

Intent-based 5G RAN Slicing for Smart Distribution Grids

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Motivation

- 5G network slicing and intent-based networking (IBN) can be used to design dynamic, automated and customized communication services required by smart distribution grid.
- Virtual and physical resource management and orchestration (M&O) are important as smart distribution grid applications may affect the performance in 5G radio access networks (RANs) with heterogeneous traffic.

Main contributions

- An M&O framework that incorporates the smart grid user intents for providing communication services.
- A performance assessment of 5G RAN with hybrid numerologies using three multi-dimensional Markov models to support heterogeneous traffic classes focusing on the transient behavior in a sliced network.

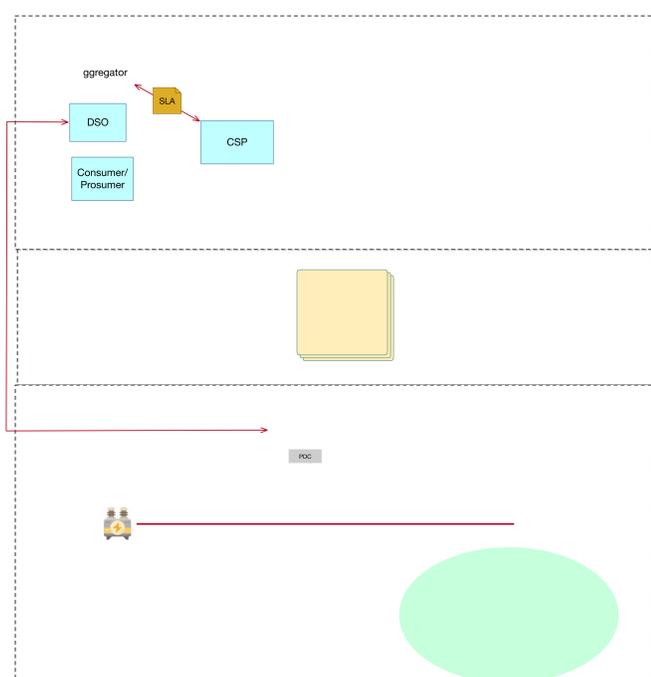


Fig 1: Intent-based management and orchestration architecture for smart distribution grid

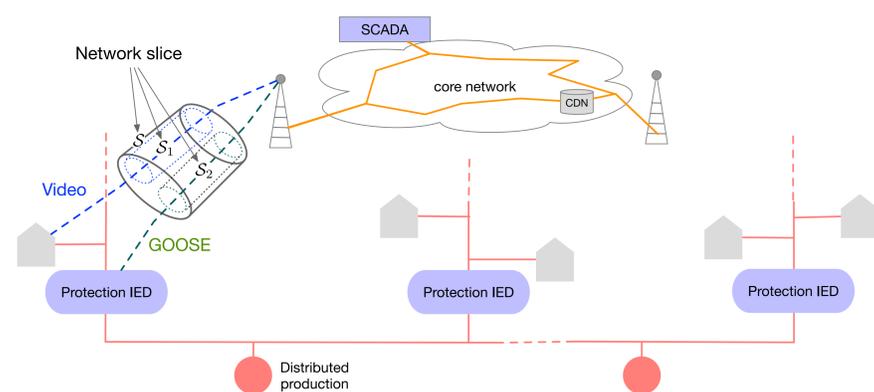


Fig 2: RAN sharing network scenario with two network slices

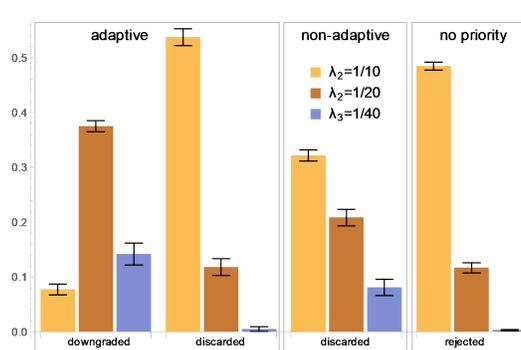


Fig 3: Reject, discard, and downgrade ratios for these network scenarios.

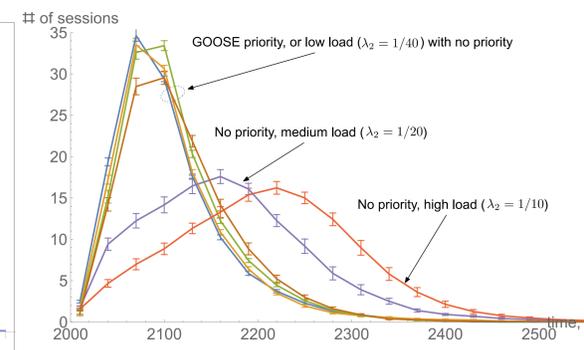


Fig 4: GOOSE burst periods

Summary

- Our study provides a reference framework for 5G network operators to increase RAN resource utilization by flexible allocation of radio resources.
- The M&O architecture facilitates the distribution grid automation using IBN and communication service provisioning using 5G network slicing.

Publications

- [1] HVK Mendis, PE Heegaard, and K Krlevska, "5G Network Slicing as an Enabler for Smart Distribution Grid Operations", in Proc. CIRED, Jun. 2019.
- [2] K Mehmood, HVK Mendis, K Krlevska, and PE Heegaard, "Intent-based Network Management and Orchestration for Smart Distribution Grids", in Proc. IEEE ICT, Jun 2021.
- [3] HVK Mendis, PE Heegaard, VC Giner, FY Li, K Krlevska, "Transient Performance Modelling of 5G Slicing with Mixed Numerologies for Smart Grid Traffic", in Proc IEEE CAMAD, Oct. 2021.