Choi received B.S. and Ph.D. degree in the College of Electrical and Computer Engineering, Chungbuk National University, Korea in 2008 and 2014 respectively. He is currently researcher in Research institute of Computer and Information Communication, Chungbuk National University. His research interests include vehicle network, energy saving network, SDN, NFV, NGN and AI .



Hyeong Bin Choi is currently pursuing the B.S. degree in college of information & Communication Engineering from Chungbuk National University, Korea. His research interests include high-speed network architecture, SDN and NFV.

Seong Gon Choi received B.S. degree in Electronics Engineering from Kyungpook National University in 1990, and M.S. and Ph.D. degree from KAIST in Korea in 1999 and 2004, respectively. He is currently a professor in College of Electrical & Computer Engineering, Chungbuk National University. His research interests include V2X, AI, smart grid, IoT, mobile communication, high-speed network architecture and protocol.