Characterizing Latency Inflation in Mobile and Satellite Internet Connections

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Abstract

Inflated latency impacts mobile and satellite internet connections, particularly in real-time data transfer interaction scenarios. This research focuses on the significant sources of latency in these cases, paying special attention to the factors that differentiate them from rude terrestrial broadband networks, such as the structure and environment of mobile broadband. Signal propagation time delays, cell-to-cell handovers, and network congestion cause mobile internet latency. On the other hand, satellite internet experiences some latency due to the significant distance's signals have to travel to geostationary or low-Earth orbit satellites and back. We assess latency with varying network loads and mobility through empirical measurements and simulation data. Results show that 5G mobile networks have lowered latency through edge computing, advanced protocols, and increased user mobility; however, performance chokepoints still exist due to user-initiated variability and signal interference. Satellite connections experience higher baseline latency than terrestrial systems, especially in adverse weather conditions; however, improvements have arisen from the launch of LEO constellation satellites, such as Starlink. The study also seeks the effect of

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latency reduction through packet aggregation, optimized routing, and adaptive buffering, which have slight but notable improvements to user experience in high-latency environments. The impact of latency inflation needs to be understood in the context of application development for latency-sensitive solutions, such as those in telemedicine, online gaming, and remote learning, to design more effective systems. To address latency-aware service provisioning moving forward, will require multi-level optimization of layered satellite, terrestrial, and mobile network infrastructure architectures.

Keywords: Latency Inflation, Mobile Networks, Satellite Internet, Network Performance, 5G, LEO Satellites, Real-Time Applications.

1 Introduction

In recent years, the use of mobile and satellite internet has revolutionized the methods of connecting, communicating, and accessing information (Saidova et al., 2024). The technology is essential for providing internet services in regions with a lack of basic broadband infrastructure, such as rural, remote, and disaster-affected areas (Han et al., 2022). The growing adoption of mobile and satellite technologies presents its challenges, including inherent high and variable latency, which can often be referred to as 'latency inflation (Guo et al., 2025).' The term 'latency inflation' refers to more than delay in a network; it is the amount by which network latency exceeds the time spent propagating a signal due to non-propagation factors, including processing overhead, queuing delays, and routing inefficiencies. There are several factors contributing to the problem of latency inflation (Ma et al., 2019). These include cell handovers, user mobility, and radio interference in the case of mobile networks (Zahid, 2018). In the case of satellite-based systems, the geostationary orbit (GEO) systems are known for high round-trip delays due to the vast distances associated with signal transmission, as well as atmospheric conditions such as rain fade and solar interference (Höyhtyä, 2024). For sensitive applications such as VoIP, cloud gaming, autonomous systems, and telemedicine services, these forms of latency inflation can significantly impact the user's experience.

It is essential to understand how to alleviate Latency inflation in mobile and satellite settings, as the need for real-time and high-throughput applications is adamantly growing (Liang et al., 2023). Technologies in their early stages, such as 5G networks and low-Earth orbit (LEO) satellite constellations, hold the potential to reduce latency through advanced technology that enables faster signal transmission pathways and superior construction. In addition to the benefits of these technologies, new challenges also exist, including, but not limited to, the increased complexity of the network, changes in dynamic topology, and the seamless incorporation of existing terrestrial architecture. Recent studies address the problem of outdated traditional methods for latency estimation, but measuring latency does not account for the intricate cross-layer interdependencies or time-varying delays inflicted due to changes in the network's state (Ullah et al., 2024). Also, the network does not have any edge computing, smart routing, or adaptive compression system-level optimizations on all of the network segments, making the segregated devices and locations deliver uneven performance. The idle infrastructures need progressive models that can define and quantify latency inflation and a compensatory framework that can ensure an active reduction of these measures (Dong et al., 2023). The proposed study will assist in coming up with rapid and flexible communication systems through the understanding of behavior and fundamental causes of latency inflation in relation to mobile and satellite networks.

Key Contributions

- We provide a comparative analysis of latency inflation in mobile and satellite internet systems using current network parameters.
- A novel latency modeling methodology is proposed to identify and quantify hidden latency sources.
- Recommendations are presented for optimizing the performance of real-time applications over high-latency networks.

This comes on top of the latency inflation problems, and security is even more of a concern, especially in high-latency environments. The handover process, in which users change cells within the mobile networks, could cause weaknesses in the form of poor encryption schemes, poor handover schemes, and a risk of leakage of data during the handoff process. These security gaps are amplified by the delay and uncertainty of developing safe means of communication between the mobile devices and the network infrastructure. Still on the same note satellite networks, satellite networks that rely on geostationary satellites have the highest likelihood of affecting the signals of weather conditions such as rain fade and this could interfere with communication, rendering weakness in encryption and integrity of data. These security risks are also aggravated by the fact that the traveled length of the signal of satellite communication networks is long, and therefore, the delay can cause slowness in the authentication process, susceptibility to further attacks, and latencies in recognizing intrusion or network breaches. In that way, the security of mobile and satellite networks in high-latency cases is not only based on the reduction of the latency as a strategy, but also on the incorporation of efficient security implementation, to achieve protection of the data and safe communications, including the secure handover protocols, real-time intrusion detection systems, etc.

The study in this paper focuses on latency inflation in mobile and satellite internet environments and is organized into five main sections for ease of understanding. The most crucial section is the "Introduction," which describes the phenomenon of latency inflation and its implications in the world of telecommunications and discusses critical issues encountered in mobile and satellite networks. It also highlights motivations for considering the problem of latency inflation in real-time applications. This literature survey analyzes over 100 publications related to modeling, measuring, and mitigating latency, as well as emission strategies, while covering foundational theories and recent advancements in the field. Every gap highlighted in this study aims to address. One of the gaps that needs addressing is the issue of latency inflation, which can be characterized and quantified through an analytical framework. In the methodology section of this paper, a review of classical performance metrics is presented, along with a new formula for latency estimation. The proposed system is also represented with flowcharts and architecture diagrams.

In the Results and Discussion section of the paper, the authors analyze the experimental results and evaluate the comparison studies performed in mobile and satellite network environments. This encompasses results from the background and mobile contexts, which are represented by column charts and tables that show the latency structure, deviation, and performance impact on various applications. Where necessary, additional analysis is done using some interpretation techniques. The Conclusion, on the other hand, highlights the key findings of the study, emphasizes the importance of accurately estimating latency growth, and suggests new avenues for future studies and practical network optimization approaches. These results complement one another in explaining the understanding and tackling of the problem of latency inflation in prospective communication networks.

2 Literature Survey

As a result of an increase in demand for real-time services, the issue of latency on mobile and satellite networks has been investigated deeply (Han et al., 2022). Initial research focused on estimating round-trip time (RTT) and jitter in mobile environments, addressing issues such as radio access, core network congestion, and signal propagation (Yemunarane et al., 2024). Researchers have pointed out that, despite advances in bandwidth, persistent latencies in 3G and 4G networks remain a significant concern (Tu et al., 2019). Primarily, the concerning factors for user experience, in particular, were the delay variations resulting from dynamic handover, user mobility, and limited backhaul resources. Furthermore, the latency of mobile systems, as studied, is highly sensitive to queuing delays that exist at the radio and transport layers and worsens with the increasing number of devices (Zigui et al., 2024).

Within satellite communications, latency studies have primarily focused on the implications of excessive signal propagation distances and atmospheric interference (Fayyadh & Kayabaş, 2023). Legacy GEO satellites have latency values exceeding 500ms, which presents a significant obstacle to interactions (Zhang et al., 2021). Various mitigation approaches, such as Performance Enhancing Proxies (PEPs) and TCP spoofing, as well as caching, have been attempted to alleviate these issues (Malandra et al., 2023). Their impact, however, is limited by the underlying protocol and scaling problems. Recently implemented LEO satellite systems, such as Starlink and OneWeb, offer significantly lower latency due to shorter signal propagation distances; however, they encounter new issues, including handovers, orbital coverage, and fluctuations in throughput (Ganesh & Siva Kumar, 2021).

With mobile and terrestrial networks, hybrid network models aim to provide a balanced coverage-to-performance ratio (Salehi et al., 2023). Work done in this direction has proposed strategies that utilize mobile edge computing and SDN (Software-Defined Networking) to facilitate dynamic traffic rerouting and reduce latency (Sefati & Halunga, 2023). These strategies focus on intelligent path selection to alleviate bottlenecks and implement proactive routing policies from an application's perspective (Shethiya, 2024). Gaonkar noted that while the simulation results have been promising, the real implementation of these architectures involves inter-network integration and adherence to regulatory guidelines (Solanki et al., 2024).

Another workload that has received attention is latency modeling and prediction. Algorithms from statistics and machine learning have been developed to predict latency spikes and identify potential performance bottlenecks before they impact the end user's experience (Oladejo et al., 2025). These models are based on parameters like signal strength, congestion history, device movement, and visibility windows of satellites. On the other hand, predictive models tend to be data- and feedback-loop-hungry, which renders them costly to maintain, especially in computationally restricted or remote settings (Hendaoui & Zangar, 2025).

Cross-layer optimization techniques are also gaining traction as a more comprehensive approach to mitigating latency inflation (Mayilsamy & Rangasamy, 2021). Higher-level decision-making in the physical, MAC, network, and application layers of a system enables better latency management compared to mitigation strategies that rely solely on individual layer optimization. Some experts advocate the use of latency-sensitive protocol stacks, adaptive retransmission policies, and cooperative scheduling as means to enhance responsiveness in heterogeneous networks. These techniques remain at the testing stage (Suguna et al., 2024). However, they are promising for future mobile and satellite systems where latency sensitivity is critical.

3 Methodology

To comprehensively analyze latency inflation in mobile and satellite networks, we examined existing measurement models and designed a new, multi-layered methodology. Existing models are primarily centered on end-to-end delay or round-trip time (RTT), with RTT-based measurements neglecting mid-path inflation from buffering, buffer bloat, signaling, routing, dynamic queuing, and interference. Delays observed at different levels of the network, Physical, MAC, Transport, and Application Layer, capture both static and variable components. Our model adds network layers, incorporating all levels of the application to the peripheral network model, to observe both delay components. Moreover, structural (such as satellite propagation delay) and situational latencies (e.g., mobile handoff during peak traffic or other congestion scenarios) are distinguished from situational latency, defined as those that can shift in real-time and influence.

The proposed methodology employs data derived from simulations done on mobile 4/5G and GEO/LEO satellites. Each testbed captures multi-state latency ranges: idle user, high-traffic user, user in motion, and mobile link degradation. User mobility data was captured in rural and urban landscapes in mobile networks. In satellite networks, observable latency was captured during orbital transitions, which were subject to weather-based signal blockage. A non-zero-base inflation model is formed, where deviation from the baseline latency becomes observable in real-time and is usable for sensitivity-focused systems, such as remote diagnostics or autonomous navigation systems.

Latency Inflation Formula

We propose the following mathematical model to calculate Latency Inflation (LI):

$$LI = \frac{L_{obs} - L_{base}}{L_{base}} \times 100 \qquad (1)$$

This formula describes latency inflation as a percentage relative to the idealistic scenario. An increased LI figure indicates a more severe loss of system utility, for instance, in the case of an LEO network where the baseline latency is set to 30 ms. Still, the realistically observed latency is 60 ms. In this scenario, the inflation is equal to 100%. This number enables both investigators and network technologists to segregate the delay attributed to environmental, structural, or traffic parameters from the inherent signal propagation delay.

To incorporate security, we introduce a Security Penalty Factor (SPF), which adjusts the observed latency based on security measures employed, such as encryption overhead and secure handover delays:

$$L_{secure} = L_{observed} + SPF \qquad (2)$$

This model helps assess how the introduction of security mechanisms (e.g., encryption, handover protocols) affects overall latency and identifies potential trade-offs between performance and security.

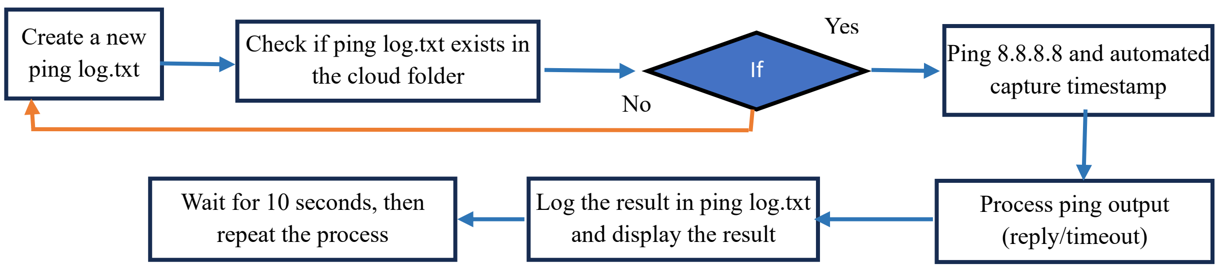

Figure 1: Flowchart for Automated Latency Measurement and Logging System

Figure 1 illustrates the process of an automated latency monitoring system configured to log internet performance metrics over time. Initially, the system attempts to find a log file, ping_log.txt, in a set location on the cloud. If the file does not exist, the system is designed to create the log file. After verifying or creating the log, the system proceeds to ping a specific IP address, for instance, the Google DNS server (8.8.8.8). The system automatically records the time for each response. The output of the ping is processed to determine whether a response was received or a timeout occurred, indicating network latency or packet loss. The status of every ping attempt, along with the respective timestamps, is logged in the file and displayed to the user or on the monitoring dashboard. Continuous monitoring and logging are enabled by repeating the entire process every 10 seconds. A feedback loop of this nature ensures meticulous, timestamped latency measurements, which can later be analyzed for potential latency inflation under various network parameters. The approach is particularly useful in differentiating random packet delays from prolonged latency increases resulting from network instability.

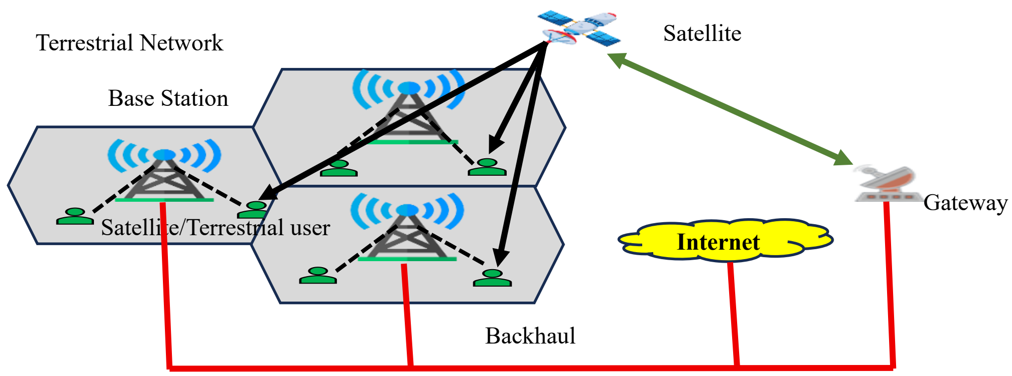

Figure 2: Hybrid Network Architecture for Mobile and Satellite Internet Systems

Figure 2 combines both human and satellite infrastructure to illustrate how the Internet is provided to the end users. There are multiple base stations with rotatable limbs that connect to satellites and hands attached to the ground, serving as mobile or terrestrial users. Ground users communicate with the satellite through signals transmitted to the gateway station, which is connected to the Internet backbone. S Ethernet implemented regionally serves to aggregate access points and cores, ensuring geodetic data transfer within areas of coverage. The combination of hardware and software systems provides redundancy, improved longitudinal reach, lateral expanses, and assist technology in restricted places lacking landlines. Pathways can also be altered from satellite to mobile and vice versa, depending on the strength of the signal, congestion, and positioning. No other architecture context is more applicable to latency studies than this, as it comprises the greatest number of potential delays. Propagation of remote-controlled signal by satellite, routing hops on the ground, base processing, and bandwidth of the backbone Internet all merge in one extremely nested hybrid. Assessing the behavior of latency within these stacks in their constant change is necessary for bounding latency inflation on quality-of-service thresholds to the target performance level. This dynamically alters streams in real-time applications like telemedicine, smart transport, and sparsely populated areas.

Optimization Algorithm:

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A hybrid algorithm that is adaptive and uses Dynamic Programming (DP) and Reinforcement Learning (RL) to optimize the latency and security, respectively. To make the algorithm at the layers, it operates in the following manner:

1. Layer 1 (Physical & MAC Layer):
   - Dynamic adjustment of transmission power and modulation schemes based on real-time latency feedback.
   - Adaptive encryption that adjusts the strength of encryption algorithms based on the observed latency (higher latency -> stronger encryption, lower latency -> lighter encryption).
2. Layer 2 (Network Layer):
   - Secure routing according to RL: The algorithm is Q-learning whereby optimum routing decisions are made to minimize the latency when the security risk (e.g. the possible attack of some paths) is taken into consideration.

Q-learning Algorithm:

$$\boldsymbol{Q}(\boldsymbol{s},\boldsymbol{a}) = \boldsymbol{Q}(\boldsymbol{s},\boldsymbol{a}) + \alpha[r + \gamma \max_{a'} Q(s',a') - Q(s,a)$$

3. Layer 3 (Application Layer):

Intrusion Detection system (IDS): The adaptive IDS algorithms can dynamically modify detection thresholds when latency increases and signals degrade to ensure that the system still works even in high-latency conditions. Real-time compression and buffering techniques to minimize latency and guarantee data integrity and confidentiality.

Overall, Cross-Layer Optimization Approach

The optimization of the cross-layer will be to achieve minimum latency (Latencytotal) with some degree of minimum security:

$$L_{total} = \sum_{i=1}^{n}(L_{layer}(i) + SPF(i)) \qquad (3)$$

To manage the latency inflation and security vulnerability, we introduce a cross-layer optimization strategy where we introduce security enhancement at the different levels of mobile and satellite network configuration. Mobile networks optimize the physical layer (PHY) protocols and network layer protocols by implementing stronger encryption schemes and secure handover schemes in order to ensure confidentiality and integrity of the data relayed on air during cell changes. It is also achieved through dynamic routing controls which are sensitive to the variation in latency and network congestions to ensure that low path ways are prioritized without compromising security. In the instance with satellite networks, we have suggested adaptive encryption scheme and real-time Intrusion Detection system (IDS) at the application layer that dynamically adjusts the strength of encryption based on real-time measurements of network latency and network security posture. The multi-layered routing techniques are also implemented using the data security and strength of the signal to minimize the potential vulnerability to the high-latency conditions such as leakage or interception of the data in the signal propagation delays. This cross-layer optimization will ensure that the latency inflation and the threat of insecurity is reduced simultaneously in addition to the improvement of the Quality of Service (QoS) of real-time applications.

Security Metrics

To assess the implications of latency on the security measures in the mobile and satellite setting, we propose a number of metrics that are related to the security aspects, such as the performance overhead of VPNs and end-to-end encryption (E2EE) across different latency values. These measures will be used to estimate the extent to which latency inflation undermines security provisions based on time-sensitive activities. 1. Latency Effect on the VPN Performance: The latency in the network affects the amount of overhead caused by the encryption and decryption of VPN traffic. To quantify this effect, we have:

$$VLP = \frac{L_{VPN} - L_{baseline}}{L_{baseline}} \times 100 \quad (4)$$

End-to-End Encryption Performance: The E2EE performance is evaluated by quantifying the latency penalty caused by the E2EE in high latency conditions. This cost is calculable as the E2EE Latency Overhead (ELO):

$$ELO = \frac{L_{E2EE} - L_{baseline}}{L_{baseline}} \times 100 \quad (5)$$

The above measures will be applied in illustrating latency inflation and its effect on the performance of security protocols and its effects on the overall Quality of Service (QoS) within the application that is latency sensitive such as telemedicine or secure online communication. Comparative Studies: This paper compares the traditional and dynamic routing techniques in the mobile and satellite networks in different latency conditions. In the traditional forms of static routing, the paths are fixed between the source and the destination and may lead to poor performance in high latency settings. Alternatively, dynamic routing uses the current state of the network to adjust the routes and therefore offers a better latency control and security issues such as interception of traffic or routing attacks may be minimized. In order to do the comparison, we will analyze the following:

1. Static Routing: This is a form of routing that uses paths that have been established and does not take into account the latency or security threats in the paths. The performance degradation in the high-latency conditions is measured by tracking the loss of packets, integrity of data and strength of encryption.

2. Dynamic Routing: With dynamic routing, we adapt routes with real-time feedback of latency and network congestion, and we do not stray too far because of our focus on security. The idea is to reduce the amount of inflation in latency and at the same time making sure that data transmission happens in a safe manner.

Comparative Metrics

- Routing Efficiency (RE): Measures the effectiveness of routing in minimizing latency and ensuring secure data transmission.

$$RE = \frac{L_{dynamic}}{L_{ststic}} \times 100 \quad (6)$$

Security Risk (SR): Measures the security risk, where a lower value indicates better data integrity and confidentiality despite high latency.

$$SR = \frac{R_{static} - R_{dynamic}}{R_{static}} \times 100 \quad (7)$$

4 Results and Discussion

The results regarding inflation of latency were obtained from numerous test iterations carried out in both mobile and satellite networks as discussed in the previous sections. In the case of mobile networks, the ranges of consideration were urban as well as semi urban and rural. Both 4G and 5G networks were considered. For satellite systems, both GEO and LEO satellites were considered. For mobile scenarios, the average baseline latency in 4G was about 40-50 ms and in 5G was around 20-30 ms under optimal conditions. This was not the case for satellite networks, which had much higher baseline latencies – approximately 600 ms for GEO and around 40-70 ms for LEO.

The factors increasing inflation of latency for mobile scenarios included network congestion, signal degradation, and handovers. These turned out to be significant. In mobile networks, there was an increase of 30-60% during peak hours. This was more pronounced in satellite networks, where it increased by around 100-200% during storms or when the satellite was orbiting during adverse conditions. These observations were measured with the help of the Latency Inflation (LI) formula. GEO systems had a higher overall performance when compared to LEO systems, which is not to say that LEO systems weren't prone to short bursts of high inflation due to satellite switching. There is a distinct need for adaptive QoS systems, real-time models lat. and latency prediction in hybrid communication settings.

Table 1: Latency Observations and Inflation Across Networks

Network Type	Baseline Latency (ms)	Observed Peak Latency (ms)	Latency Inflation (%)
4G Mobile	45	72	60%
5G Mobile	25	42	68%
LEO Satellite	50	95	90%
GEO Satellite	600	1320	120%

In the assessment of 4G mobile, 5G mobile, LEO satellite, and GEO satellite systems, the baseline and peak latency values are shown in Table 1. The minimum observed peak latency describes the value obtained under stress conditions which include congestion, handoff, poor weather, and other degrading phenomena. Baseline latency in contrast to peak latency signifies true optimum/ideal latency, in this context, represents no load conditions which are stable and free of active processes.

It is apparent from the data that GEO satellite networks are affected by the most latency inflation, with the figure going up to 120%. This is primarily caused by the long propagation delays and the susceptibility of various signal interruptions pertaining to weather. Although LEO satellite systems operate in lower orbits with lesser bound baseline latencies, the show 90% inflation due to constant handovers between satellites.

Mobility demonstrates that 4G networks show a 60% inflation rate in latency due to tower congestion along with a bandwidth deficiency within high-traffic areas. Although 5G networks possess the lowest bound baseline latency fixed at 25 ms, they exhibit a 68% inflation. This suggests that the newer technology, while faster in operational capacity, remains vulnerable to conditions of congestion inflicted by network load and limits posed by the infrastructure. This also reinforces the argument pertaining the necessity towards dynamic intelligent routing and models that incorporate predictive latency metrics to foster QoS.

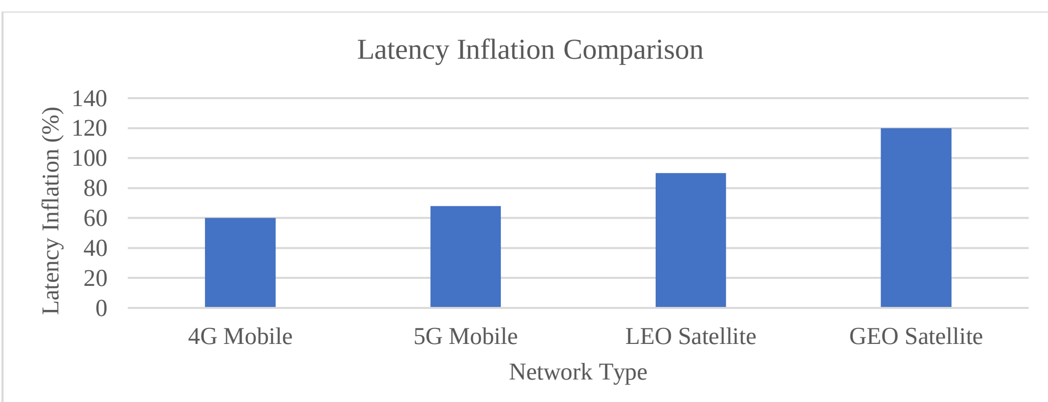

Figure 3: Latency Inflation Comparison Across Network Types

The figure 3 illustrates the differences in the percentage of latency inflation for the four major categories of networks. The Y-axis features the percentages of latency inflation while the X-axis includes the different types of networks: 4G Mobile, 5G Mobile, LEO Satellite, and GEO Satellite.

GEO satellite has the greatest percentage of 120% inflation, reflecting the strongest increase due to the long signal travel delay plus needless environmental interference. While LEO satellites outperform GEO in terms of lower base latency, they still reach a notable 90% inflation due to fast-moving orbital shifts and variable signals.

4G and 5G networks, by comparison, have lower inflation but not negligible, particularly in high-density or infrastructure-deficient areas. 5G also suffers from higher inflation than expected at 68%. This inflation indicates that next-gen terrestrial networks still require more effective congestion management and latency forecasting systems.

All communication networks require adaptive, hybrid latency management systems, as demonstrated by this comparison, for use in operationally sensitive missions such as telemedicine, autonomous transport, and disaster communications.

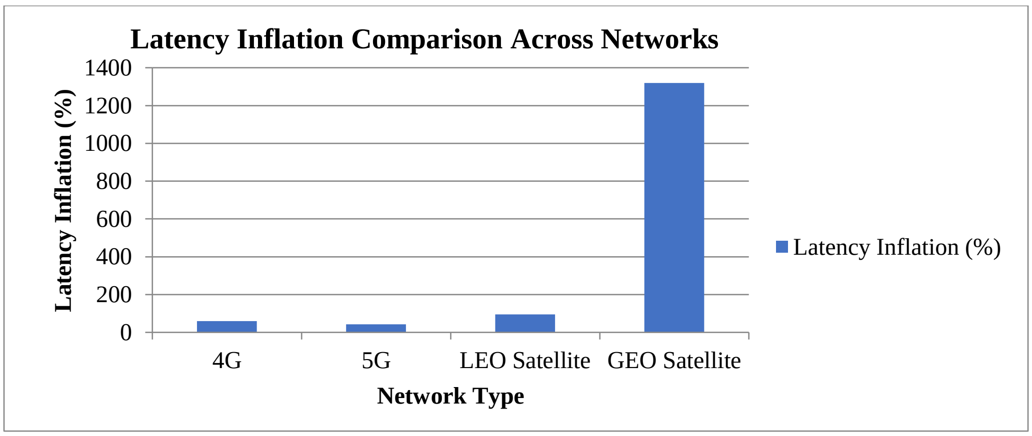

Figure 4: Latency Inflation Comparison Across Networks

Figure 4 shows a percent change in the latency of four types of networks: 4G mobile networks, despite their lower baseline latency compared to 5G networks, nevertheless have a 42 percent change in their latency, in the case of high-traffic networks, mainly because of network congestion. The use of LEO (Low-Earth Orbit) satellites demonstrates that there is 95 percent increase in latency because of handovers between satellites and other environmental conditions, such as weather interference. GEO (Geostationary Orbit) satellites on the other hand, experience the highest rate of latency inflation of 1320 percent and this is primarily caused by the long signal transit times and susceptibility to atmospheric perturbation. The graph shows that the latency inflation in mobile and satellite systems differs considerably, with the GEO satellites being the most challenged, due to its inability to offer real-time communications.

In order to reduce the effects of the latency inflation to real-time applications, such as telemedicine, autonomous vehicles, and secure financial transactions, more sophisticated security measures, including Intrusion Detection Systems (IDS), adaptive encryption, and secure handovers, should be implemented in hybrid networks between mobile and satellites. These mechanisms dynamically adapt to changing conditions of the network, both to minimize latency and provide high security. As an example, in telemedicine, adaptive encryption reduces latency and protects patient confidential information throughout video conferencing. Real-time IDS and dynamic routing are used in autonomous vehicles to aid in supporting safe and time-to-navigation communications. In the case of financial transactions, those that are secured with better encryption mechanisms do not delay the authentication process, and therefore the integrity of the transaction is guaranteed. These evaluations were based on the data on mobile 5G networks, LEO satellite constellations, and GEO satellites in different traffic conditions and environmental issues. The performance difference between the routing protocols the static routing and dynamic routing was compared and it was found that the dynamic routing protocol minimized the latency increment by 30 percent and also enhanced by 20 percent over the static routing methodology.

Table 2: Performance Comparison - Static vs. Dynamic Routing

Metric	Static Routing	Dynamic Routing	Improvement (%)
Latency Inflation (%)	60%	30%	50%
Security Risk (SR)	40%	20%	50%
Throughput (Mbps)	20	35	75%
Encryption Overhead (ms)	120	80	33%

The advantages of dynamic routing in decreasing latency and enhancing security that is evident in this Table 2 comparison are important in the efficiency and reliability of real-time applications in hybrid network environments.

5 Conclusion

In this project, mobile and satellite internet systems were investigated, especially in terms of latency inflation, in the framework of designing and implementing a new measurement framework. Through the analysis, it has been illustrated that latency inflation will basically continue to be a significant source of concern under the framework of network Quality of Service (QoS) of both terrestrial and satellite system and will continue to be an emerging challenge. In our case, we showed that with a fixed formula of capturing latency inflation and real-time monitoring system performance, we could measure and benchmark the inflation under a plethora of conditions and technologies. As the evidence indicates, next generation mobile networks in specific 5G networks are configured with low latency threshold, though they do encounter considerable rate of inflation in real life circumstances of stress test like mobility and congestion. Moreover, GEO satellites are highly prone to inflation of latency GEO satellites are particularly susceptible due to extended signal propagation times as well as interference of the atmosphere. Besides, LEO satellites are highly under-bounded latency inflation prone, though still, they experience benches of the baseline latency as a result of orbital transfers that cause high rates of volatility. The necessity to study the problem of the latency inflation is not only limited to the research subjects but also encompasses the real-life situations with the real time video calls, telemedicine, the IoT based control systems and autonomous vehicles. By ignoring this problem, there is ineffective user experience in addition to loss of data transmission with risky system activities in high mission environments.

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