1. What new possibilities will be created by the development of this application?

The development of 5G technology opens up numerous possibilities, significantly transforming various sectors and aspects of daily life (Rabine, 2022). It enables increased speeds of data transfer, supports a larger number of simultaneous connections, and offers faster response times between devices. Some of applications are as follows:

* **Enhanced Connectivity:** The advent of 5G technology promises unprecedented improvements in internet connectivity speeds. This leap forward not only means faster browsing and download speeds for consumers but also opens up new avenues for high-definition media streaming, real-time gaming, and seamless communication across the globe.
* **Internet of Things (IoT) Expansion:** Its ability to support a vast network of devices simultaneously is a game-changer for the Internet of Things (IoT). With its low latency and high capacity, it will enable more efficient smart cities, where everything from traffic lights to water systems can be interconnected. Homes will become smarter
* **Transforming Industries:** The industrial sector stands to benefit significantly from 5G technology. High-speed, reliable connectivity can drive automation in manufacturing, with smart factories leveraging IoT devices for real-time monitoring and decision-making. This could lead to enhanced productivity, reduced operational costs, and improvements in safety by minimizing human involvement in dangerous tasks.
* **Advancements in Healthcare:** This technology will also revolutionize healthcare by enabling telemedicine, remote monitoring, and digital diagnostics with greater efficiency and reliability. High-speed data transfer will allow for real-time sharing of patient data among medical professionals, facilitating faster and more accurate diagnoses. Additionally, 5G could enable remote surgeries through robotic arms, breaking geographical barriers to healthcare access.

Reference: Rabine, J. (2022). The Rise of 5G Technology: How Internet Privacy and Protection of Personal Data Is a Must in An Evolving Digital Landscape. <https://scholarship.law.edu/cgi/viewcontent.cgi?article=1128&context=jlt>

1. What vacuum of policies/standards existed concerning this applications?

The international 5G standards landscape and its implications for U.S. strategy (Brake, 2021) and policy are:

**Concerns over China's Influence:** The China's potential to manipulate international standards-setting bodies for 5G technology. This concern is rooted in China's strategic ambitions, as outlined in its China Standards 2035 plan, to dominate future industries, including telecommunications, though not necessarily fair or transparent processes. The fear is that China could leverage its increasing presence and influence in standards-setting organizations like the International Telecommunication Union (ITU) and the 3rd Generation Partnership Project (3GPP) to steer global 5G standards in a direction that benefits Chinese companies and national interests, potentially at the expense of global interoperability, innovation, and security.

**Governance of Standards-Setting Bodies:** The standards-setting bodies like 3GPP are designed with principles of transparency, consensus, and fairness in mind. These organizations have historically functioned well, fostering an environment where conflict is rare, representation is balanced, and outcomes are generally fair. However, the positive situation is not guaranteed to persist, especially in smaller bodies or those with weaker governance structures that could be more susceptible to influence or manipulation.

**Recommendations for U.S. Policymakers:** To safeguard the integrity of the standards-setting process and ensure continued U.S. leadership in technological innovation, the article makes several recommendations:

* **Analyze Governance Models:** U.S. policymakers and allies should closely examine the governance models of standards-setting organizations to understand their vulnerabilities and strengths.
* **Support Good Governance Mechanisms:** By informally observing deliberations and supporting good governance practices, the U.S. can help ensure that standards-setting remains fair and transparent.
* **Financial Support for Industry Participation:** Recognizing the financial burden of participating in international standards bodies, the U.S. government should provide financial support to U.S. companies. This support could help ensure that U.S. interests are adequately represented and that the standards-setting process benefits from U.S. technological leadership.

Reference: Bruer, A., & Brake, D. (2021). Mapping the international 5g standards landscape and how it impacts u.s. strategy and policy. <https://itif.org/publications/2021/11/08/mapping-international-5g-standards-landscape-and-how-it-impacts-us-strategy/>

1. What conceptual muddles exist concerning this application?

5G has introduced several new security challenges along with the applications. The conceptual muddles concerning the application of 5G networks, can revolve around the complexities and vulnerabilities introduced by this technology. Here are some the key points:

**Conceptual Muddles and Challenges:**

* **Virtualization and Containerization:** The shift from dedicated hardware to virtualized network functions (VNFs) running on standard server hardware or cloud platforms introduces a layer of abstraction that can be exploited if not properly secured (ENISA, 2022). This abstraction layer creates a challenges around the demarcation of security responsibilities and the implementation of effective security controls.
* **Orchestration and Management:**  The dynamic nature of NFV requires sophisticated orchestration and management tools to deploy, manage, and scale virtual network functions. This complexity introduces challenges in ensuring these tools themselves are secure and do not become vectors for attack.
* **Administration and Access Control:** The decentralized and dynamic nature of NFV architectures complicates the administration and enforcement of access controls, leading to potential security gaps if not properly managed.
* **Adoption of Open Source or Commercial Off-The-Shelf (COTS) Software:** While open-source and COTS software can accelerate NFV deployment, they also introduce risks if the software contains vulnerabilities or if dependencies are not securely managed.
* **Lawful Interception (LI):** The need to support lawful interception in a virtualized environment adds another layer of complexity, requiring secure and compliant solutions that do not compromise overall network security.

The ENISA report identifies 60 security challenges classified under these categories and proposes 55 best practices to address them. These practices span technical, policy, and organizational measures, aiming to mitigate the risks associated with NFV deployment in 5G networks.

Reference: ENISA. (2022). Tackling security challenges in 5g networks. <https://www.enisa.europa.eu/news/enisa-news/tackling-security-challenges-in-5g-networks>

You have highlighted the transformative potential of 5G technology in healthcare, emphasizing its role in enabling smart hospitals, telemedicine, remote surgery, and the integration of Internet of Things (IoT) devices in medical settings. While the benefits of 5G, such as higher data transfer speeds and network slicing, are clear, you also pointed out significant challenges, including data security, privacy concerns, and the need for robust cybersecurity frameworks to protect patient information and ensure the reliability of remote medical procedures.

The article by MIT(MIT technology review, 2021)It highlights how 5G, with its high-speed data transfer capabilities and low latency, is poised to revolutionize various sectors, including healthcare, by enabling advanced applications such as telemedicine, remote surgeries, and the operation of smart hospitals. The piece underscores the importance of network slicing, a feature that allows for the creation of multiple virtual networks, providing the flexibility and efficiency needed for the diverse requirements of different applications, from Internet of Things (IoT) devices to critical communications.

Furthermore, the article addresses the challenges and opportunities presented by the deployment of 5G technology. It discusses the need for robust policies and standards to safeguard patient data and ensure the compatibility of communication among IoT devices within the healthcare sector.

Reference: MIT Technology Review. (2021). Building the future with software-based 5g networking. <https://www.technologyreview.com/2021/12/15/1042187/building-the-future-with-software-based-5g-networking/>