

Software Defined Network systems embedded with big data

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Abstract

Sdn and big data both are independently powerful technology. But when we combine aspects of both the technology then we can get good results. Sdn requires big data for many different operations like – extracting data, storing, processing and transmitting data. So in this paper, we will discuss the advance and emerging technology of sdn and big data, how big data is beneficial for the software defined networks. Beneficial methods on how the sdn will solve the problems of the big data. The interrelationship or correlation between sdn and big data has not been defined properly so, both the technology presents unique challenges beyond the existing works.

Keywords used: Software defined networks, Network Virtualization, Cloud Data Center, Big Data, Data Traffic, and Data Center

Introduction

With increase of huge amount of data day by day we need a powerful technology that can manage such a large sum of data. So, big data technology that can handle a complex and large data amount which traditional data processing tools were unable to handle. Big data have to deal with the various different aspects like – speed of data, size of data, quality of data, range of data type and its usability. Networking plays a major role in big data applications. Traditionally the use of Hardware + Software was used to direct traffic between different switches and routers. Today sdn market has evolved the traditional techniques which were previously used for sdn for virtualizing the network by separating data plane (manage traffic flow) and control plane (manages network). As compared to the traditional network systems, Sdn is very much efficient for the development as well as for deployment.

Well, many outstanding works have been performed on both sdn and big data separately. However, Sdn is important part of networking that's why it has major effect on big data applications. Mainly various different features of Sdn like it separates control and data plane from each other, it also centrally control central layer, through sdn we can view the network globally, it also have the powerful feature to program the network. Mainly the processing of big data takes place at cloud data centres. As compared to previous data centres, sdn based data centres can have better efficiency and can work perfectly as it dynamically allocates all the resources present at data centres to different big data applications to meet service level agreements (SLAs) of these big data applications [1].

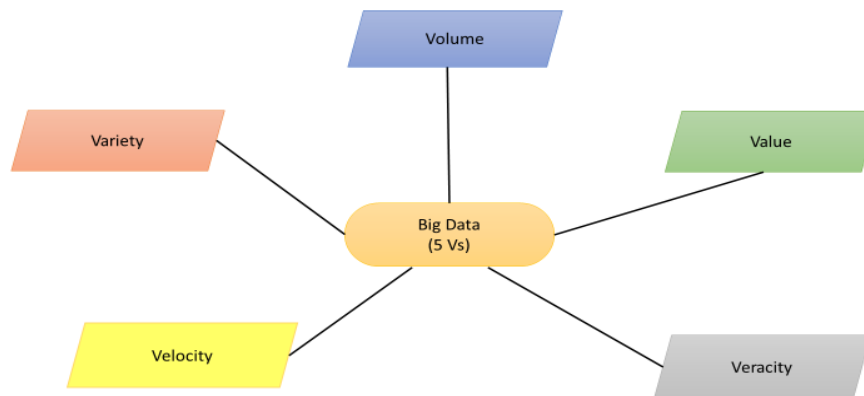
Big data has a major effect in the operation and designing in the technology embedded with SDN. Mainly, with the large network, the centralized controller which is present in SDN can collect big data from physical to application layer and also from various different layers with arbitrary granularity. For improving the network performance, sharing of the information among different layers is important, but due to this our network becomes more and more complicated that our traditional approaches are incapable to optimize and design these networks. Gratefully, big data analytics, which uses analytical methods to get useful information from data to guide decisions which, can ultimately be useful in designing and operation of SDN. For example, it is very easy for the controller to perform traffic engineering to enhance the performance of Sdn with the help and support of big data analytics. There are very beneficial features of Sdn that helps in solving various different problems of big data applications like- processing the big data in cloud data centres, delivering of data, optimization of data, big data architectures. We can also prove that with the help of Sdn we can enhance the network efficiently which will ultimately improve the performance of big data

applications. From another perspective we can say that big data can also be very much useful for Sdn as well the area in which it can be beneficial includes – sdn based intra and inter data center networks, traffic engineering, providing protection on security attacks, and cross-layer design.

Insights of Software Defined Networking and Big Data

Big Data

Big data mainly deals with a large sum of data and it is becoming a blooming technology day by day because nowadays there has been a rapid increase in the useful data which must be stored and managed properly. In every domain whether it be social media, research, healthcare, business etc. Each and every domain is generating petabyte of data and this rate increases by 0.5 petabyte per year. Big data enable new direction for research in scientific area as it has to deal with the volume of available data which is rapidly increasing every day. Big data also have many loopholes or problems like – how to transfer such a huge amount of data?, how to capture all the data?, where to store data?, how to remove useless data?, how to share such a large amount of data?, how to search for the required data?, how to visualize all the data? . So, these are the challenges which are faced by the big data but there are also various important factors like security and performance which are also need to be taken care of while working with such a large amount of data. [2] Mainly Big data can be managed using Nosql, Hadoop, and MapReduce framework. Eventually, not every single big data problems can be solved using these techniques. Usually we require processed, filtered and right data with privacy so that we can apply various different techniques to get good results from such a large amount of data.

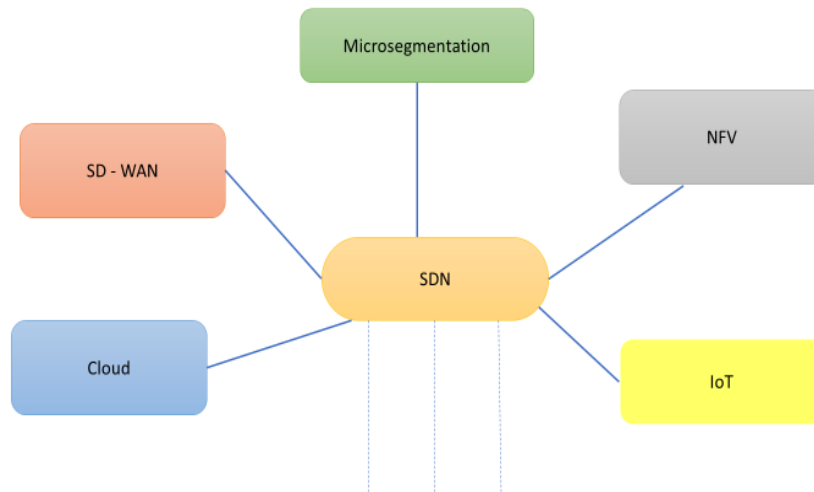


Software Defined Networks

Software Defined Networks have gained attention of many researchers and networking community as this technology is capable of designing and managing the network in a well simplified and flexible approach. The programmable networks and separation of the logically centralized control from underlying data plane has become a point of interest of researchers as it simplifies network management and its evolution process. So, basically the idea of Sdn was applied by a working group called OpenSig they applied concept of programmability in ATM networks and later another project was designed by Developed Control of ATM Networks (DCAN). But all these early approaches have not meet a widespread success and one of the reasons for their failure is that they have not focused on major issues like – performance and security. In the early 2000s more and more people switched to high speed internet connection with these new trends like cloud computing, virtualization and big data came into picture and as result of this technological shift there was emergence of new improved network programming concept Sdn. The important fact behind the success story of the great success of sdn is due to it keeps on improvising the prevailing problems and finding better solution to improvise the programmable network.[3, 8 - 16]

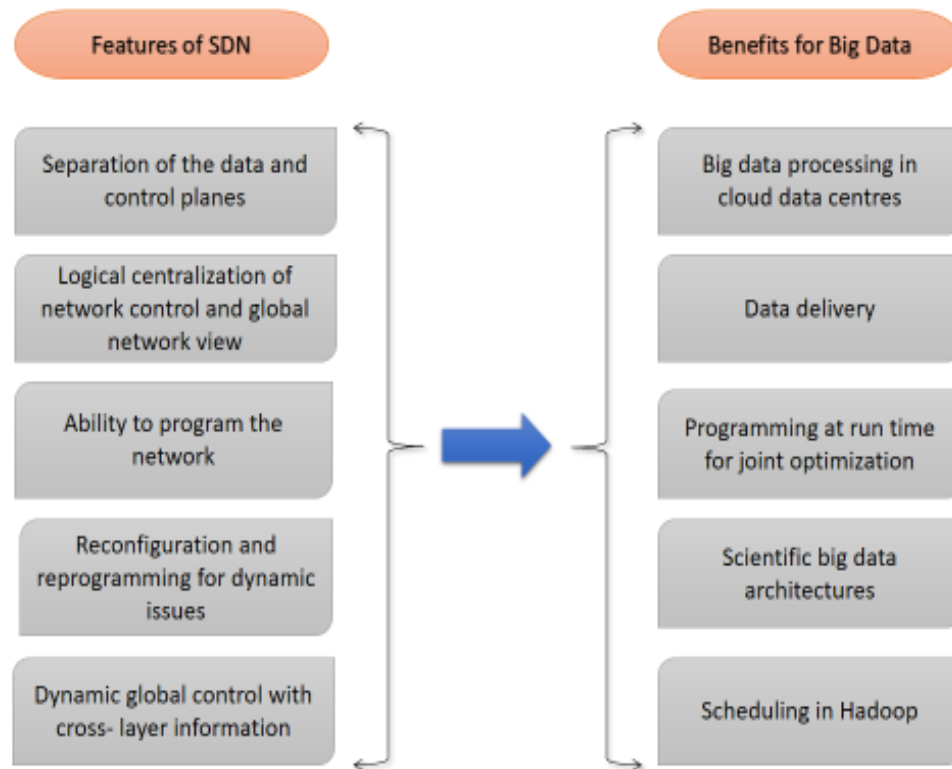
Sdn is an emerging technology that can solve the problem of the current network infrastructures. First, it separates control plane from the underlying data plane. Second, in the logically centralized network operating system we can implement the control logic. Building block of Sdn uses bottom-up and layered approach. [4]

Nowadays Sdn has become more advanced in terms of technology as it uses wide area network (WAN) to connect their main data centres with their branch or local offices. There is a new technology known as SD-WAN which uses the software to combine different types of network connections whether it is wired or wireless which ultimately form strong and price effective connections.



Ways in which Software defined networking is advantageous for big data applications

In this section we will discuss the latest advancement in technology that improves big data application performance.



Methods by which Sdn monitors big data

There are mainly three main activities which are been included in the big data monitoring with the help of Sdn they are:

1. **DATA ACQUISITION** – With the help of the Sdn controller we can load network inventory and traffic data from control and data planes.
2. **DATA AGGREGATION** – In this activity the next step is to process the acquired data, calculating network parameters in actual time.
3. **DATA PERSISTENCE** – It helps to store and provide network inventory and parameters to traffic analysis systems.

Support of Sdn in Big data processing in cloud data centers

Sdn has the capability to increase improve and increase big data application performance. Cloud data centres usually processes big data. The requirement of resources of big data application changes dynamically in cloud data centers. The service level agreement (SLA) is one of the most critical components of a data center lease. It provides number of benefits to both data center operators and their customer. At the time of lease negotiations, each party must consider which services will be covered by the SLA and the desired performance standards. Nowadays it is becoming common to include data center services, e.g., security, connectivity, response time and delivery service levels. The latest trend in the field of telecom and IT is the rise and use of cloud data centres. Cloud is predicted on the idea of self-service and on-demand capacity, which Sdn can dynamically deliver based on availability and demand of resources within data centers.

Sdn can also be used in data delivery for big data by managing traffic

Delivering due to the large volume of data. The feature of the sdn which is traffic engineering that is a very essential feature which can help various features or characteristics to perform its activities which are - topology update, characterization, traffic analysis, flow management and fault tolerance.

Architectural Design Defined for Big Data based on Sdn

Sdn can generalize the whole network system by using common hardware and advanced software. In this section we define a general big data architecture based on Sdn.

- A. Data access network based on sdn – Data access network based on sdn achieves dynamic configuration and heterogeneous network access by using network virtualization functions. The architecture for data access combines the two important features which are -passive optical network (PON) and general packet radio service (GPRS) core network. The network have different nodes that communicate with controller to perform various different functions such as – Adaptive Reconfiguration, Collaborative Services and Mobility Management.
- B. Content delivery network based on Sdn– If any of the data center network receive or release the data directly then the issue of network overload and application delay can occur so to resolve this issue to reduce the pressure of data center network and content delivery network to respond to the user data access requests. The architecture of content delivery network includes – Content Distribution Agent (CDA) it also includes Content Sink Agent (CSA). CDA helps to store the processed application data connections which are been transmitted over the data center networks. CSA receives its initial data from the data access network after that it performs the basic pre-processing operations like – clustering of the data and removal of the noise from data it also forwards pre-processed data to data center networks.
- C. Data center network based on Sdn – The infrastructure of the data center consist of network devices which basically consists of devices like – routers, switches, cables, heat distribution system, power distribution system, storage devices and servers. Data Center Network (DCN) is the communication infrastructure in the data center. There are various different manager in the architecture for data center network (Resource Manager, Pre-process Manager, Process Manager, Application Manager) all the above mentioned managers helps in transforming the state information of servers and networks by communicating with controller.
- D. Big data backbone network based on Sdn – Sdn based architecture of big data backbone network adopts a distributed and heretical way to reach transmission. The autonomous subnet is present in backbone network which employ Sdn structure. Main Controller is established in the cloud so that it can form multiple distributed servers. Network information is been received by the main controller which include status of routing and how much resource is utilized. It also include the count of packets which are been forwarded from the edge of the router to its backbone network.

Conclusion

The main logic behind this article is to explore the technologies which are based on the joint relationship of big data and sdn and also discusses the future possibilities which can be don further in this field. At the beginning we discussed both the technologies and their correlation after that we have separately defined big data and software defined network with their in-depth explanation. After that we have discussed about the various different methods in which sdn can be advantageous to the big data and its various applications. Last but definitely not least we discussed the different sdn based network architecture for the big data applications. Both technologies Sdn and big data are independently powerful but when combined together they can make the technology powerful as well

as it can make the life of the people easier as it is the vast and open field where more work is needed to be done.

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