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**SOME NETWORKING SKILLS TO APPLY FOR WLANs TO MAKE THEM MORE
ACCELERATED AND PERSPECTIVE IN FUTURE**

This article investigates the features of the information technologies and their constantly changing nature. For example creation of new algorithms to solve the problem of high-performance IP lookup engine can be effective for the short period of time. People working in this industry need to be constantly ready for the changes and to learn new skills. Wireless technology becomes a part of our life very fast. It gives the chance to be more independent in computing area but new problems with wireless networks designing and security appears. Here the existed problems of IP Lookup engines for software routers, wireless networks are investigated and possible solutions are shown.

Key Words: IP Lookup, Software Router, WLAN, network engineering, improve.

Fig. 1., Ref. 6.

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**ЗАСТОСУВАННЯ ДЕЯКИХ МЕРЕЖЕВИХ ВЛАСТИВОСТЕЙ ДЛЯ ЗБІЛЬШЕННЯ ЇХ
ШВИДКОДІЇ ТА ПЕРСПЕКТИВИ**

Описані дослідження особливостей інформаційних технологій та характер їх кардинальних змін. Наприклад, створення нових алгоритмів для вирішення проблеми високопродуктивного механізму IP-пошуку може бути ефективним для короткого періоду часу. Люди, які працюють в цій індустрії, повинні бути постійно готові до змін і здобувати нові навички. Бездротові технології стають частиною нашого життя дуже швидко. Це дає можливість бути більш незалежними у галузі комп'ютеризації, при тому з появою нових проблем проектування бездротових мереж і їх захисту. В даному випадку досліджуються проблеми механізму IP-пошуку для програмного забезпечення маршрутизаторів, бездротових мереж і пропонуються можливі їх рішення.

Ключові слова: IP-пошук, програмний маршрутизатор, безпроводні локальні мережі, мережева інженерія, вдосконалення.

Рис. 1., Літ. 6.

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**ИСПОЛЬЗОВАНИЕ НЕКОТОРЫХ СЕТЕВЫХ СВОЙСТВ ДЛЯ УВЕЛИЧЕНИЯ ИХ
БЫСТРОДЕЙСТВИЯ ТА ПЕРСПЕКТИВЫ**

Описаны исследования особенностей информационных технологий и характер их кардинальных изменений. Например, образование новых алгоритмов для решения проблемы высокопродуктивного механизма IP-поиска может быть эффективным для краткого периода времени. Люди, которые работают в этой индустрии, должны быть постоянно готовы к изменениям и приобретать новые навыки. Беспроводные технологии становятся частью нашей жизни очень быстро. Это дает возможность быть больше независимыми в отрасли компьютеризации, при этом с появлением новых проблем проектирования беспроводных сетей и их защиты. В данном случае исследуются проблемы механизма IP-поиска для программного обеспечения маршрутизаторов, беспроводных сетей и предлагаются возможные их решения.

Ключевые слова: IP-поиск, программный маршрутизатор, беспроводные локальные сети, сетевая инженерия, улучшение.

Рис. 1., Літ. 6.

INTRODUCTION

This paper attempts to show how networking skills can be applied in different departments of internet

technology. Assessment consists of three parts. The first part describes how to optimize algorithm for IP Lookup engine in GPU-Accelerated Software Routers. In other words it gives the example of creating new, better than existed software routers. Second part shows the importance of wireless LANs in corporative networks. Moreover it describes what solutions for expansion of the network can be implemented. Third part shows the promising areas in networking and compares them. The comparison has shown that experience, knowledge, skills and abilities are the key criteria for building career.

GPU-Accelerated Software Router

This part of the assignment will discuss the design and modernization of a software router – computer based and cheaper alternative to the hardware routers. Workstation can use more than one network interface card (NIC) and it is possible to add more memory. Software is usually based on Linux operation system and programmed to forward packets between different NICs and take part in routing functions [1]. One of the main functions of a router is to compare the incoming IP address with stored prefixes in a routing table and identify the next-hop port. Using Classless Inter-Domain Routing makes the lookup process more difficult and needs a lookup engine to search variable-length IP prefixes in order to find the longest prefix matching for the destination address [1]. Routing tables are always growing up and scientists trying to find solutions for high-performance IP lookup engines. The concept summarized in this work is to find solution for the IP lookup and show examples of the economical high-performance software router.

One of the main issues is how to scale software routers. In some articles (e.g. [2]), authors propose a software router architecture that parallelizes router functionality in multiple servers and between multiple cores in one server. The experiment has shown that software routers with multiple 1Gbps ports per server can be build, in this way it make a group of multiple servers possible to scale more ports. Modern servers allow to rich 40Gbps [2].

Another important dilemma is to find an optimal algorithm for routing prefix update operations. Using the analysis and comparison of different actual algorithms it is possible to make a new suitable algorithm for high-performance software routers. In the experiment [3] have been used DIR-24-8-BASIC and Tree Bitmap algorithms for IP lookup. The proposed hybrid scheme has shown high lookup speed. With using only 18 cores of TILEPro64 achieved almost 40Gbps lookup throughput with low power. In another article [4] the author compares and analyses three route lookup algorithms. As a result, it was proposed the configurable route lookup algorithm include the main idea of different lookup solutions and can be used in software routers.

The using of graphics processor units (GPU) is one of the best solutions to build cost-effective and high-performance IP lookup engines. The paper [5] shows a GPU-Accelerated Lookup Engine (GALE). In fig. 1 is shown GPU-accelerated IP lookup engine.

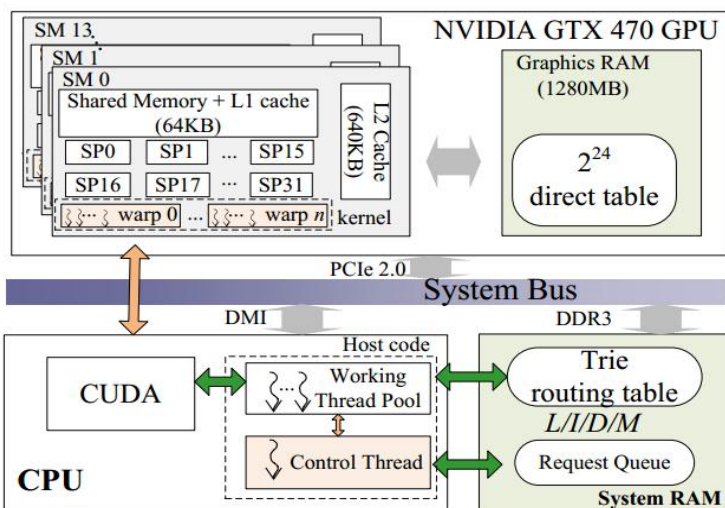


Fig. 1. GPU-accelerated IP lookup engine

The first principle identified in GALE is that independent lookup requests can be processed in parallel. To make suitable parallel IP lookup on the many-core GPU was used programming model Compute Unified Device Architecture (CUDA). This engine also stores the next-hop information for all

the possible IP prefixes in GPUs direct table. For the lookup and update requests GALE uses a pool of working threads and a control thread [5]. The experiment on NVIDIA GeForce GTX 470 that have 448 computing cores provides evidence that GALE can reach lookup throughput about 250 million/s. To speedup parallel routing table lookups use the massive parallelism and a direct table for effective IP lookup with small computing overhead and memory access latency. The experiment shows that, there is the potential for improvement in lookup throughput and using GPUs a good solution for high-performance routing processing [5].

In another work a high-performance software router platform for general packet processing with using GPU called "PacketShader", was presented. Combination with high-performance packet I/O engine which use aggressive batching and pipelining, "PacketShader" reaches IP packet forwarding performance of 40 Gbps on an eight-core Nehalem server for 64-byte packet size. It should be noted that "PacketShader" scalable with Multiple Multi-Core CPUs, GPUs, and high-speed NICs. The current version supports IPv4, IPv6, Open Flow, and IPsec [6].

This part of assignment has explained the central importance of IP Lookup engine in GPU-Accelerated Software Router. Taken together, these results suggest that the usage of GPU is a great opportunity for fast packet processing. It would be interesting to create new GPU-accelerated, high-performance software router, with optimized IP Lookup Engine and compatible with multi-core GPUs, CPUs and high speed NICs.

Wireless LAN security issues and solutions

Along with the spreading of smart phones and tablets that use wireless technology, companies should expand their wireless LAN infrastructure. Users become more mobile and networks become more user-oriented. Wireless networking gives the same capabilities and comparable speeds of an Ethernet network without the problems with drilling of walls, laying out wires, or stringing cables throughout an office building. For example, if enterprise opens a new department in another building, which is located near the main one, the use of directional Wi-Fi antenna is possible and also cost effectively. Users accessing the WLAN only need to be within wireless signal range, in order to move easily without having to spy out a connector cable or available jack. On the other hand Information technology departments should combine wired and wireless networks and pay more attention on security and scalability.

In June 1999 the IEEE (Institute of Electrical and Electronic Engineers) released the 802.11 specifications which data rate is up to 2Mbps in 2.4GHz band. In 1999 the 802.11b (the performance up to 11Mbps in the 2.4GHz band) and 802.11a specification up to 54Mbps in the 5GHz band were released. This new specifications used different frequencies, in other words it means that 802.11a access points and network interface cards (NICs) cannot communicate with 802.11b NICs and access points. This incompatibility forced the creation of the new draft standard known as 802.11g (data rate up to 54Mbps in the 2.4GHz band). Products that follow to this standard are considered "Wi-Fi Certified." New standard compatible with 802.11b and may replace it [7].

Network Interface Cards and access points (APs) are basic components of Wireless LAN. To block unauthorized users access APs based on Service Set Identifier (SSID). If the SSID present by the AP's and presented by the user is not compatible, then the AP will not provide access it through a wireless service area. All wireless cards have a unique MAC address, physical address used to block unauthorized users access. AP has added Access Control List based on the physical address to ensure that only the physical address of the registered card enter the network. Therefore, to achieve physical address filtering administrator can manually support the AP through a group of the physical address access list. It can be good for small networks, but if the network has a lot of AP, better to use the 802.1x port authentication combined with RADIUS Server Authentication [8]. In the article [9] authors proposed a cost effective authentication framework. This is software framework based on Centralize Authentication Architecture (CM). The result has shown that this framework provides cost effective solution than biometric or password base solutions.

In designing a large Wireless LANs engineer should pay attention in potential number of users, expected coverage, environment configuration, site specific user demands, and co-channel interference. Moreover, it is necessary to carefully examine lot of parameters and find critical factors which can influence the network. In the paper [10] author has shown a scalable optimization algorithm based on the tools of distributed artificial intelligence, which overcomes the failings of current approaches and can be utilized for WLAN design regardless of size or complexity. However, good results obtained in the experiment did not fully solve the issue of scalability.

This part of assessment has shown that usage of wireless technology is the necessary instrument to scale up companies networks. The main dilemma for IT specialist is how to supplement existing Ethernet network with wireless network. There are some difficulties in optimization and security in WLANs.

With this in mind, was shown some of Wireless LAN security issues and solutions. Besides, main points in designing a large Wireless LANs and introduce the optimization agent-based algorithm were shown.

Networking career

The problem discussed in this part of work is what are the main and perspective ways, in a networking career and what steps should be taken to become a network professional. In the modern world information technology is rapidly growing and nobody can imagine how companies would work without local network and internet access. Networking consists of a range of technologies and areas of specializations. There is a need for new workers with experience and some level of qualification. Normally, companies ask for 1 + years of experience. This is done to ensure that the candidate can perform his tasks. One way to get networking experience is to find a part-time job in the university or internship during the summer.

An important point in career is to get a valid certification that authenticates skills and also to matches the experience level. Cisco certification is recognized worldwide. Cisco Certified Network Associate (CCNA) is the first level of certification and receiving this shows that the applicant knows how to plan, configure, and operate simple routed WAN and switched LAN networks using Cisco products. Network professionals can secure their future with the right choice of certifications which acknowledge their main networking skills.

The analysis from recruiting and staffing specialist Robert Half Technology has shown that in 2013 wireless network engineers (2012 salary range: \$79,250-\$108,500) and network engineers (2012 salary range: \$75,000-\$107,750) can expect 7.9% and 7.8% increase in starting salaries which is one of the biggest pay raises in IT. It should be noted that the expected salary range for network administrators in 2013 will be around \$62,750-\$93,250 (6.8% increases) [11].

The role of a network engineer and a network administrator seems similar, but actually they are different. It is necessary to understand difference between the two roles, when building a career in the IT sector. Before any suggestions can be offered, it is necessary to compare their job descriptions. A network engineer is responsible for designing, analysis, troubleshooting, maintaining computer communication networks in one organization or between organizations. His main responsibility is to create, maintain and optimize networks that can give maximum productivity and reliability for their users, such as staff or clients. A network administrator performs technical work installing, maintenance and administration of networks. This includes the hardware and software support.

To compare two roles – the administrator has responsibility for smaller networks such as local area networks (LANs) and wide area networks (WANs). While the network engineer can work with global area networks (GANs) which can include different types of networks. "Typical tasks usually include: installing, supporting and maintaining new server hardware and software infrastructure; managing email, anti-spam and virus protection; ensuring the most cost-effective and efficient use of servers; suggesting and providing IT solutions to business and management problems; providing training and technical support for users with varying levels of IT knowledge and competence; planning and implementing future IT developments and undertaking project work; etc" [12].

Some of the essential duties of network administrator are to make backups, security management, user account management, e-mail systems, office systems and applications support, internet access. In other words administrators have responsibilities less than network engineers. Becoming a network engineer can be the next step on the path to system administrator, after good performance and years of experience. As for network engineers they can also rise to Vice President of IT Services or Chief Technology Officer [13].

This paper has given an account of the perspective ways of developing networking career. It has shown that getting certification is important along the career path. Moreover, the work includes comparison of perspective professions of network engineer and network administrator. The evidence from this comparison has shown that experience, knowledge, skills and abilities are important to build a good career path in networking. Information technology always evolves and to keep up with the times professionals should always study and implement new knowledge in practice.

Conclusion

In this paper shown how networking skills can be applied in different departments of internet technology. It is described how to optimize algorithm for IP Lookup engine in GPU-Accelerated Software Routers. It is also shown the importance of wireless LANs in corporative networks. Moreover it described what solutions for expansion of the network can be implemented. Shown the promising areas in networking and compares them. In conclusion the experience, knowledge, skills and abilities are the key criteria for building career.

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