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Networking

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Networking Final Paper

The use of computers and other technological devices have been an important aspect in today's society. This helps with one's business, education, organizing your work, and for creating things such as particular applications and social media. An important aspect to the use of technology is networking in which it is vital for the way people communicate with each other. Networking is based on the data that is transferred from one computer to another computer within a computer network. The importance of computer networking is to allow users to be able to distribute copies of crucial information to various locations and make sure that those essential information is not lost with the failure of any computer in the network.

Networking has been crucial for the communications between computer devices. The process with networking can include routing and decentralized control. In the article "Achieving High Scalability Through Hybrid Switching in Software-Defined Networking", by Hongli Xu et al., the authors discuss how software-defined networks achieve both near optimal network performance and policy-based management through routing and centralized control, but they have faced challenges based on having limited addressable memory and on-die memory for storing the forwarding table, and per flow of communication and computation. The authors expressed their design of the novel hybrid switching (HS) design that integrates both traditional switching and software-defined networking (SDN) switching in order to achieve scalability and optimal performance. Because of integration within a network, the authors state how it leads to

unexpected benefits of making both the HS and SDN switching more efficient under the hybrid design. Hongli Xu et al. stated “Testing and numerical evaluation results demonstrate the superior performance of hybrid switching when comparing with the DevoFlow solution” (Hongli Xu et al., 2018). This indicates that Hongli Xu et al. the performance of the HS switching design is better than DevoFlow due to how over 90% of switches need less than 500 flow entries by HS switching design when the DevFlow has over 80% of switches that needs at least 1,000 to 4,000 flow entries (Hongli Xu et al., 2018). In essence, the HS switching design reduces 80.5% required flow entries when compared to DevoFlow.

When it comes to networking, the process of it works through the following framework and parts of the OSI model. In the article “A Software-Defined Ultrasonic Networking Framework for Wearable Devices”, by G. Enrico Santagati and Tommaso Melodia, the authors discuss networking and framework among wearable devices. Santagati and Melodia stated “wireless wearable medical devices are connected through radio frequency (RF) electromagnetic waves. Standards in use are often scaled down versions of wireless technologies (e.g., Bluetooth and Wi-Fi), with little or no attention to the peculiar characteristics of the human body and to the severe privacy and security requirements of patients" (Santagati and Melodia, 2017). Because of the issue with the wearable medical devices, Santagati and Melodia wanted to introduce U-Wear which is a networking framework for wearable medical devices that works with the use of ultrasonic communications. The U-Wear encloses the data link, and network layer functionalities which adapts to applications and the system requirements in order to exchange information between ultrasonic wearable devices.

In order for communication to work, software networking goes through a process in order to have end systems to communicate properly among applications. In the 2018 article “Joint

Resource Allocation for Software-Defined Networking, Caching, and Computing", by Chen et al., the authors discussed software-defined networking, caching, and computing (SD-NCC). The SD-NCC enables dynamic orchestration of networking, caching, and computing resources to efficiently meet the requirements of different applications and improve the end-to-end system performance (Chen et al., 2018). The authors considered how energy consumption is being an important factor when performing resource placement. The authors based their study on the joint caching, computing, and bandwidth resource allocation for SD-NCC and it formulated an optimization problem. Because of this, Chen et al. reduced computational complexity and signaling overhead where they created a distributed algorithm to solve the formulated problem, based on recent advances in alternating direction method of multipliers (ADMM) (Chen et al., 2018). Additionally, it means that the different network nodes only need to solve their own problems without exchange of caching/computing decisions with fast convergence rate. The author's results from this simulation showed that their proposed algorithm was effective with the different system parameters.

Within software controlled networking, open flow is part of the process for letting the applications within a network be able to manage and process the flow of networks. In the 2017 article "SDPA: Toward a Stateful Data Plane in Software-Defined Networking", by Sun et al., the authors proposed a stateful data plane architecture (SDPA) for the SDN data plane. The authors talked about how the co-processing unit and the forwarding processor (FP) is designed for the SDN switches to manage state information through new instructions and state tables. Sun et al. state that they were to "design and implement an extended open flow protocol to support the communication between the controller and FP" (Sun et al., 2017). This indicates how the authors wanted to have a better open flow protocol in order to have communication among the

controller (co-processing unit) and FP to work properly. What the authors did to make sure their approach for the open flow protocol was to show practicality and feasibility, Sun et al. had implemented both software and hardware prototypes of SDPA switches, and develop a sample network function chain with stateful firewall, domain name system (DNS) reflection defense, and heavy hitter detection applications in one SDPA-based switch (Sun et al., 2017). Sun et al. stated that their experimental results showed that the SDPA architecture improved the forwarding efficiency with manageable processing overhead for those applications that need to maintain states (Sun et al., 2017).

Networking has been a very important aspect for communication among end systems, businesses, and lets users be able to distribute information to various locations and make sure that those essential information is not lost. Learning and understanding how networks work and what is consisted within that process of networking gives you a better understanding of what the physical and logical vulnerabilities are, and see what is done in order to make the communication among end systems work properly. With Xu et al. design for the novel hybrid switching (HS) design that integrates both traditional switching and software-defined networking (SDN) switching, they were able to use less required flow entries in this process, where they achieved scalability and optimal performance. Wearable devices have been part of communication in a network, but can have a few issues. With having an issue among the wearable medical devices, Santagati and Melodia wanted to introduce U-Wear which is a networking framework for wearable medical devices that works with the use of ultrasonic communications. The authors Satangati and Melodia wanted the framework among wearable devices to be perfected in communication. They created U-Wear which encloses the data link, and network layer functionalities and adapts to both applications and system requirements. Because of this, it

helped with exchanging information between ultrasonic wearable devices. Upon communication between end systems in a network, Chen et al. wanted to reduce computational complexity and signaling overhead where they created a distributed algorithm to solve the formulated problem based on ADMM where this lead to having different network nodes to solve their own problems without the exchange of caching/computing decisions in which this lead to a fast convergence rate. Due to making the process of networking work among devices open flow control is part of this. Based on Sun et al. experiment, the authors decided to implement both software and hardware prototypes of SDPA switches, and develop a sample network function chain with stateful firewall, domain name system (DNS) reflection defense, and heavy hitter detection applications in one SDPA-based switch in order for the communication among devices to have more feasibility and practicality. Software controlled networking demonstrates its importance for communication and gives understanding of how it works among end systems, and the hardware and software components that is a part of it.

References

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