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Comparative analysis of options for organizing internet traffic exchange in territorially distributed communication networks - Review 2

ROUND 2

Anonymous
Reviewer
Recommendation: Accept
Date: June 2, 2024

Comments:

The authors improved their manuscript, stating more clearly the limitations of their proposed model.

Anonymous
Reviewer
Recommendation: Minor Revision

Comments:

The paper is well written, well organized with a clear methodology. Some of the terms in the equations need to be explained. Other than that, minor aspects of the paper are listed below. The point that I think needs to be improved is to connect the theme of the work more closely to the scope of the Journal, which would be in the aerospace area. Here I suggest some contextualization to give the authors a starting point:

The proposed mathematical model for optimizing internet traffic exchange networks, which can be generalized to multiple Internet Exchange Points (IXes), highlights the potential for improved performance metrics such as lower delay, higher availability, and cost-effectiveness. This concept aligns well with the work of Chechin (2023), where the integration of terrestrial and satellite communication networks for UAVs is analyzed for example. Both studies emphasize the importance of dynamic control and optimal resource allocation to enhance the efficiency and reliability of information exchange. In the context of UAVs, the integration ensures high efficiency and reliability by dynamically managing information flows between terrestrial and satellite networks, similar to how the internet traffic exchange model seeks to optimize parameters like round-trip delay and channel capacity to improve network performance.

Furthermore, the discussion of using multiple IXes to enhance network performance is paralleled in Sampaio (2022) exploration of the Air Traffic Management (ATM) system through Complex Network Theory (CNT). Just as the internet traffic exchange network can be optimized for resilience and efficiency, the CNT model applied to the ATM system aims to identify critical nodes and enhance resilience against failures and targeted attacks. Both models underscore the significance of network topology and strategic resource allocation in maintaining robust and efficient operations, whether in internet traffic exchange or air traffic management. These examples elucidate a connection between the proposed manuscript and the aerospace scope of JATM.

Finally, Starlink, SpaceX's satellite internet service, which intends to establish a network of 12,000 satellites soon according to Pessoa-Filho (2021), also relies on Internet Exchange Points (IXPs) to interconnect with other networks and exchange traffic. IXPs are physical locations where different Internet Service Providers (ISPs) and network operators, including satellite providers like Starlink, connect their networks. Starlink users can peer directly with the Starlink network over IXPs located in Starlink's points-of-presence (PoPs). The IXP peering LAN and route servers facilitate this interconnection between Starlink and other networks. By peering at IXPs, Starlink can exchange traffic destined for its network more efficiently, reducing costs and improving performance. To ensure the article aligns with the JATM scope, I recommend establishing these links in the introduction, highlighting IXPs'

role in contemporary satellite communication as a key motivation, as well as their relevance to emerging technologies like UAVs and critical services such as ATM.

I also consider that motivations related to pricing for efficient traffic exchange at IXPs, especially in the context of 5G technology, are important and worth contextualizing in the work, as discussed in Alam et al. (2023) and Hoeschele et al. (2021).

At the beginning of the paper, I missed a figure explaining the IPX, with a map of https://www.internetexchangemap.com/, for example illustrating the areas with few IXPs. The same goes for when you comment on the AS architecture

When the authors say "This article proposes a mathematical model for evaluating the performance indicators of Internet traffic exchange networks for an arbitrary number Ixes", I have two questions on this point:

1) what metrics are you going to use would be interesting to mention at this point, packet loss, latency, throughput?
2) Aren't there any previous models in the literature that you could at least cite on this point?

Cite references for equations that are not yours

The conclusions of the paper are far below the standard of a scientific article, consider improving and highlighting the main contributions of the work.

See the references cited:

Alam, M. I. I., Anshelevich, E., Kar, K., & Yuksel, M. (2023). Pricing for Efficient Traffic Exchange at IXPs. IEEE/ACM Transactions on Networking.

Chechin, G. V., Kalyagin, M. Y., Kolesnichenko, V. E., & Zamkovoi, A. A. (2023). Organization of Communication with the Unmanned Aerial Vehicle in a Combined Data Transmission Network. Journal of Aerospace Technology and Management, 15, e2923.

Hoeschele, T., Dietzel, C., Kopp, D., Fitzek, F. H., & Reisslein, M. (2021). Importance of Internet Exchange Point (IXP) infrastructure for 5G: Estimating the impact of 5G use cases. Telecommunications Policy, 45(3), 102091.

Sampaio, F. C. G., Costa Filho, R. N., & Guterres, M. X. (2022). Modeling Resilience of Air Traffic Management Systems Based on Complex Networks. Journal of Aerospace Technology and Management, 14, e2222.

OECD (1998-04-01), "Internet Traffic Exchange:Developments and Policy", OECD Digital Economy Papers, No. 34, OECD Publishing, Paris. http://dx.doi.org/10.1787/236767263531

Pessoa Filho, J. B. (2021). Space age: Past, present and possible futures. Journal of Aerospace Technology and Management, 13, e3421.