Introduction of big data and hadoop ecosystem pdf

Before we start with exploring the blog, let’s take a look at the various topics covered in this blog: It is an open-source data platform or framework developed in Java, dedicated to store and analyze large sets of unstructured data. With the data exploding from digital media, the world is getting flooded with cutting-edge Big Data technologies. However, Apache Hadoop was the first one which reflected this wave of innovation. Let us find out what Hadoop software is and its ecosystem. In this blog, we will learn about the entire Hadoop ecosystem that includes Hadoop applications, Hadoop Common, and Hadoop framework. Watch this video on Hadoop before going further on this Hadoop Blog: Allows multiple concurrent tasks to run from single to thousands of servers without any delayConsists of a distributed file system that allows transferring data and files in split seconds between different nodesAble to process efficiently even if a node fails Hadoop ComponentsTasks PerformedCommonCarries libraries and utilities used by other modulesHDFSAllows storing huge data across multiple machinesYARNResponsible for splitting the functionalities and scheduling the jobsMapReduceProcesses each task into two sequential steps, i.e., the map task and the reduce task To learn more about Hadoop, check out Intellipaat’s Hadoop Certification Course. Inspired by Google’s MapReduce, which splits an application into small fractions to run on different nodes, scientists Doug Cutting and Mike Cafarella created a platform called Hadoop 1.0 and launched it in the year 2006 to support the distribution of Nutch search engine. Apache Hadoop was made available for the public in November 2012 by Apache Software Foundation. Named after a yellow soft-toy elephant of Doug Cutting’s kid, this technology has been continuously revised since its launch. As part of its revision, Apache Software Foundation launched its second revised version Hadoop 2.3.0 on February 20, 2014, with some major changes in the architecture. Get 100% Hike!Master Most in Demand Skills Now ! There are four basic or core components: Hadoop Common: It is a set of common utilities and libraries which handle other Hadoop modules. It makes sure that the hardware failures are managed by Hadoop cluster automatically. HDFS: It is a Hadoop Distributed File System that stores data in the form of small memory blocks and distributes them across the cluster. Each data is replicated multiple times to ensure data availability. It has two daemons. One for master node— NameNode and their for slave nodes —DataNode. NameNode and DataNode The HDFS has a Master-slave architecture. The NameNode runs on the master server. It manages the Namespace and regulates file access by the client. The DataNode runs on slave nodes. It stores the business data. Internally, a file gets split into a number of data blocks and stored on a group of slave machines. NameNode manages the modifications that are done to the namespace file system. NameNode also tracks the mapping of blocks to DataNodes. This DataNode also creates, deletes, and replicates blocks on-demand from NameNode. Block in HDFS Block is the smallest unit of storage on a computer system. In Hadoop, the default block size is 128MB or 256MB. Replication Management The replication technique is used to provide the fault tolerance HDFS. In that, it makes copies of the blocks and stores them in on different DataNodes. The number of copies of the blocks that get stored is decided by the replication factor. The default value is 3 but we can configure it to any value. Rack Awareness A rack contains many DataNodes machines and there are many such racks in the production. To place the replicas of the blocks in a distributed fashion. The rack awareness algorithm provides low latency and fault tolerance. YARN: It allocates resources which in turn allow different users to execute various applications without worrying about the increased workloads. Hadoop MapReduce: It executes tasks in a parallel fashion by distributing the data as small blocks. The Hadoop MapReduce runs the following tasks The map task stores data in the form of blocks. In this phase, the data is read, processed, and given a key-value pair. The reduce task receives the key-value pair from the map phase. The key-value pair is then collected into smaller sets and an output is produced. Processes such as shuffling and sorting occur the reduce task. The Hadoop Architecture comprises of the following : Hadoop CommonHDFSMapReduceYARN Hadoop Common Hadoop Common is a set of utilities that offers support to the other three components of Hadoop. It is a set of Java libraries and scripts that are required by MapReduce, YARN, and HDFS to run the Hadoop cluster. HDFS HDFS stands for Hadoop Distributed File System. It stores data in the form of small memory blocks and distributes them across the cluster. Each data is replicated multiple times to ensure data availability. It has two daemons. One for master node— NameNode and their for slave nodes —DataNode. NameNode and DataNode : The NameNode runs on the master server. It manages the Namespace and regulates file access by the client. The DataNode runs on slave nodes. It stores the business data. MapReduce It executes tasks in a parallel fashion by distributing the data as small blocks. The two most important tasks that the Hadoop MapReduce carries out are Mapping the tasks and Reducing the tasks. YARN It allocates resources which in turn allow different users to execute various applications without worrying about the increased workloads. Hadoop commands have various file systems that directly interact with Hadoop distributed file systems in order to get the required results. appendToFilechecksumcopyToLocalmoveFromLocalchgrp These are some of the most common commands that are used in Hadoop for performing various tasks within its framework. The major advantages of Hadoop are given below: Cost Reduction: The reason behind the cost-effectiveness of Hadoop is that it is open-source. Also, Hadoop uses cost-efficient commodity hardware that makes it affordable. This is in contrast to RDBMSs which depend on expensive hardware to handle Big Data. Enhanced Scalability: Hadoop is a highly scalable platform as it divides a large amount of data into multiple inexpensive machines. These parts are put into a cluster that is simultaneously processed. Also, Hadoop allows enterprises to alter (increase / decrease) the number of these machines or nodes depending on the requirement.Flexible: Hadoop is a highly flexible platform. What makes it flexible is its high adaptability to different kinds of datasets, be it structured, semi-structured or even un-structured.Minimal Traffic: Hadoop facilitates minimum network traffic because every single task is fragmented into various sub-tasks. Further, these sub-tasks are assigned to every data node in the Hadoop cluster. This helps in reducing the network traffic. Even though Hadoop has a lot of advantages, there are certain limitations too associated with it. Below discussed are a few of them: Security Issues: Hadoop, by default has the security feature unavailable. The user needs to take due care to ensure that the security feature is enabled. Also, Hadoop uses Kerberos to offer data security and protection. However, Kerberos is very tough to manage and work with.Processing Issues: Hadoop only allows batch processing, i.e. there is no interaction between the user and the processes running in the background. This hinders the chances of returning a low latency output. Another issue with data processing in Hadoop is that high quantity of data i.e. in TB or PB is tough to handle in case of Hadoop.Highly Vulnerable: Hadoop is written in Java. Now since Java is the most used programming language, it is highly possible that hackers and cyber criminals can exploit the entire Hadoop system. There are various ways in which Hadoop can be run. Here are the scenarios in which Hadoop can be downloaded, installed, and run. Standalone Mode Though Hadoop is a distributed platform for working with Big Data, you can even install Hadoop on a single node in a single standalone instance. This way, the entire Hadoop platform works like a system that runs on Java. This is mostly used for the purpose of debugging. It helps if you want to check your MapReduce applications on a single node before running on a huge cluster of Hadoop. Fully Distributed Mode This is a distributed model that has several nodes of commodity hardware connected to form the Hadoop cluster. In such a setup, the NameNode, JobTracker, and Secondary NameNode work on the master node, whereas the DataNode and the Secondary DataNode work on the slave node. The other set of nodes, namely, the DataNode and the TaskTracker work on the slave node. Pseudo-distributed Mode This, in effect, is a single-node Java system that runs the entire Hadoop cluster. So, various daemons such as NameNode, DataNode, TaskTracker, and JobTracker run on a single instance of the Java machine to form the distributed Hadoop cluster. There are various components within the Hadoop ecosystem such as Apache Hive, Pig, Sqoop, and ZooKeeper. Various tasks of each of these components are different. Hive is an SQL dialect that is primarily used for data summarization, querying, and analysis. Pig is a data flow language that is used for abstraction so as to simplify the MapReduce tasks for those who do not know to code in Java for writing MapReduce applications. Example of Hadoop: Word Count The Word Count example is the most relevant example of the Hadoop domain. Here, we find out the frequency of each word in a document using MapReduce. The role of the Mapper is to map the keys to the existing values and the role of the Reducer is to aggregate the keys of common values. So, everything is represented in the form of a key-value pair. Cloudera Hadoop Cloudera offers the most popular platform for the distributed Hadoop framework working in an open-source framework. Cloudera helps enterprises get the most out of the Hadoop framework, thanks to its packaging of the Hadoop tool in a much easy-to-use system. Cloudera is the world’s most popular Hadoop distribution platform. It is a completely open-source framework and has a very good reputation for upholding the Hadoop ethos. It has a history of bringing the best technologies to the public domain such as Apache Spark, Parquet, HBase, and more. You can install Hadoop in various types of setups for working as per the needs of big data processing. In this section, you will learn about Hadoop download. To work in the Hadoop environment, you need to first download Hadoop which is an open-source tool. Hadoop download can be done on any machine for free since the platform is available as an open-source tool. However, there are certain system requirements that need to be satisfied for a successful download of the Hadoop framework such as: Hardware Requirements: Hadoop can work on any ordinary hardware cluster. All you need is some commodity hardware. OS Requirement: When it comes to the operating system, Hadoop is able to run on UNIX and Windows platforms. Linux is the only platform that is used for product requirements. Browser Requirement: When it comes to the browser, most of the popular browsers are easily supported by Hadoop. These browsers include Microsoft Internet Explorer, Mozilla Firefox, Google Chrome, Safari for Windows, and Macintosh and Linux systems, depending on the need. Software Requirement: The software requirement for Hadoop is Java software since the Hadoop framework is mostly written in Java programming language. The minimum version for Java is the Java 1.6 version. Database Requirement: Within the Hadoop ecosystem, Hive or HCatalog requires a MySQL database for successfully running the Hadoop framework. You can directly run the latest version or let Apache Ambari decide on the wizard that is required for the same. ‘The world is one big data problem’ – Andrew McAfee, Associate Director, MIT Hadoop streaming is the generic API that is used for working with streaming data. Both the Mapper and the Reducer obtain their inputs in a standard format. The input is taken from Stdin and the output is sent to Stdout. This is the method within Hadoop for processing a continuous stream of data. Hadoop is the application that is used for Big Data processing and storing. Hadoop development is the task of computing Big Data through the use of various programming languages such as Java, Scala, and others. Hadoop supports a range of data types such as Boolean, char, array, decimal, string, float, double, and so on. ‘Information is the oil of the 21st century, and analytics is the combustion engine’ – Peter Sondergaard, VP, Gartner ‘Information is the oil of the 21st century, and analytics is the combustion engine’ – Peter Sondergaard, VP, Gartner Some of the interesting facts behind the evolution of Big Data Hadoop are as follows: Google File System gave rise to theThe MapReduce program was created to parse web pages.Google Bigtable directly gave rise to HBase. Want to learn Hadoop? Read this extensive Hadoop tutorial! Before you get pumped up by the Hadoop mania you should think for a minute. Hadoop has been a hot topic in the IT industry for some time now. People jump into learning every buzzing technology without thinking about it. Before you join them you must know this “When to use and when not to use Hadoop”. When should you use Hadoop? If your data is really big like at least terabytes or petabytes of data then Hadoop is for you. For other not-so-large datasets like gigabytes or megabytes, there are other tools available with a much lower cost of implementation and maintenance. Perhaps your dataset is not even that large to be processed by Hadoop. But, this could change as your data size expands due to various factors. For Storing a Diverse Set of Data Hadoop can store and process any file data. It could be a plain text file or a binary file like an image. You can at any point change how you process and analyze your Hadoop data. This flexibility allows for innovative developments, while still processing massive amounts of data, rather than slow and complex traditional data migrations. For Parallel Data Processing The MapReduce algorithm in Hadoop parallelizes the data for your data processing. MapReduce works very well in situations where variables are processed one by one. However, when you need to process variables jointly, this model does not work. When should you not use Hadoop? If you want to do some Real-Time Analytics expecting results quickly, Hadoop should not be used directly. It is because Hadoop works on batch processing. Multiple Smaller Datasets Hadoop is not recommended for small-structured datasets as you have other tools available in the market. For small Data Analytics, Hadoop could be costlier than other tools. Not a Replacement for Existing Infrastructure The big data can be stored in Hadoop HDFS and it can be processed and transformed into structured manageable data. After processing the data in Hadoop you need to send the output to relational database technologies for BI, decision support, reporting, etc. The things you need to remember are Hadoop is not going to replace your database and your database is not going replace Hadoop. Hadoop can be so complex at times so unless you have some understanding of the Hadoop framework it is not recommended to use Hadoop in the production otherwise you will be stuck in haywire. With evolving big data around the world, the demand for Hadoop Developers is increasing at a rapid pace. Well-versed Hadoop Developers with the knowledge of practical implementation is very much required to add value to the existing process. However, apart from many other reasons, the following are the main reasons to use this technology: Extensive use of Big Data: More and more companies are realizing that in order to cope with the outburst of data, they will have to implement a technology that could subsume such data into itself and come out with something meaningful and valuable. Hadoop has certainly addressed this concern, and companies are tending toward adopting this technology. Moreover, a survey conducted by Tableau reports that among 2,200 customers, about 76 percent of them who are already using Hadoop wish to use it in newer ways.Customers expect security: Nowadays, security has become one of the major aspects of IT infrastructure. Hence, companies are keenly investing in security elements more than anything. Apache Sentry, for instance, enables role-based authorization to the data stored in the Big Data cluster.Latest technologies taking charge: The trend of Big Data is going upward as users are demanding higher speed and thus are rejecting the old school data warehouses. Realizing the concern of its customers, Hadoop is actively integrating the latest technologies such as Cloudera Impala, AtScale, Actian Vector, Jethro, etc. in its basic infrastructure. Following are some of the companies that have implemented this open-source infrastructure, Hadoop: Social Networking Websites: Facebook, Twitter, LinkedIn, etc.Online Portals: Yahoo, AOL, etc.E-commerce: eBay, Alibaba, etc.IT Developer: Cloudspace Grab high-paying Big Data jobs with these Top Hadoop Interview Questions! With the market full of analytical technologies, Hadoop has made its mark and is certainly wishing to go far ahead in the race. The following facts prove this statement in a clearer way: (1) As per research conducted by MarketsandMarkets, the efficiency and reliability of Hadoop have created a buzz among the software biggies. According to its report, the growth of this technology is going to be US$13.9 billion by the next year, which is 54.9 percent higher than its market size reported five years ago. (2) Apache Hadoop is in its nascent stage and is only going to grow in its near and long-term future because of two reasons: Companies need a distributed database that is capable of storing large amounts of unstructured and complex data as well as the processing and analyzing the data to come up with meaningful insights.Companies are willing to invest in this area, but they need a technology that is upgradable at a lesser cost and is comprehensive in many ways. (3) Marketanalysis.com reports Hadoop’s market to have a grip in the following segments in the years between 2017 and 2022: It is supposed to have a strong impact in the Americas, EMEA, and the Asia Pacific.It will have its own commercially supported software, hardware and appliances, consulting, integration, and middleware supports.It will be applied in a large spectrum of areas such as advanced/predictive analytics, data integration/ETL, visualization/data mining, clickstream analysis, and social media, data warehouse offload, mobile devices and Internet of Things, active archive, cybersecurity log analysis, etc. Find some important tips to crack Hadoop Developer Interview in this amazing blog! The explosion of big data has forced companies to use the technologies that could help them manage complex and unstructured data in such a way that maximum information could be extracted and analyzed without any loss and delay. This necessity sprouted the development of Big Data technologies that are able to process multiple operations at once without failure. Some of the features of Hadoop are listed below: Capable of storing and processing complex datasets: With increasing volumes of data, there is a greater possibility of data loss and failure. However, Hadoop’s ability to store and process large and complex unstructured datasets makes it somewhat special.Great computational ability: Its distributed computational model enables fast processing of big data with multiple nodes running in parallel.Lesser faults: Implementing it leads to a lesser number of failures as the jobs are automatically redirected to other nodes as and when one node fails. This ultimately causes the system to respond in real-time without failures.No preprocessing required: Enormous data can be stored and retrieved at once, including both structured and unstructured data, without having to preprocess them before storing them into the database.Highly scalable: It is a highly scalable Big Data tool as you can raise the size of the cluster from a single machine to thousands of servers without having to administer it extensively.Cost-effective: Open-source technologies come free of cost and hence require a lesser amount of money for implementing them. ‘With data collection, ‘the sooner the better’ is always the best answer’ – Marissa Mayer, Ex. CEO of Yahoo The world is getting inclined toward Data Analytics and so are the professionals. Therefore, Hadoop will definitely act as an anchor for the aspirants who wish to make their career in Big Data Analytics. Moreover, it is best suited for Software Professionals, ETL Developers, Analytics Professionals, etc. However, a thorough idea of Java, DBMS, and Linux will surely give the aspirants an upper hand in the domain of analytics. Learn more about Hadoop through our blog on Hadoop Overview. According to Forbes’ report, about 90 percent of global organizations are investing in Big Data Analytics and about one-third of them call it ‘very significant.’ Hence, it can be inferred that Big Data Hadoop not only will remain merely as a technology but will also be a magical wand in the hands of the companies trying to mark their presence in the market. Therefore, learning Hadoop is like a feather in the cap for the beginners aspiring to see themselves as Analysts, 10 years from now. More Market Opportunities The market trends which gives an upward trajectory for Big Data Analytics shows that the demand for Data Scientists and Analysts is not going to decline anytime soon. This clearly indicates that learning this technology will give a surety about making a successful career in this industry. Big Bucks As per the statistics, the average Hadoop Developer’s salary in the United States is US$102,000 per year. This clearly gives an idea that learning Big Data technologies will be your sure-fire ticket to grab the top-paying jobs in the Data Analytics world without an iota of doubt. Hadoop has taken the Big Data market by storm as companies are constantly getting benefitted by its scalability and reliability. Though it will be exaggerating to say that it is the only player in the market, the continuous advancements have made it a preferable choice for the companies. With the increasing number of companies gravitating toward Big Data Analytics, learning this technology and being well-versed with its functionalities will definitely lead an aspirant to new career heights. Did you like the post? Please share your feedback in the comment section below!

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