Towards the Support of 5G Networks During COVID-19

Divya Gupta, Shruti, & Shalli Rani, *Chitkara University Institute of Engineering and Technology, Chitkara University, Punjab, India,* **Shruti,** *Goswami Ganesh Dutta Sanatan Dharma Dutta College, Chandigarh, India,* **Syed Hassan Ahmed**, *Independent Researcher, USA*

July 2021

Compared to the Second World War and the 1918 Spanish flu in terms of impact on human lives and behaviors, COVID-19 is a pandemic experienced worldwide. Maintaining social distancing, wearing face masks, and staying home to quarantine are some common measures being followed to date to help control the spread of this disease. In complying with these measures, human life has taken on a new normal in which routinely in-person activities such as shopping, training, education, meetings, entertainment, etc. have fully shifted from offline to online mode. This paradigm shift has accelerated the use of digital technologies uniquely among every human. The excessive use of telecommunication technologies has put an enormous strain on both fixed and mobile networks. Existing networks often encounter various challenges due to high traffic congestion on core networks which merely degrades its performance. Even in its early stage, the recently launched 5G network combines various features, such as enhanced mobile broadband and reliable low delay communication, to provide support for some of the challenges faced during this crisis. In addition, the Artificial Intelligence (AI) features have been embedded into 5G networks to enable autonomous and intelligent telecommunication networks. The use of AI can help in dynamic resource allocation due to the ability to assign resources to different locations on-demand in real-time vs. the static resource allocation implemented in existing networks.

HEALTHCARE

The healthcare industry has been immensely impacted by the COVID-19 outbreak. The magnitude of COVID patients in certain countries/regions has resulted in a shortage of medicines, insufficient patient to doctor ratios, and an extremely limited availability, and in some cases inaccessibility, of ventilators, testing kits, and Personal Protective Equipment. As a direct consequence, the daily death rates have drastically risen due to coronavirus infections in addition to constraints on facilities to treat non-COVID patients experiencing other health issues. As of 9 July 2021, the WHO has reported over 4 million deaths worldwide, of which approximately 15% has been in the United States alone [9]. The pandemic has not only affected physical health but mental health as well. On one hand, many relatives and friends of COVID patients have been diagnosed with depression, and on the other hand, medical workers are experiencing traumatic stress due to excessive work hours, inadequate sleep, and fear of contracting the virus while caring for infected patients. The use of telecommunication facilities in terms of video conferencing, remote health surveillance, and web applications were best suited for providing medical support outside the hospitals during this time.

EDUCATION

The COVID-19 outbreak forced many people to study remotely, generally from their homes, throughout the first quarter of 2020. In tandem with the new normal, almost all students and educators utilized video-based online platforms to continue driving education to the designated track. This large portion of the population was grouped into a category containing the second most number of users consuming services provided by the telecommunication industry. The educators had to work very hard to prepare online

course content, examinations, and to analyze the results. The AI-based 5G networks provided assistance by supporting ultra-reliable low latency communication with great quality of experience.

ENTERTAINMENT

This was one of the most affected sectors of the economy during these times. Since the worldwide outbreak of COVID, almost all countries announced a complete shutdown of entertainment venues including movie theatres, dance halls, music concerts, and more. Although people were forced to comply with these mandates, in a time like this, entertainment is one of the most important pleasures that can help to keep people happy and motivated. Various entertainment programs and streaming services emerged during this time, such as amazon prime, Netflix, Disney+ Hotstar, ZeeFive, etc, and now, they continue to be highly popular. AI-enabled 5G offers an abundant amount of services that can be used to support the continuous streaming of multiple on-demand media channels. Moreover, the burden on the network core can be reduced by utilizing caching at different locations for a number of popular videos through the use of dynamic resource allocation. 5G can provide high-quality options for obtaining on-demand content in a mobile scenario, such as when on the road.

MANUFACTURERS

Manufacturing industries were also affected by COVID-19. Being that it is difficult to maintain social distancing among workers, factories were forced to shut down to protect staff from contracting and spreading the virus. Automobiles, electronics, and chemical manufacturers are among the most affected sectors across the world. The transportation industry (the transporting of goods, in particular) was also hit hard. In this scenario, 5G played an important role by enabling industrial IoT and manufacturing. Autonomous manufacturing will significantly reduce, if not eliminate, the need for on-site staff, thus helping to prevent the spread and keeping people safe from exposure. In factories, robots can be used to control processes and achieve set goals. URLLC, a use case of 5G, ensures the remote controlling of communication between factories, processes, and power supply between the factories.

CONCLUSION

COVID-19 brought our lives to halt and shifted just about everything from offline to online mode. Many existing technologies were unable to manage daily requirements due to issues such as heavy traffic and high-speed requirements, therefore 5G networks played a vital role in this situation. 5G provides low latency, improved broadband, enables autonomous environments, intelligent networking, and much more, making it reliable for different applications within various industries such as healthcare, education, entertainment, and manufacturing.

REFERENCES

1) Shi, Y., Han, Q., Shen, W., and Zhang, H. (2019). Potential applications of 5G communication technologies in collaborative intelligent manufacturing. *IET Collab. Intell. Manuf.* 1, 109–116. doi: 10.1049/iet-cim.2019.0007
2) Cheng, J., Chen, W., Tao, F., and Lin, C.-L. (2018). Industrial IoT in 5G environment towards smart manufacturing. *J. Ind. Inform. Integr.* 10, 10–19. doi: 10.1016/j.jii.2018.04.001
3) Abubakar AI, Omeke KG, Ozturk M, Hussain S and Imran MA (2020) The Role of Artificial Intelligence Driven 5G Networks in COVID-19 Outbreak: Opportunities, Challenges, and Future Outlook. *Front. Comms. Net.* 1:575065. doi: 10.3389/frcmn.2020.575065.
4) McKibbin, W. and Fernando, R., 2020. The economic impact of COVID-19. *Economics in the Time of COVID-19*, 45.
5) Xiong, J., Lipsitz, O., Nasri, F., Lui, L.M., Gill, H., Phan, L., Chen-Li, D., Iacobucci, M., Ho, R., Majeed, A. and McIntyre, R.S., 2020. Impact of COVID-19 pandemic on mental health in the general population: A

systematic review. *Journal of affective disorders*.
6) Siriwardhana, Y., De Alwis, C., Gür, G., Ylianttila, M. and Liyanage, M., 2020. The fight against the COVID-19 pandemic with 5G technologies. *IEEE Engineering Management Review*, 48(3), pp.72-84.
7) Siriwardhana, Y., Gür, G., Ylianttila, M. and Liyanage, M., 2020. The role of 5G for digital healthcare against COVID-19 pandemic: Opportunities and challenges. *ICT Express*.
8) Chatzittofis, A., Karanikola, M., Michailidou, K. and Constantinidou, A., 2021. Impact of the COVID-19 Pandemic on the Mental Health of Healthcare Workers. *International Journal of Environmental Research and Public Health*, 18(4), p.1435.
9) WHO Coronavirus (COVID-19) Dashboard. (n.d.). WHO Covid Data. Retrieved July 10, 2021, from https://covid19.who.int/

Divya Gupta received her master's degree in computer science and engineering from Lovely Professional University, Phagwara, in 2012. She is currently pursuing a Ph.D. degree with Chitkara University, Rajpura, India. She is also an Assistant Professor in CSE at Chitkara University, with almost seven years of teaching experience. Her research areas include information-centric networking, IoT, edge, and fog computing.

Shruti received her M.Tech degree in computer science and engineering from PEC University of Technology, Chandigarh in 2015. She is currently pursuing her Ph.D. degree from Chitkara University, Rajpura, India. She is working as an Assistant professor in Goswami Ganesh Dutta S.D. College, Chandigarh since 2015 and has 5 years of teaching experience. She has published many papers in international journals, attended workshops, seminars, and lectures. Her research areas include networking, IoT, and fog computing.

Shalli Rani received her M.C.A. degree from Maharishi Dyanand University, Rohtak, in 2004, her M.Tech. degree in computer science from Janardan Rai Nagar Vidyapeeth University, Udaipur, in 2007, and her Ph.D. degree in computer applications from Punjab Technical University, Jalandhar, in 2017. She is currently an Associate Professor in CSE with Chitkara University, Rajpura, India. She has over 15 years of teaching experience. Her main areas of interest and research are wireless sensor networks, underwater sensor networks, and the Internet of Things. She has published/accepted/presented more than 35 papers in international journals/conferences (SCI+Scopus) and two books with Springer. She has worked on big data, underwater acoustic sensors, and the IoT to show the importance of WSN in the IoT applications. She received a Young Scientist Award in the same field from the Punjab Science Congress in February 2014. She serves as the Associate Editor of the IEEE FUTURE DIRECTIONS LETTERS.

Syed Hassan Ahmed (Senior Member, IEEE) received the B.S. degree (Hons.) in CS from the Kohat University of Science and Technology (KUST), Pakistan, and the master's combined Ph.D. degree from the School of Computer Science and Engineering (SCSE), Kyungpook National University (KNU), South Korea. He is currently working at JMA Wireless as a Product Specialist for Distributed Antenna System (DAS), CBRS, Small Cell, and virtualized RAN product line. He was an Assistant Professor with the Department of Computer Science, Georgia Southern University, Statesboro, GA, USA, where he has also founded Wireless Internet and Networking Systems (WINS) Laboratory. Prior to this, he was a Post-Doctoral Fellow with the Department of Electrical and Computer Engineering, University of Central Florida, Orlando, FL, USA. His research interests include sensor and Ad hoc

networks, cyber-physical systems, vehicular communications, and Future Internet.

EDITOR:

Priscilla Amalraj is a Senior Director, responsible for Strategy, Execution and Support for all aspects of Information Technology at IEEE.

Key accomplishments of Ms. Amalraj at IEEE are creating a state of the art e-Commerce platform that is the back bone of firm's business, Mobile Application suite(IEEE App), Cloud Adoption, Data Security, an Advanced Analytics & AI Platform and Sales & CRM Solution. During her tenure at IEEE, Ms. Amalraj led several large initiatives improving key functional capabilities of the firm in Technology, Corporate Finance, Treasury Management, Sales and Marketing, e-Commerce, Legal, HR and Client Services.

Ms. Amalraj led the largest initiative of the firm "IEEE Business Platform" with ~$50 million budget, over 150 member team to introduce a new e-Commerce system that brought transformational changes to firm's business model and client experience. Ms. Amalraj's responsibilities included: IEEE's Mobile Center of Excellence, Innovation Lab, Digital Solutions & Enterprise Web Applications, Business Analytics Center of Excellence, Test Engineering, Cloud Strategy and Data Privacy Program(GDPR).

Prior to IEEE, Ms. Amalraj was a Principal Consultant at AT&T focused on the development of their International Customer Service Systems. Ms. Amalraj started her career in Asia working for SPIC Ltd, and Leyland Information Technology from 1990 to 1994.