INTISARI

RUBINSTEIN-STAHL BARGAINING GAME UNTUK ALOKASI BANDWIDTH PADA JARINGAN LAN BERBASIS SDN

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Perkembangan jaringan komputer mendorong penerapan *Software Defined Network* (SDN) sebagai solusi untuk meningkatkan flesibilitas dan efisiensi manajemen jaringan. SDN memungkinkan pemisahan *control plane* dan *data plane* sehingga *controller* memiliki pengetahuan global untuk mengatur sumber daya, termasuk pengelolaan *bandwidth.* Meskiput bersifat terpusat, interaksi antara *host* sebagai peminta layanan dan *controller* sebagai pengelola sumber daya tetap dapat dapat dimodelkan dalam pendekatan teori permainan, karena setiap *host* memiliki preferensi dan kebutuhan yang berbeda. Berangkat dari konsep tersebut, penelitian ini mengusulkan model alokasi *bandwidth* berbasis Rubinstein-Stahl *bargaining game* pada jaringan LAN berbasis SDN untuk mencapai keseimbangan antara efisiensi, keadilan dan stabilitas. Model ini dibandingkan dengan metode alokasi klasik seperti HTB, TBF, CBF dan *Greedy* melalui enam indikator utama yaitu: SLA, *Efficiency, Fairness, Welfare, Gap*, dan *Stability*. Hasil pengujian menunjukan bahwa model *bargaining* memberikan kinerja terbaik secara konsisten dengan SLA 100%, pemanfaatan *bandwidth* optimal, serta distribusi yang adil (Jain Index ≈ 1; Gini Coefficient ≈ 0). Nilai *welfare* dan presisi alokasi (ΔB) yang tinggi serta perubahan kecil antara kondisi *balanced* dan *overload* menunjukan stabilitas dan adaptivitas yang baik. Secara keseluruhan, model Rubinstein-Stahl terbukti efisien, adil dan stabil jika dibandingkan dengan metode konvensional lainya, serta menawarkan pendekatan berbasis teori permainan yang relevan dan efektif untuk manajemen sumber daya jaringan modern berbasis SDN.

Kata Kunci: SDN, LAN, Teori Permainan, *Bargaining Game, Bandwidth*.

ABSTRACT

RUBINSTEIN-STAHL BARGAINING GAME FOR BANDWDITH ALLOCATION ON LAN-BASED SDN

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The development of computer networks has driven the adoption of Software Defined Networking (SDN) as a solution to improve flexibility and efficiency in network management. SDN enables the separation of the control plane and data plane, allowing the controller to maintain a global view of the network to manage resources, including bandwidth allocation. Although SDN operates in a centralized manner, the interaction between hosts as service requesters and the controller as the resource manager can still be modeled using game-theoretic approaches, as each host possesses distinct preferences and requirements. Building on this concept, this study proposes a bandwidth allocation model based on the Rubinstein–Stahl bargaining game for SDN-based LAN environments to achieve a balance between efficiency, fairness, and stability. The proposed model is evaluated against classical allocation methods such as HTB, TBF, CBF, and Greedy across six key performance indicators: SLA, Efficiency, Fairness, Welfare, Gap, and Stability. Experimental results show that the bargaining model consistently delivers the best performance, achieving 100% SLA compliance, optimal bandwidth utilization, and highly fair distribution (Jain's Index ≈ 1; Gini Coefficient ≈ 0). High welfare values, accurate allocation (ΔB), and small variations between balanced and overload conditions demonstrate strong stability and adaptivity. Overall, the Rubinstein–Stahl model proves to be more efficient, fair, and stable than conventional methods, offering a relevant and effective game-theoretic approach for modern SDN-based network resource management.

Keywords: SDN, LAN, Game Theory, Bargaining Game, Bandwidth, QoS.