**VILNIUS UNIVERSITY**

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**MARKET ANALYSIS REPORT**

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**OKR №4** Research the market of the VPN apps (Sofiia Chekmenova, Jaykumar Mathukiya, Stepan Kozlov)

* 1. Analyze providers of the online servers (Sofiia Chekmenova, first part of the report)
  2. Analyze the latest apps available (Jaykumar Mathukiya, second part of the report)
  3. Make a paper, creation of the paper and SWOT analysis (Stepan Kozlov)

**Aim of the 1st part of work:**

* The aim of this analysis is to overview the server infrastructure supporting VPN services, assessing their supply, demand, performance, and trends.

**Task for the 1st part of work:**

* Figure out how many servers are needed for VPNs.
* Find out what kind of servers VPN providers and users prefer.
* See where in the world these servers are located.
* Make sure VPN servers work well and don't break.
* Know how much it costs to get, run, and expand servers.
* Look at new server technologies and trends for VPNs.

**Aim of the 2nd part of work:**

* The aim of this analysis is to provide a comprehensive overview of the Virtual Private Network (VPN) market, including its size, dynamics, and key players.

**Task for the 2nd part of work:**

* Understand how big the VPN market is and how fast it's growing.
* Find out who the main players in the VPN market are and what they're doing.
* Learn what different types of VPN users want.
* See what's new and popular in the VPN world.
* Listen to what VPN users are saying to improve services.
* Check the rules and laws affecting VPNs.

# Overview of services which provide servers for Virtual Private Networks (VPNs)

In this part of the analysis, will be researched virtual server rental services. At first you need to understand why you need a server when developing a virtual private network (VPN). When setting up a VPN, you have the option of either using a VPN service provider or hosting the VPN on a rented server. There are several reasons why you might want to rent a server to create a VPN:

* Control and configuration. Renting a server allows you to have full control over the VPN configuration. You can configure security settings, select specific encryption protocols, and customize the VPN to suit your specific requirements.
* Privacy and security. By renting a server, you have more control over the privacy and security of your VPN service. Using a reliable hosting provider can ensure that your data is stored in a secure environment, which is especially important if you work with sensitive information.
* Resource Scalability. Renting a server allows you to choose the server specifications to suit your needs. You can scale resources such as CPU, RAM, and storage as your VPN user base grows, ensuring optimal performance for users.
* Bypassing Restrictions. Some countries or networks might block known VPN service provider IP addresses. By hosting your VPN on a server with an IP address not associated with a VPN service, you can potentially bypass these restrictions.

During the analyses, 10 services were found that provide server rental:

* Amazon Web Services (AWS)
* Microsoft Azure
* Google Cloud Platform (GCP)
* DigitalOcean
* Vultr
* Linode (Akamai)
* Rackspace
* IBM Cloud
* HostGator
* Bluehost
* NordVPN
* Hotspot Shield VPN
* OpenVPN

We looked through them all and chose three of them. At this stage, the main criterion for choosing services was the interface. Thus, we can conclude that a clear and easy website interface has a great influence on the subsequent choice of the customer. We chose DigitalOcean, Vultr and Linode. At first should be described advantages and disadvantages of each service. Here are:

* Pros and Cons of DigitalOcean:

|  |  |
| --- | --- |
| **Pros** | **Cons** |
| Simplicity and User-Friendly Interface | Limited Enterprise Features |
| Affordability | Limited-Service Offerings |
| Droplets (Virtual Servers) | Support Tiers |
| Developer-Friendly Features | Complex Networking |
| Data Center Locations | Storage Limitations |

Pros and Cons of Vultr:

|  |  |
| --- | --- |
| **Pros** | **Cons** |
| High-Performance SSD Storage | Multiple Data Center Locations |
| Multiple Data Center Locations | Customer Support |
| Developer-Friendly Features | Complex Networking Configurations |
| Dedicated Instances and Block Storage | Limited-Service Offerings |
| Pricing |  |

Pros and Cons of Linode:

|  |  |
| --- | --- |
| **Pros** | **Cons** |
| Server Customization | Limited Enterprise Features |
| Multiple Data Center Locations | Complex Networking Configurations |
| High-Performance SSD Storage | Service Offerings |
| Developer-Friendly Features | Managed Services |
| Scalability | Customer Support |

Secondly, we checked feedback from users about these tools in the Internet. Here you can see some of them:

* Positive and negative feedback about DigitalOcean:

A screenshot of a computer

Description automatically generated

***Figure 1. Feedback about DigitalOcean***

* Positive and negative feedback about Vultr:

A screenshot of a computer

Description automatically generated***Figure 2. Feedback about Vultr***

* Positive and negative feedback about Linode:

A screenshot of a screenshot of a chat

Description automatically generated***Figure 3. Feedback about Linode***

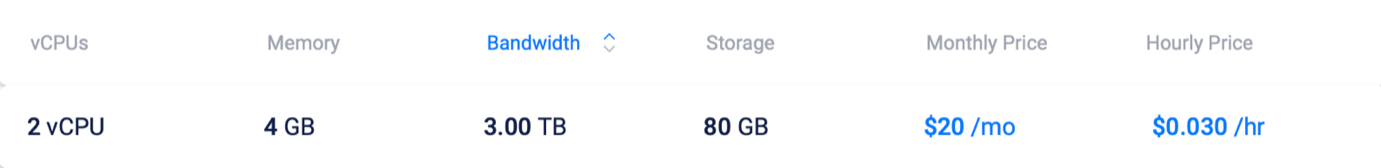
The next step was to choose the best service that fully meets our needs. We found plans on each site. We will compare according to the following criteria: Memory, CPUs, Transfer (in Vultr it called Bandwith), Storage (in DigitalOcean it called SSD) and $/month. Among all packets in each service, we chose the most similar. Here are:

* DigitalOcean:

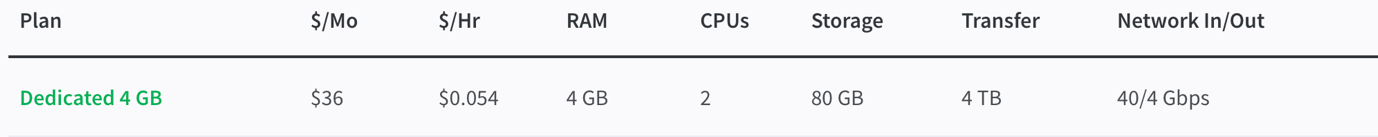
A close-up of a number

Description automatically generated***Figure 4. DigitalOcean pricing***

* Vultr:

***Figure 5. Vultr pricing***

* Linode:

***Figure 6. Linode pricing***

Here you can a see a table for better understanding:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Memory | CPUs | Storage | Transfer | $/m |
| DigitalOcean | 4 | 2 | 80 GB | 4 TB | 24 |
| Vultr | 4 | 2 | 80 GB | 3 TB | 20 |
| Linode | 4 | 2 | 80 GB | 4 TB | 36 |

All packets have the same memory and CPUs and Storage unity, but transfer and price are different. The Vultr is the chippiest, but it transfer equal 3 TB. Regarding our project, it will be enough 3 TB, but the price difference is not that big (comparing with Linode). Linode’s packet is really expansive, therefore, both DigitalOcean and Vultr can be used for our project.

And the last step is to identify the locations of servers of each service. regions. For the best performance and minimal latency, we should choose the datacenter nearest to us and our users. We need the server, which located close to Lithuania. Here are the lists of countries, where located servers of DigitalOcean, Vultr and Linode:

* DigitalOcean:
  + India (Bangalore)
  + Singapore (Singapore)
  + Germany (Frankfurt)
  + Netherlands (Amsterdam)
  + United Kingdom (London)
  + Canada (Toronto)
  + United States (New York. San Fransisco)
* Vultr:
  + Mexico (Mexico City)
  + Brazil (Sao Paulo)
  + Australia (Melbourne)
  + United States (Honolulu)
  + India (Mumbai, Bangalore, Delhi NCR)
  + South Africa (Johannesburg)
  + Israel (Tel Aviv)
  + Chile (Santiago)
  + Japan (Osaka)
  + United Kingdom (Manchester)
* Linode:
  + USA (Newark, Dallas, Atlanta, Fremont)
  + Singapore (Singapore)
  + United Kingdom (London)
  + Germany (Frankfurt)
  + Canada (Toronto)
  + Australia (Sydney)
  + Japan (Tokyo)
  + India (Mumbai)

The closest server of DigitalOcean to Lithuania (Kaunas) is in Germany (Frankfurt), Vultr - United Kingdom (Manchester) and Linode - Germany (Frankfurt). Germany located closer to the Lithuania rather than United Kingdom.

Finally, we can choose the best tool. Regarding all explanations above, the best service which provides servers is DigitalOcean. It has good feedback from users, the price and package contents fit all our requirements, the location of the server not so far away and as we mentioned at the beginning, the interface of the website is clear, easy and understandable.

# Overview of the Virtual Private Networks (VPNs)

**Market Research Analysis of NordVPN**

Introduction

NordVPN stands as a market leader in the VPN industry, renowned for its robust security features, user-friendly interface, and extensive server network. This analysis delves into NordVPN's market positioning, highlighting its strengths and areas for potential improvement.

Market Positioning

NordVPN occupies a prominent position in the VPN market due to its:

* Security Protocols: Utilizing top-tier encryption standards, including AES-256 bit encryption, ensuring user data confidentiality and integrity.
* Server Network: Boasting a vast network of servers spanning across multiple countries, providing users with a seamless and fast connection experience.
* User-Friendly Interface: Offering an intuitive interface, catering to both tech-savvy users and beginners, enhancing user accessibility.
* Privacy Focus: Commitment to a strict no-logs policy, ensuring user anonymity and privacy.
* Continuous Innovation: Regularly updating features, such as specialty servers for specific needs (like streaming and P2P), showcasing adaptability to market demands.

Competitive Analysis

NordVPN's main competitors include ExpressVPN, CyberGhost, and Surfshark. While these competitors offer similar features, NordVPN differentiates itself through a combination of advanced security features, a vast server network, and a reputation for reliability.

User Satisfaction

NordVPN enjoys high user satisfaction due to:

* Reliability: Consistent performance across various platforms and devices, ensuring uninterrupted service.
* Customer Support: Offreting responsive customer support, addressing user queries promptly and effectively.
* Affordability: Providing competitive pricing plans, catering to budget-conscious users without compromising on quality.

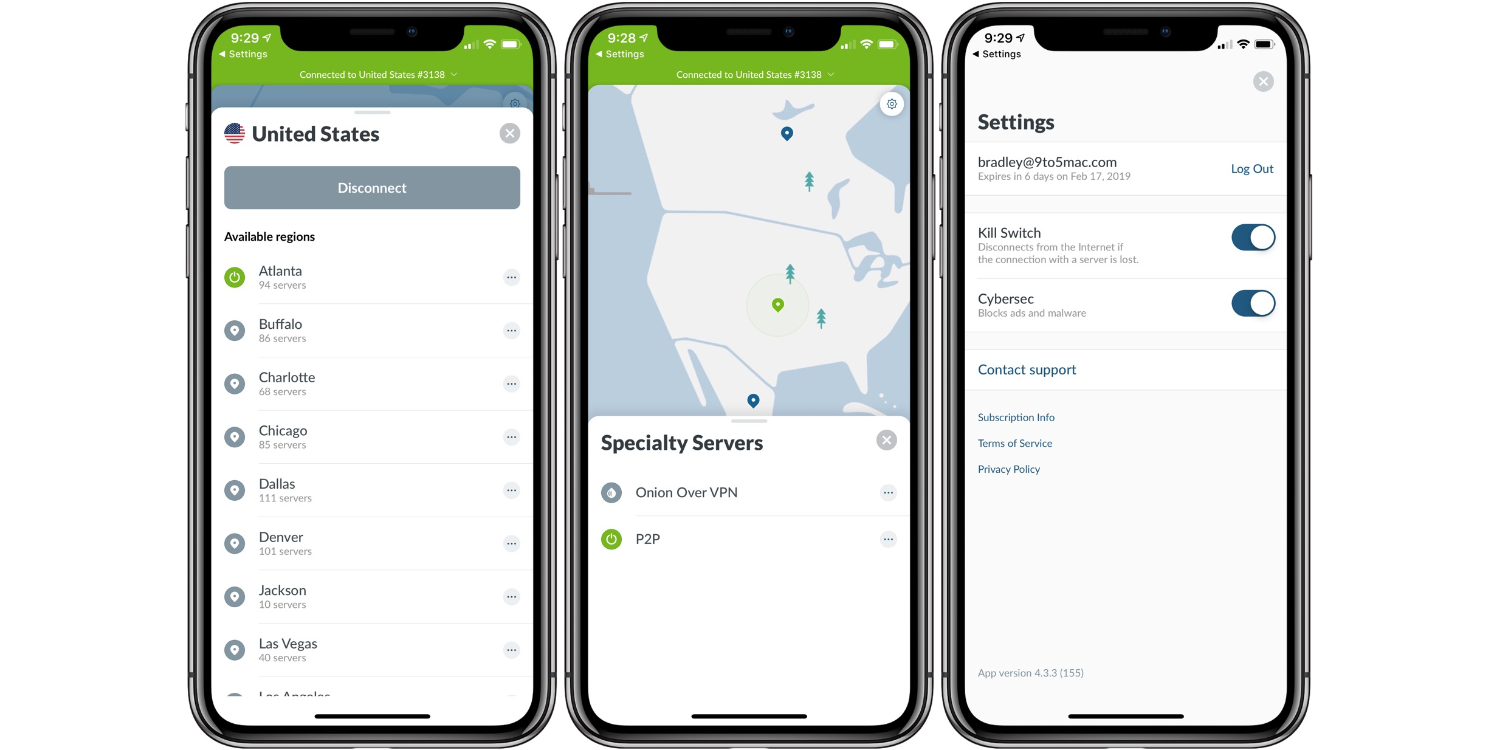
Areas for Improvement

* Speed Optimization: Although NordVPN offers a large server network, some users report inconsistent speeds, suggesting a need for further optimization.
* User Education: Enhancing user education about advanced features could improve user engagement and satisfaction.

Conclusion

NordVPN's strong market position stems from its robust security features, user-friendly design, and commitment to user privacy. As you proceed with your VPN app development, analyzing NordVPN's success provides valuable insights into user expectations and industry standards, guiding your team towards creating a competitive and user-focused product.

NordVPN screenshots



***Figure 7. Screenshots of NordVPN***

**Market Research Analysis of Hotspot Shield VPN**

Introduction

Hotspot Shield VPN, once considered a prominent player in the industry, has faced significant scrutiny due to various downsides affecting its reputation. This analysis focuses on the negative aspects, shedding light on the key issues surrounding Hotspot Shield VPN based on the provided information.

Downsides and Concerns

Hotspot Shield VPN has been accused of multiple privacy breaches, including tracking user data, injecting ads, redirecting traffic, and selling user information to third parties. These allegations raise serious concerns about user privacy and data security, undermining the fundamental purpose of a VPN.

* Poor Customer Support and Limited Compatibility: Users have reported dissatisfaction with Hotspot Shield VPN's customer support, indicating a lack of responsiveness and assistance. Additionally, the VPN's inability to work with popular streaming services like Netflix diminishes its value, limiting users' options for content accessibility.
* Malware and Adware Risks: The presence of malware and adware in Hotspot Shield VPN's installer poses a significant threat to users' devices and data integrity. This compromise in security creates a substantial risk for users, deterring them from utilizing the service.
* Subpar Speed and Protocol Limitations: Independent speed tests have revealed Hotspot Shield VPN's inferior performance, particularly in distant locations. Moreover, the use of a relatively slow VPN protocol primarily designed for Windows devices further hampers its effectiveness, resulting in subpar user experiences in terms of speed and connectivity.
* Privacy Policy Concerns: The affiliation with the Aura group and the handling of user connection and data as per Aura's privacy policy have raised additional concerns. An in-depth analysis of the policy has left users unimpressed, indicating a lack of transparency and user-focused privacy practices.

Conclusion

Hotspot Shield VPN, once a notable contender, now faces significant criticism due to its compromised data privacy, inadequate customer support, compatibility limitations, security risks, speed issues, and privacy policy concerns. These downsides not only diminish its reputation but also raise questions about the ethical and user-centric practices of the service provider. For users seeking a reliable and secure VPN experience, exploring alternatives with a better track record in privacy and security is highly advisable.

Hotspost Shield VPN screenshots

A blue and white power button

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***Figure 8. Screenshot of Hotspot Shield VPN***

A screenshot of a phone

Description automatically generated

***Figure 9. Screenshot of Hotspot Shield VPN***

**Market Research Analysis of OpenVPN**

Introduction

OpenVPN is an open-source VPN protocol and software solution widely recognized for its flexibility and security. This analysis provides an overview of both the strengths and weaknesses of OpenVPN to present a comprehensive view for potential users.

Positive Aspects

* Open-Source and Customizability: OpenVPN's open-source nature allows for extensive customization and adaptation according to specific user requirements. Its flexibility enables businesses and developers to tailor the VPN setup precisely to their needs, making it a popular choice for enterprises and tech-savvy users.
* Strong Security Features: OpenVPN is renowned for its robust security protocols, including military-grade encryption (AES-256 bit) and support for various authentication methods. Its emphasis on security and the availability of security audits contribute to its reputation as a reliable choice for privacy-conscious users.
* Cross-Platform Compatibility: OpenVPN supports multiple operating systems, including Windows, macOS, Linux, iOS, and Android, ensuring widespread compatibility. This cross-platform availability enables users to maintain a consistent VPN experience across different devices and platforms.
* Community Support and Documentation: The OpenVPN community is active and vibrant, providing extensive support, forums, and documentation. This wealth of resources aids users in troubleshooting, configuration, and understanding the intricacies of the VPN, enhancing the overall user experience.

Negative Aspects

* Complex Setup for Non-Technical Users: OpenVPN's extensive customization options can be overwhelming for non-technical users. The initial setup process, especially for self-hosted solutions, might require technical expertise, potentially deterring individuals seeking a straightforward, plug-and-play VPN experience.
* Limited User-Friendly Interfaces: While there are third-party applications and services offering simplified interfaces for OpenVPN, the core OpenVPN software primarily provides a command-line interface and basic GUIs. Users accustomed to highly intuitive VPN interfaces might find OpenVPN's native interfaces lacking in user-friendliness.
* Network Performance and Speed: OpenVPN's performance, particularly in high-demand networks, can sometimes be slower compared to proprietary VPN solutions. This limitation might affect users who prioritize high-speed connections for activities like streaming or online gaming.

Conclusion

OpenVPN's strength lies in its open-source nature, allowing for extensive customization, robust security features, cross-platform compatibility, and a supportive community. However, its complexity in setup, lack of user-friendly interfaces, and potential performance limitations in certain scenarios should be considered by users. For tech-savvy individuals and businesses seeking a highly customizable and secure VPN solution, OpenVPN remains a compelling choice, provided they are willing to invest time in the setup and configuration process.

OpenVPN screenshots

A screenshot of a black screen

Description automatically generated

***Figure 10. Screenshot of OpenVPN***

A screenshot of a login form

Description automatically generated

***Figure 11. Screenshot of OpenVPN***

A screenshot of a phone

Description automatically generated

***Figure 12. Screenshot of OpenVPN***

A screenshot of a black and orange box

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***Figure 13. Screenshot of OpenVPN***

# SWOT analysis for 1st part:

* DigitalOcean service:

|  |  |  |  |
| --- | --- | --- | --- |
| Strengths | **Weaknesses** | **Opportunities** | **Threats** |
| User-friendly interface | Limited server locations | Growing demand for cloud services | Intense competition |
| Competitive pricing | Fewer advanced features | Expansion into new markets | Rapid technological changes |
| Scalability | Limited variety of services | Partnerships and collaborations | Data security concerns |
| Developer-focused community | Smaller network compared to major competitors | Rising interest in cloud-native applications | Economic downturns |
| Transparent pricing model | Potential for service outages | Increasing awareness of cloud benefits | Regulatory changes |
| Strong developer support | Limited customer support options | Growth in the developer and startup ecosystem | Dependency on third-party infrastructure |

* Vultr service:

|  |  |  |  |
| --- | --- | --- | --- |
| **Strengths** | **Weaknesses** | **Opportunities** | **Threats** |
| Competitive pricing | Limited server diversity | Expanding service offerings | Intense competition |
| High-performance servers | Smaller network compared to major providers | Market expansion into new regions | Security vulnerabilities |
| Scalability | Fewer advanced features | Attracting developers and startups | Data privacy concerns |
| Simple and user-friendly interface | Limited customer support options | Partnerships and collaborations | Economic downturns |
| Developer-oriented focus | Potential for service outages | Growing cloud adoption | Regulatory changes |
| Transparent pricing structure | Limited global presence | Increasing demand for cloud-native solutions | Infrastructure failures |
| Active developer community | Dependency on third-party infrastructure | Potential for growth in emerging markets | Evolving cyber threats |

* Linode service:

|  |  |  |  |
| --- | --- | --- | --- |
| **Strengths** | **Weaknesses** | **Opportunities** | **Threats** |
| Well-established brand | Limited server locations | Expanding service offerings | Intense competition |
| Competitive pricing | Smaller network compared to major providers | Growing cloud adoption | Data security concerns |
| Excellent performance | Fewer advanced features | Attracting developers and startups | Economic downturns |
| Developer-friendly | Limited customer support options | Partnering with businesses | Regulatory changes |
| Transparency in pricing | Potential for service outages | Market expansion into new regions | Infrastructure vulnerabilities |
| Scalability | Limited global presence | Increasing demand for cloud-native solutions | Dependency on third-party infrastructure |

# SWOT analysis for 2nd part:

* NordVPN:

|  |  |  |  |
| --- | --- | --- | --- |
| **Strengths** | **Weaknesses** | **Opportunities** | **Threats** |
| Wide server network | Premium pricing | Expanding user base | Growing competition |
| Strong encryption and security | Limited free plan | Expanding into new markets | Privacy regulations |
| User trust and brand reputation | May not support all devices | Strategic partnerships | Evolving cyber threats |
| User-friendly interface |  | Enhanced service features |  |

* Hotspot Shield VPN:

|  |  |  |  |
| --- | --- | --- | --- |
| **Strengths** | **Weaknesses** | **Opportunities** | **Threats** |
| Large server network | Privacy concerns | Expanding user base | Growing competition |
| Robust security features | Premium pricing | Expanding into new markets | Regulatory changes |
| User-friendly interface | Limited free plan | Strategic partnerships | Evolving cyber threats |
| Trusted brand reputation |  | Improved customer support |  |

* OpenVPN:

|  |  |  |  |
| --- | --- | --- | --- |
| **Strengths** | **Weaknesses** | **Opportunities** | **Threats** |
| Open-source and customizable | Technical complexity | Integration with other software | Limited user-friendliness |
| Strong security capabilities | May require advanced configuration | Adoption in corporate environments | Competition from commercial VPNs |
| Versatility and compatibility | Limited customer support | Expanding user base | Regulatory changes |
| Active developer community |  | Enhanced documentation |  |

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