1 Introduction According to the United Nations (UN) report, 63 percent of the world population will migrate to cities by 2050 (12). This will lead to 50 percent more apartments and houses to be constructed in the cities (4). More and more people are migrating to cities for a better quality of life. Expanding cities and population is putting pressure on the city infrastructures such as increased traffic and pollution, healthcare is at breakpoint etc. With the rise in such issues, it has become imperative for cities to adopt technology to address such issues and ultimately become smart cities. Smart cities are using technology and information to upgrade the lifestyle of residents by providing interconnected transport systems, advanced health care systems, traffic management and so on. As shown in figure fig:1, 24 percent of smart technology in transportation is helping urban citizens in day-to-day activities and addressing challenges in transportation, healthcare etc.This report highlights and discusses about the role of transport as one of the important components of smart cities, key issues and challenges the cities face with transport and how those challenges can be addressed. 1 Figure 1: Global growth rate for smart cities(2017–2020) (3) 1.1 Background and Key Issues There are different types of transport systems used in the cities such as railways, buses, private cars, taxis, lorries etc and what types of systems are used in the cities depends on the size of the city, demographics, terrain, budgets, requirements etc. Most of the cities combine different methods of transport to efficiently manage the city’s requirements. Each of these systems traditionally existed and operated in its own isolation without interacting or knowledge of other systems. But with the rise in population of the cities, these systems are failing under the pressure, and it becomes vital for these systems to be improved and work together to achieve the common goal of making an efficient transport system. Smart Urban transport is when cities adopt the technologies to improve the traditional transport systems to be smart, efficient and safe by way of sharing the data, building intelligence and using that intelligence to automate the monitoring, safety, enforcing regulations etc. Smart transport systems use technology to make sure people can move to another place in the city more conveniently, more cost-effectively and safely.For example, navigation systems can guide a person to get from one point to another by driving in less time and avoiding traffic and delays. According to the 2013 Florida Department of Transportation report, the benefits of using the smart transportation system have led to a reduction of incidents and traffic delays and has resulted in time savings of $1.72 billion in the financial 2 year 2013 (1). Although the smart urban transport systems are very promising but as adoption, these systems come with its own issues and challenges that the various city administrations are facing and trying to resolve. These issues are such as cost, traffic congestion, adoption, environment etc. 1.2 Aim and Objectives of this study The aim of this study is to learn about smart urban transport, how it is helping the cities achieve to become smart cities and how it is solving the problems helping everyday commuting in the city to be smooth. Then this study will focus on the key challenges that cities are facing in making their transport to become smarter and how the city administrations and researchers are working to solve those issues. . 1.3 Literature review Smart urban transportation has many concepts, technologies under its umbrella ranging from smart devices, technologies like the internet of things, different modes of transport, interconnecting these different systems, management of these systems, failure and recovery of these systems using the technology. The author Ken Gwilliam writes in the reports of “Urban transport in developing countries”, which defines the area in urban transportation and transport strategy for making more improvement in urban transportation. This paper examines the major difference between developing countries and developed countries facing the problem of urban transportation and how the weak policy of transportation create the problem of traffic(5). In addition, the author Joshi, Sujata and Saxena, Saksham and Godbole, Tanvi write down in the report of “Developing Smart Cities: An Integrated Framework” shows that advanced technologies are very helpful to solve many difficult things which are not possible to solve by manpower. Moreover, technology very easily utilizes the resources, create communication between other modes of transportation like railways, buses, cars, airline, water transportation, heavy-duty transportation and efficiently monitors all the resources of transportation(8).Furthermore, the author Vukoman R. Jokanović write down in the report “Towards Smart World Homes 3 to Cities Using Internet of Things” to expose the various aspects of artificial intelligence, tools, technology, major application domain and solution of relevant problems in urban transportation(15).Moreover, The author Ning, Zhaolong and Wang, Xiaojie and Rodrigues, Joel JPC and Xia, Feng write the report of ““ Joint Computation Offloading, Power Allocation, and Channel Assignment for 5G-Enabled Traffic Management Systems ” is that the focus is on how critical communication systems and Intelligent Transportation Systems (ITS) are helpful in the management of the urban transport system. The report represents the vehicle technology like real-time processing, the alert system in the vehicle makes very safe and secure transportation system(11). 2 What is a Smart Transportation System? With the advancement in technology, availability of varied sensor networks, communication devices and technologies like the Internet of things, the traditional transport system has advanced to an intelligent transport management system. This intelligent and smart transport system is highly efficient, has increased safety and security. Intelligent transport systems used technology to make sure people can move to another place in the city more conveniently, more cost-effectively and safely. Traditional transport systems such as railways, buses, cars, airlines, heavy transport and water transport have been running for centuries. Traditional transport systems operate independently of each other and the only way any communication was done was mostly through intercom channels etc. The smart transport system is also known as intelligent transport systems use advanced technology like communication devices, traffic sensors, navigation controls, live tracking and so on. The intelligent transport system ingests realtime data processing to make time-critical decisions automatically. With the usage of the smart transport system, the everyday life of commuters has improved in terms of low cost, less travel time and safety. For example, as shown-2 in the figure various transport systems are connected to each other.A smart transport system has already been adopted in many cities of the world. From metropolitan cities like New York and London to states like Wyoming are testing and adopting smart transport systems to reduce the time of mo4 Figure 2: llustration of Smart Transportation(9) bility, more safer, more reliable, failsafe and automated. Cities like London are already successfully running rail networks such as DLR which are automatically driven. Different types of transport modes are there. 3 Component of Smart Cities Cities and metropolitan areas are hub for different activities, which require suitable and well organized transport system for people and goods. The transportation system is considered as the lifeblood of cities. To manage the high density of population living in cities and that population involved in doing different activities arises the need for highly efficient transport modes such as railways, metros, buses, taxies and so on and such transport modes need to be more economical, more efficient and less harmful to the environment. In figure-3 show the different types of transportation mode. 5 Figure 3: Components of an Urban Transit System(14) 3.1 Metro System Metro system in cities are mostly underground .It all metro line and other transport modes are connect with the help of technology and connection stations. Shifting of the metro line and other transport modes made at connection stations. All system is managed by technology such as internet, wi-fi, communication device, sensors and intelligent traffic management system. It is very convenient and cost efficient for people. many transit fare system are available which provide zonal and district type fare . The fare and usage of system is very common .it is easily to understandable and usage. When people enter in system, they move one destination to other destination without any problem ,feel safely and save their time . 3.2 Bus System Bus system schedule by fixed route system and passengers (40-80 passengers) move to their destination by the bus. Bus systems are connected with other heavy transport system mainly metro, transit rail and taxes. With this connectivity, passengers feel comfortable and reach their destination without any problem. Express services have their own rights .its moves with a limited number of stoppages and follows their routes for reaching the 6 destination. 3.3 Transit Rail System Mainly transit trains are divided into two types. The first type is tram-trains .which are move around the cities for a short distance. It has composed as street cars or light trains .which are used for slower speed and short distances between the stations. Tram trains may be used to share the common streets with people and vehicles (public or private) . The second type is the commuter rails system. Basically, commuter rail is known as heavy rail, using electronic and diesel trains. which are used for faster speed and longer distances between stations. These whole services link with the intelligent transport management system and real-time process system. fare of transit trains depends upon the service of the train and is proportional to distance or different services zone areas. 3.4 Shuttle System Basically, this service is used for elderly and disabled people. The service provider of this system is private owners of small buses or vans. Who are provided the service to needy people and link with the mall, college, industries, hospitals, hotels, campus and so on. The routes of shuttle service to be fixed. But according to the situation route can be changed. 3.5 Paratransit System Paratransit system are provided for disabled people who are unable to use regular and fixed route of transport service in particular region. Paratransit service must be flexible according to the service taker. Paratransit service usually offer on-demand door-to-door service by the simple phone call. The other name of this service is community transport. 7 3.6 Taxi System Taxi system is very common transport mode which has used private owner small vans and cars for traveling. Taxi systems never follow fixed routes and times. It is up to the demand of customer routes and time is decided. Fare is decided according the distance/time, but sometimes can be negotiated or changed. Taxi companies are issuing the taxi permit to pick up the customers. In general, the fare is standardized by taxi companies that consider the benefits of customers and owners of taxis. Information technology is very helpful for taxi systems. It moves the taxi system to the next level. All taxis are interconnected with technology .taxies are available on online. Customers can pre-book the taxies and can see the live location of the taxies. Many online websites and applications are available. Where customers book the taxies and send feedback regarding the taxies .It should be good or bad, according to given the services of taxies. 4 Internet of Things (IoT) In Smart Transportation The backbone of smart transportation is the internet of things. The smart transportation system needs to have three characteristics: inter-connection, intelligence and arrangement or flow of the system which has been provided by IoT. The smartphone, smart sensors, smart meters, radio frequency identification (RFID), GPRS, Location tracker, networks, computer, firmware, smart software and applications are essential for making the smart transportation systems. All internet things are interconnected with each other in the IoT networks and it ensure that all electronic smart devices and smart applications are communicated each other for providing the next level of smart, secure and safe services(Smart City and the Applications). Smart devices like GPRS, communication devices, smart applications, maps are very helpful in smart transport. That is why all resources of transportation are fully utilized. For example, people book their taxi, bus, train, and plane tickets by their phone, on the website and use other smart applications. They don’t need to go physically anywhere for booking the tickets. All things are available only one click. 8 5 Challenge of Transportation In Urban Cities Smart cities are the future of the upcoming world. Many countries are working on these systems. Transport management is a major concern in urban cities. Urban cities offering better jobs, better universities and lifestyle are attracting more population. The cities are expanding and consuming more land to accommodate this rise of population. This rise is also putting pressure on the existing systems. One of the most affected areas of cities as a result of this increase in population is the transportation system. The transportation system plays a vital role in the growth of the city and is the heart for the city to work. 5.1 Finance In the development of an Intelligent transportation system, and improving and maintaining the current system requires large financial support. The money is not just needed for building new infrastructure that adopts the new technology but also maintaining the current one and interdependent of new and old systems to work together in tandem. This becomes more difficult in developing countries. 5.2 Security of Smart Interconnection system The usage of technology and interconnection of all these smart transportation systems will make them more prone to cyber-attacks. Cyber attacks in these systems can lead to an increase in accidents, traffic jams etc. 5.3 Coordination Most of the different transport systems are owned/operated by different agencies with different goals and budgets. It would be very difficult to get the coordinated effort to improve the current system in a unified way towards a unified goal. These systems work under different standards. It creates the need for cities, countries to form a set of standards for the smart transportation system(2). 9 5.4 Congestion and How To Control With the increase in population in the major cities around the world, has exponentially worsened the state of traffic as well. Most of these cities are very old and still use traditional methods along with trying to modernize where it is possible. But lack of space and increase in population is making it difficult. For example, In weekdays average traffic speed is claimed 10 km/h or less in Bangkok Manila, Mexico and Shanghai (5). As Figure 4: vehicle owners and income. Data shows the car owner in developed and developing countries from 1950 to 1995 .Reference (5) shown in figure-4, the developing country have less cars owners as compared to developed countries such as France, Japan, United kingdom and Spain. Reason of Congestion problem is using of traditional planning method. To solve this problem by using strong administration models. Industry areas should be located outside of the cites. By this, most of traffic can be passed outside the cites or inside of cities become less crowdy (5). Developed countries are following the strong administration methods such as divide cities in various sectors (industrial sector ,education sector, hospital sector, resident area ) for smart cities.With more congestion in the areas, it becomes very difficult to expand the road networks, especially in the cities. It requires more planning but it definitely causes 10 disruption to the public till the time the project is not finished. Traffic management and planning in the cities need to ensure different factors while constructing the bypass, bridges, flyovers and so on. Underground metros are a very good solution for controlling traffic. London is a very good example for using the underground metro. Underground metros have solved the problem of time and space.Traffic management failed in many developed countries. Use advanced traffic management systems with advanced sensors, tools, smart apps and real-time data processing devices and software and so on. Most of the vehicles now are equipped with live traffic feeds and automatically route the drivers to fewer traffic areas. This not only helps save time for the drivers but also saves congestion. 5.5 Bad Situation of Environment Increasing the number of vehicles on the road has created a very dangerous situation. The income of every person has been increased as compared to past. In developed countries (USA, UK, Canada, Germany ) people are capable to buy their own car and bike. Vehicles emit carbon dioxide that is very harmful for environment. It has a very terrible situation not for the environment but it is bad for everyone. Transportation is the backbone of smart cities but that is not mean it damages the environment. Very surprising evidence have which transportation use 25 percent of world carbon emission in the form of fuel, coal, electricity etc. but all of the world consumes 23 percent of the world total carbon emission. But according to present data , transports consume 13.5 percent of more carbon energy (10). It is 50 percentage higher carbon emission (412.5 parts per million) in 2020 as compared to when the industrial revolution started (IEA). Planning and taking strong action is very important for the environment. Old generation vehicles are emitting more carbon dioxide as compared to today’s vehicles. Today, technology and engineering work at a very advanced level. Everyone shifts on a new transport vehicle and makes a strong policy regarding more than 10 years of the vehicle not being allowed in smart cities. for example, banning the vehicles that are more than 10 years old on entering the bigger cities to control the CO2 emission in the environment. A similar type of policy adopted 11 by the Delhi government in India banned 15+-year-old vehicles in Delhi. Many countries are moving transportation from fuel to alternative fuels such as electricity, CNG, LPG for controlling the air quality in the environment. CNG vehicles have 30 percentage fewer emissions as compared to diesel vehicles (5). Electric vehicles are more environmentally friendly and very effective for improving the air quality in the environment. Vehicle repair policies are very effective for reducing carbon emission in the environment. The data collected by India from November to December in 2019, shows the reduction in emissions by 27 percent during inspection and maintenance customers of two-wheelers (5). 5.6 Safety and security The world health organization claimed 1.3 million people deaths occurred due to road accidents in Poland from 2004 to 2017(13). But in the whole world, the number of deaths are unaccountable by road accidents. According to the report by World Bank, in 1999, the death rate globally was between 750,000 and 880,000 for road accidents,By the forecast of 2020, the death rate by road accidents in the world will move to a 6th place(7). To increase the awareness of road accidents is recently formatted of the Global Road Safety Partnership (GRSP) by the world bank, the International Federation of the Red Cross and other parties working under the framework of the World Bank’s Business Partners for Development (BPD) Programme. The aim of this partnership is that people are more aware of road accidents in all of world. The setting of GRSP was gathering information about the global situation of road accident in developed and developing countries (7). By finding that information, GRSP members are finding the real problem and solution to road accidents. Firstly, developing countries should work more on traffic safety management systems. They spend more money on traffic management systems and smart devices. Traffic management system plays a major role in preventing road accident. Many developed counties have overcome the problem of road accidents such as accidents due to excess driving speed, driving under the influence of alcohol and road crossing problem and so on by the use of 12 good traffic management system. Apart from traffic management systems, other things that very helpful for preventing road accidents are to improve road quality, signal control system, separate bicycle lane, the good hierarchy of road separation lanes, real-time information of the vehicle and so on. In the long run, developing countries are more focused on the traffic system and always focus on the betterment of road infrastructure and traffic management systems. According to the need of time, developing countries should be taken important steps like Strick policy regarding traffic implementation, remove the shortage of man pawer in traffic management system , use latest and advance device in controlling traffic . 6 Conclusion Intelligent transport systems are vital systems for cities and countries. With Smart transport systems in place, cities can easily benefit from it in terms of less traffic, less pollution, more safe travel. But these systems come with their own challenges such as finance, congestion, traffic laws, disconnected autonomous current systems etc. For a smart transportation system, one of the first goals is to connect different transport systems. Careful planning and enactment of common standards and laws can assist with the setup of smart transport systems.