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Research Article

Research on the Construction Model of 5G Special Town Based on Edge Computing

Qi Da and Xing Pengchao

School of Design and Art, Xijing University, Xi'an, Shannxi 710123, China

Correspondence should be addressed to Qi Da; qida@xijing.edu.cn

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This study conducts a study on edge computing technology, focusing on the advantages of edge computing technology and its applications, and delves into the edge computing architecture, which leads to an in-depth study on the construction of a 5G special town model. Based on the existing 5G characteristic town construction model, this study proposes a new model of edge computing and proposes an application partitioning algorithm based on this model by analyzing the edge computing scheduling scenarios to minimize the total time cost of the system. By analyzing the edge computing scheduling scenarios, an application partitioning algorithm based on this model is proposed, so that the total time cost of the system is minimized. This study analyzes and studies the current situation of infrastructure construction, and investment in the special town analyzes the significance and purpose of its construction and develops the research method and technical route of this study as a result. Then, the connotation of characteristic town and infrastructure is elaborated, and the value, characteristics, and role of infrastructure construction of characteristic town are analyzed; the influencing factors of infrastructure investment in characteristic town are analyzed; the development of the characteristic town has endless potential, and the development of characteristic town must meet the demand of social economy as well as town population for infrastructure support. However, there are more risk factors for infrastructure investment in characteristic towns, and the investment risk is larger than general projects, so it is necessary to strengthen risk management and do a good job of investment protection.

1. Introduction

With the high tide of mobile Internet, new media forms and communication forms are emerging, and in the spirit of faster, simpler, and smarter, various types of information carriers are emerging, such as big data, cloud computing, Internet of things, and 5G. The importance of networked technology for regional construction and development is becoming increasingly prominent [1]. Without losing time, the construction of information technology has been made an important task, and as measures continue to be taken, the digital construction of networks in all regions has been fully rolled out, breakthroughs have been made in key areas, and the application of network digital technology has begun to have a positive impact in many aspects of the national economy and the construction of civilized society. In the future, digital network technology will continue to play an important role in all areas of society, driving political, economic, cultural, and social development and change in all regions.

The deep integration of tourism and information technology has become an unstoppable trend of the times. How to apply 5G technology to develop tourism and better build tourism cities has become a challenge for government departments and scenic spots at all levels, and tourism integration with information technology is an important path to promote the transformation and upgrading of tourism cities. With the high tide of mobile Internet, new media forms and communication forms are emerging, and in line with the principles of faster, simpler, and smarter, various types of information carriers are emerging, such as big data, cloud computing, Internet of things, and 5G. The importance of networked technology for regional construction and development is becoming more and more prominent. With the deepening commercialization of 5G wireless networks and the increasing improvement of 5G ecology, how to plan 5G wireless networks for tourism cities to enrich tourism content, enhance the experience of tourists and residents, and meet the growing demand for 5G services in tourism cities has become an important theme for future 5G development [2]. The emergence of edge computing allows local intelligent control services, intelligent data collection, data analysis, industrial intelligent manufacturing, and other fields to gradually sink to achieve the corresponding purpose without cloud services. Traditional data processing is mainly carried out with cloud computing, but now it can be sunk to the edge, which will greatly reduce the pressure on the cloud and of course can be processed collaboratively. Edge computing is a hot term that has emerged in recent years, which refers to computing data at terminals close to data sources, completing traditional cloud data processing tasks at the edge, and processing through computing and storage resources at the edge to solve problems such as excessive network bandwidth load and network latency [3]. Edge computing can be done locally, or run on large, medium, and small devices. The core idea of edge computing is to sink computing, storage, and network services to the edge of the network, using a series of devices near the edge of the network for auxiliary computing without changing the original network architecture and offloading the data originally to be transmitted to the cloud computing platform to a place closer to the terminal for local processing, which can achieve the purpose of fast response and reduced service response delay; in edge computing, edge computing devices are usually the existing network devices such as switches, routers, and gateways at the edge of the network or dedicated edge computing servers on the side. Edge computing devices are used in a wide range of applications, which could be computers, mobile phones, IoT intermediate nodes, smart homes, gateways, etc., or even municipal terminals such as ATMs and cameras. The emergence of edge computing has enabled the gradual sinking of local smart control services, smart data collection, data analytics, industrial smart manufacturing, and other areas for corresponding purposes without cloud-based services [4]. Traditional data processing is mainly carried out with cloud computing, but now it can be sunk to the edge, which will greatly reduce the pressure on the cloud and of course can be processed collaboratively. For areas such as data collection or equipment monitoring, the ultimate purpose of our data collection is to analyze the data, and if the computing power of the equipment near the source of the data allows, it can be done entirely at the edge, which will greatly reduce the pressure on the cloud; at the same time, it can also draw conclusions quickly and efficiently. Current research on application partitioning and scheduling is mainly based on the cloud computing scenario, when different microservices are scheduled by the partitioning algorithm and assigned to the same cloud center, by default there is no communication cost between them, and all communication time cost comes from the cross-end communication cost when scheduling to different clouds. At present, edge computing has become an important part of the current information infrastructure, and future development is promising.

To solve the problems existing in the construction model of the 5G characteristic town, a reasonable idea is to adopt edge computing to achieve the unified optimization of computing and communication resources, so that the 5G network can be better used in the characteristic town [5]. The core idea of edge computing is to sink computing, storage, and network services to the edge of the network, using a series of devices near the edge of the network for auxiliary computing without changing the original network architecture. In addition, since edge computing is designed to make up for the shortcomings of cloud computing, the combination of cloud computing and edge computing can give fuller play to their respective advantages and provide better service quality for the featured town, so it is very necessary to study a new cloud-edge computing network architecture based on edge computing technology.

2. Related Works

After the 1990s, the study of the relationship between rural development and the media in development communication entered a new phase, revolving around the question of "how much and what role does communication play in rural modernization" [6]. Development is a systemic process, and if communication is useless or even counterproductive for some components, it will inevitably threaten the smooth functioning of the entire development system [7]. During this period, much attention was paid to the role of communication in social development, and it was argued that, as media technologies were updated, peasants entering the cities were also applying flexible and varied communication channels [8]. In gateway devices, edge devices with both strong computing and storage capabilities are costly, so it is important to select a cost-effective hardware and software system to deal with small data collection and computing services. A structural-functionalist research paradigm was developed, using qualitative research methods to analyze the role of various media channels on social development, and the impact of communication technologies on rural development was examined dynamically. A communitarian approach to research was developed, stating that the media should not be used as an external tool for development, but should be an internal tool for development.

Edge computing was first proposed in 2009 to solve the problem of excessive latency and network congestion caused by cloud computing architectures supporting latency-sensitive services. Edge computing empowers wireless access network computing, and by deploying servers with computing, storage, and communication capabilities next to nodes in wireless access networks, it can meet the demand for high-reliability and low-latency 5G services; by offloading services to edge servers, it can break through the limitations of storage and computing resources of terminals and can extend terminal life [9]. Edge computing has been gradually gaining attention since 2016, and numerous researchers and companies are involved in promoting its development [10]. Many experts and scholars have studied edge computing, which has been carried out in the field of industrial data collection and used edge gateways and edge clouds to parse and encapsulate data for processing and data triage respectively, achieving the effect of edge data classification and storage. The edge computing algorithm is used in the IoT detection system to implement the anomaly detection of sensed data and design the corresponding computational model [11]. A convolutional neural network construction method for FPGA is proposed in an embedded environment at the edge of the network, and the power consumption performance is further improved by optimizing the traditional model in terms of caching, data flow, and expansion. Edge computing research has also been conducted in areas such as smart home and power IoT data processing [12]. The edge computing infrastructure is designed in the energy management system of IoT to enable enhanced learning capability and efficient energy scheduling. Edge computing environments are introduced using deep learning methods and a new offloading policy is designed to improve performance in performing multiple tasks through edge optimization. The problem of deploying nodes for large-scale IoT edge computing is investigated and a three-phase deployment method is proposed to achieve real-time processing and reduce nodes [13]. Edge computing and software-defined networking technologies are applied to the industrial Internet, and adaptive transmission architectures are designed to solve problems such as flow-limited transmission and path optimization. Edge computing is widely used, as it is a relative concept, and what is more important is the specific processing method in the edge computing scenario.

With the emergence of edge computing, it has solved various business problems caused by the explosive growth of data volume generated by many communication technology developments and the popularity of smart devices; but due to the rapid growth of user data processing demands in edge computing and the continuous emergence of many emerging and diverse edge applications, these applications are very delay sensitive and requires a large number of network connections and lower latency, which will lead to increasing data size and service requests per unit time processed by the core network, challenging the computing capacity of mobile devices with limited resources. The target of 5G wireless network planning in the featured town 5G wireless network planning is to promote the development of 5G mobile communication network, improve the scientific, economic, and reasonable planning and construction of 5G mobile communication base stations as the overall goal, meet the development needs of full coverage of 5G wireless network within a certain time, and strongly support economic and social development. Since all the data generated by these latency-sensitive applications in a short period must pass through the core network, it will put a lot of pressure on the edge cloud network load during the peak period of service access, and the traditional mobile edge servers can no longer provide timely and efficient services.

3. Research on the Construction Model of 5G Special Town Based on Edge Computing

3.1. Modeling Edge Computing Systems. Current research on scheduling algorithms for edge applications or services is based on a relatively simplified model, which generally schedules all or some of the application services across the edge to a cloud center for execution or within a cluster, scheduling virtualized resources from one machine to another. Edge computing can be done locally or run on large, medium, and small devices. Edge computing devices can be used in a wide range of applications, including computers, cell phones, IoT intermediate nodes, smart homes, gateways, etc., and even municipal terminals such as ATMs and cameras. The scheduling destinations involved are only an edge cloud and a cloud center or are limited to the interior of a cluster for scheduling only, as shown in Figure 1. In this case, a node in the graph is used to represent a subservice or subcomputing module of the application, an edge between two nodes is used to indicate that there is a communication or data transfer relationship between these two subservices, and the weight of the edge is used to represent a certain physical resource. However, in the past, studies based on this model graph have been based on two premises [14]: first, since an edge and a cloud center is considered, the communication cost between subservices scheduled to the edge or between subservices scheduled to the cloud center is negligible when the subservices are divided into two parts. Or when a whole application is scheduled, the whole application is executed at the new location without local communication over the LAN but only in the shared memory, so the cost of the communication and transfer process can also be ignored; second, when different subservices communicate across ends at different ends, their communication cost is the same.

The current research on application partitioning and scheduling is mainly based on the cloud computing scenario, when different microservices are scheduled by the partitioning algorithm and assigned to the same cloud center, by default there is no communication cost between them, and all communication time cost comes from the cross-end communication cost when scheduling to different clouds [15]. The coupling between different microservices, such as function calls, or the transfer of data, is then represented by the edges of two nodes on the graph, and the input/output data of the microservices transferred between computing servers include data and code related to the microservices (e.g., application data such as image/video data, mobile system settings, parameters, program code, intermediate state, and return values of method calls) [16]. For applications or services to reduce latency, the entire model has two types of time costs, one is the computational time cost of running the microservice locally or scheduling to an offsite server, represented by the weights of the nodes, and the other is the time cost of communication and data transfer between microservices, represented by the weights of the edges. To solve the problems in the construction model of the 5G special town, a reasonable idea is to adopt edge computing to

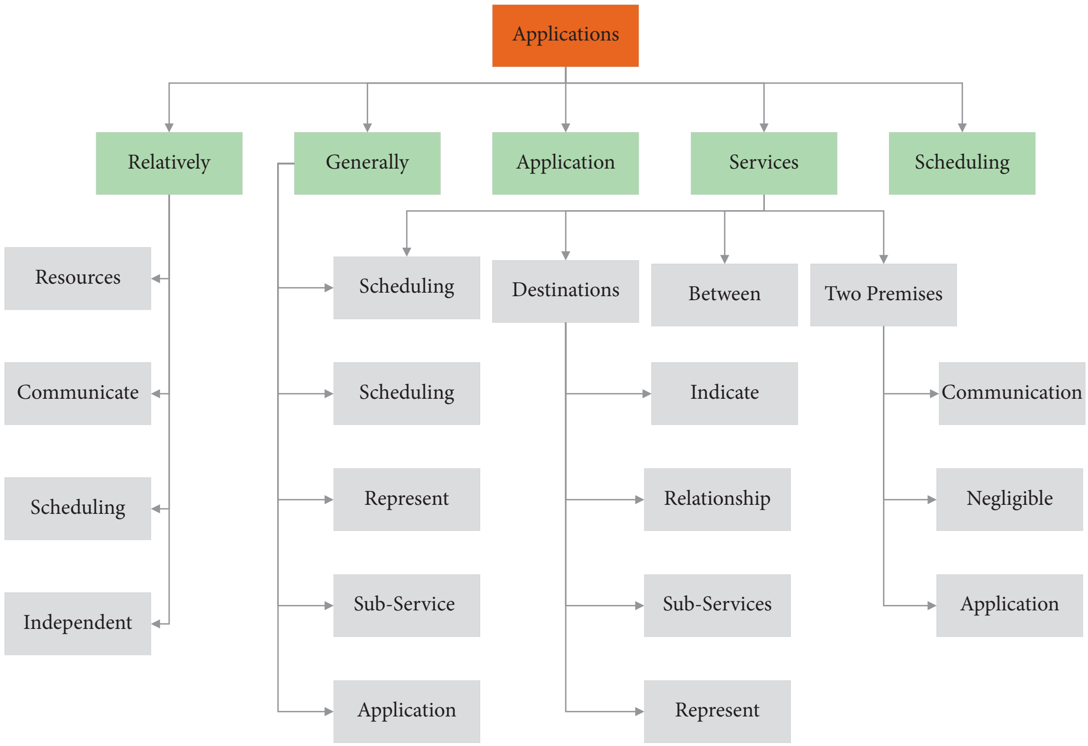

Figure 1: Data processing architecture diagram.

achieve unified optimization of computing and communication resources, so that the 5G network can be better used in the special town. Therefore, it is necessary to try to find the optimal vertex assignment for graph partitioning and scheduling of microservices by balancing the computational time cost with the communication time cost. Assume that $W = F \times w_i$, where F is the acceleration factor, that is, the ratio of the execution speed of the scheduled server to the execution speed of the local edge cloud server (or the inverse of its average task completion time). Usually, the computational power of the offsite server is higher than that of the local edge device with $F > 1$. Therefore, the total execution time cost of microservice computation can be obtained expressed as follows:

$$T_1 = \sum_{v_i} I_i - w_i \times \sqrt{1 - I \times w_i}. \tag{1}$$

Emphasis is placed on edge devices with object autonomy and object collaboration capabilities, which should have features such as autonomous connectivity, autonomous decision-making, autonomous optimization, and autonomous execution. For the edge gateway, it is required to be able to have certain network connectivity, protocol conversion and to provide light connection management, data analysis, and application management. According to the reference architecture, the edge gateway is an important part of the overall edge system architecture, undertaking the data transmission and edge-side computing tasks. Among the gateway devices, the edge devices with both strong computing and storage capabilities are costly, so it is important to select a cost-effective hardware and software system to cope with small data collection and computing operations. Industrial Internet edge computing node design methods and techniques have mentioned efficient adaptive edge computing methods, according to this part, as a theoretical background to study edge adaptive acquisition of gateways. Studies on scheduling algorithms for edge applications or services are based on a more simplified model, generally scheduling all or some of the application services across the edge to the cloud center for execution, or within a cluster, scheduling virtualized resources from one machine to another. Combined with the data aggregation characteristics of the gateway, we can calculate and filter the data at the gateway end and adjust the collection frequency adaptively according to the collected data to achieve the effect of reducing network transmission. According to the gateway edge reference architecture, the edge reference architecture of this gateway is also designed with the actual situation, which is shown in Figure 2.

The traffic volume of surveillance video, especially HD video, is large, and the uplink bandwidth demand for 4k HD video all the way can reach 16 Mbps. With dense camera deployment, the information volume of video is large, and the requirements for transmission, storage, and processing are high. There are two ways to process the current video surveillance service: one is to upload the video stream to the central cloud for processing and the other is to perform video processing at the camera side. If the data are uploaded to the central cloud, it will increase the pressure on the core network and the service response delay is large, which is too inefficient; processing data at the camera side require the camera to have data processing and analysis capability,

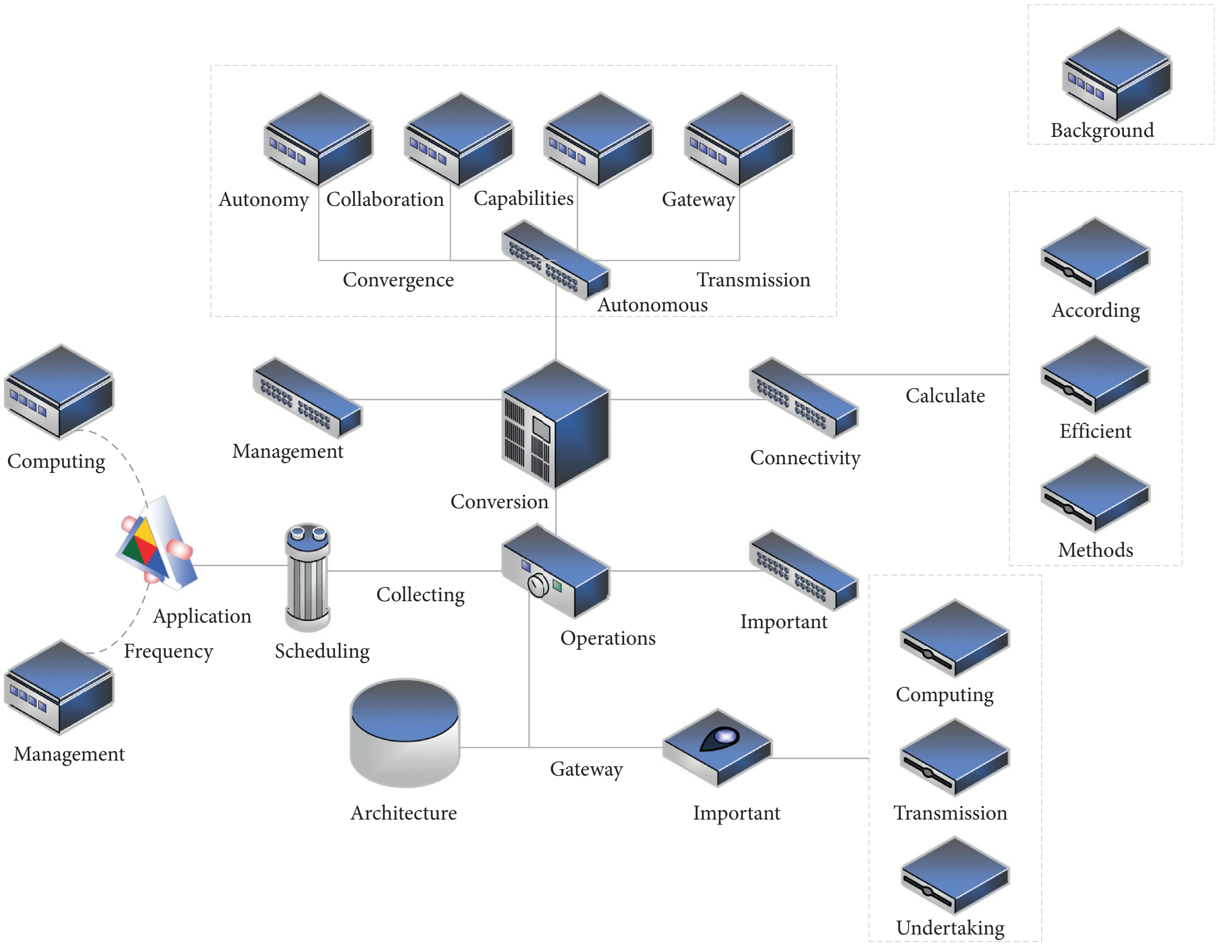

Figure 2: Edge reference architecture diagram.

which is too costly. By introducing MEC technology and deploying MEC devices at the edge of the network for local streaming of surveillance video data, we can avoid the problems of high latency, high bandwidth consumption, and low efficiency caused by uploading video to the remote end, thus providing better services to users. In addition to surveillance video analysis, live events and video tours, which have low latency and high bandwidth requirements, can significantly reduce service response latency, enhance user experience, and reduce network costs after applying MEC technology. Combining the above considerations, the weights of the edges in the weighted graph are used to represent the communication transmission time cost between individual microservices, and $w(e(v_i, v_j))$ is used to represent the communication time cost when microservices v_i, v_j are executed locally or when they are scheduled to the same edge cloud. Denoted by $w(e(v_i, v_j))$, the communication time cost when microservices v_i, v_j are scheduled to different locations is as follows:

$$w_v = \sqrt{\frac{\text{in}_i}{B}} - \sqrt{\frac{\text{out}_i}{B_i}}. \tag{2}$$

3.2. *Model Design of 5G Special Town Construction.*

Looking at the development path of 1G to 4G networks, each development of mobile communications is addressing the most dominant and urgent communication needs that exist at the time. In the future, hundreds of millions of smart terminals will be connected to the network, enabling more diverse services and applications. As a result, 5G will build a user-centric, all-encompassing information ecosystem that seamlessly converges to achieve the overall vision of "information at your fingertips and everything at your fingertips." The evolving user needs will pose a great challenge to key 5G technologies, including transmission and network technologies, and 5G will meet the growing demand for mobile service traffic through higher spectrum efficiency, more spectrum resources, and denser cell deployment. In terms of transmission rates, 5G will increase typical user data rates by 10 to 100 times, with peak transmission rates of up to 10 Gbit/s. In the edge computing scenario, microservices may be scheduled on each clock computing resource at the edge, and due to the heterogeneity of network resources, the communication time cost between microservices cannot be ignored, and there may also be no symmetric cross-end communication cost, so the simple research models in the past do not apply to the microservice architecture scenario of edge computing. Therefore, a new scheduling model for

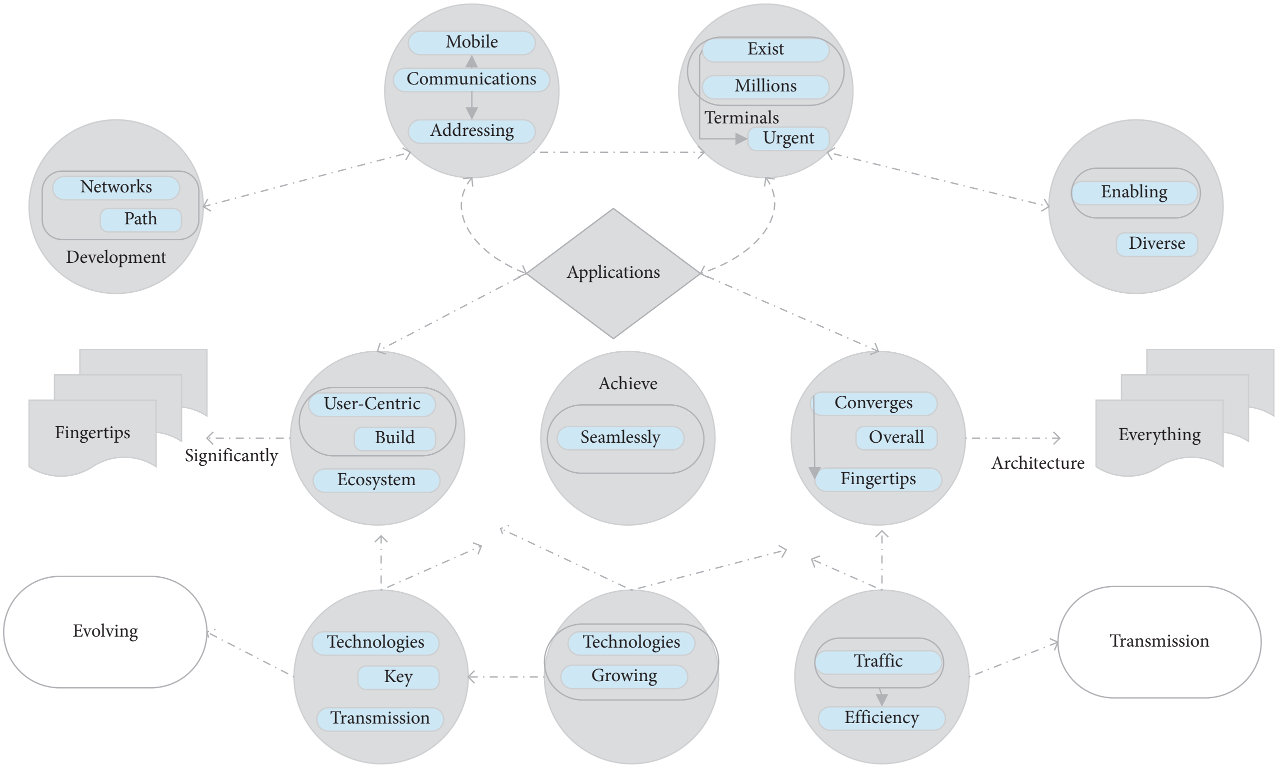

Figure 3: Flowchart of CU, DU, and AAU planning.

microservices in edge computing scenarios is proposed. At the same time, 5G will achieve millions of connections per square kilometer, achieve millisecond end-to-end latency, and support mobility of more than 500 km per hour. 5G will also significantly improve network deployment efficiency and operational efficiency. Compared with 4G, the 5G wireless technology network architecture design must consider how to meet the 5G specifications while specifying different deployment modes based on actual scenarios. Therefore, in the logical architecture of the 5G access network, BBU (baseband unit) is divided into two functional entities: CU (centralized unit) and DU (distributed unit), making the network more flexible and easier to achieve the balance of performance and cost. The RRU (radio remote unit) is evolved into a centralized unit and a distributed unit. The RRU (radio remote unit) can be combined with an antenna to form an AAU (active antenna unit) [17]. With 5G's flexible 3-layer architecture and efficient eCPRI (enhanced common public radio interface), 5G can achieve deployment diversity through flexible combinations of CU, DU, and AAU. Depending on DU front or centralized deployment, CU front, centralized deployment or cloud-based, and AAU/DU/CU centralized deployment, the CU, DU, and AAU planning flowchart is designed as shown in Figure 3. Edge computing services as IoT gateway built-in function, the combination of these two will solve the transmission, bandwidth, data processing, and many other problems in the IoT system, providing a new solution for data collection and transmission redundancy, that is, scheduling edge computing services in the gateway system to solve the problem.

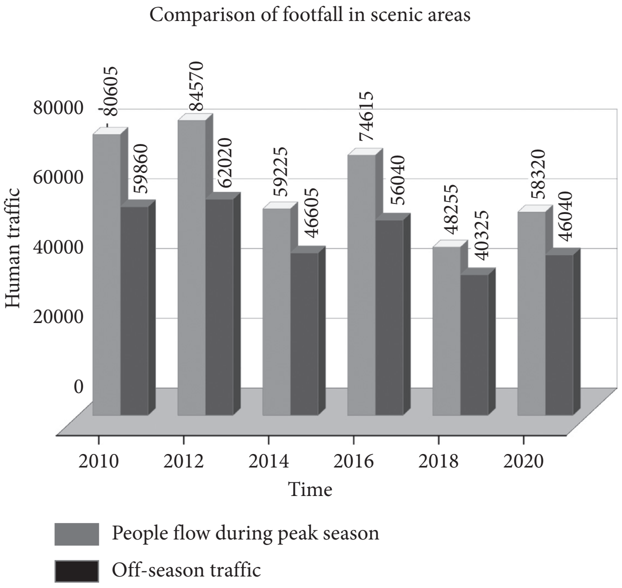

Figure 4: Comparison of footfall in scenic areas.

In tourism cities, 5G wireless network construction should help the development of scenic spots. As we all know, tourism has a very important position as the pillar industry of tourism cities; therefore, in the planning, 5G wireless network should not only play the role of enriching tourism content but also promote the development of the tourism industry to a smarter direction, so that 5G wireless network becomes the necessary infrastructure for scenic area operation. At the same time, based on meeting SS-RSRP and

SS-SINR targets, tourism cities aim to prioritize coverage of scenic spots and gradually achieve network coverage targets and capacity targets for each scenario in tourism cities to enhance the experience of 5G wireless network use for tourists and residents.

(1) Landscape and residential convergence network strategy. Normally, data traffic will peak at a certain time of the day, while at other times, such as midnight, the utilization of communication equipment is relatively low. In the case of tourist cities, because there is an off-peak season, the utilization of base stations is low during the off-peak season. To ensure user experience, operators must again deploy equipment at peak rates, and as a result, low utilization of network equipment becomes an urgent problem [18]. Observing Figure 4, we can find that the traffic flow data of the scenic area and its surrounding residential area do not reach the peak time; at the same time, if the two converge to form a network and share part of the network resources, it can save network resources to a certain extent and reduce the resource loss from the planning.

3GPP has already proposed a solution in the 5G standard, namely the C-RAN architecture, which achieves low cost, high bandwidth, and highly flexible operation by placing devices centrally and using virtualization technology for resource sharing and dynamic scheduling. The separation of CU devices and DU devices for 5G makes the C-RAN architecture easier to implement. CU is a general-purpose device and generally used to handle the nonreal-time part, while DUs are generally dedicated devices that handle real-time services. A well-designed C-RAN architecture in planning can achieve reduced operating costs while maintaining good performance levels. 5G wireless network planning is based on actual scenario requirements to determine the deployment plan, that is, building 5G wireless networks based on the environmental conditions of the region to which they belong. For tourist cities, scenic spots do not have high requirements for latency and mobility, so scenic spots can adopt the form of CU-DU separation, with CU equipment concentrated in the convergence room to form a cloud-based pool, and the medium transmission distance can meet less than 40 km. As for DU devices, it is mentioned in the TR38.801 protocol that DU devices can be deployed centrally when the transmission network resources are sufficient to achieve collaborative technology in the physical layer, while DU devices should be deployed in a distributed manner when the transmission network resources are insufficient. Therefore, when the situation allows, for high-capacity forward transmission services, DU can also be placed centrally to achieve aggregated provisioning resources, optimize the utilization of network resources, save energy, and alleviate the problem of shortage of scenic room locations. In the tourist city, the scenic and residential areas are converged and grouped and managed by the DU cloud, so that instead of adding up the maximum value of the two peaks when calculating the capacity peak of the area, only the total peak of users in the two areas needs to be calculated, which achieves meeting the 5G Internet demand of tourists and residents with less cost. The calculation method of resource-saving S for the converged network of scenic and residential areas is as follows:

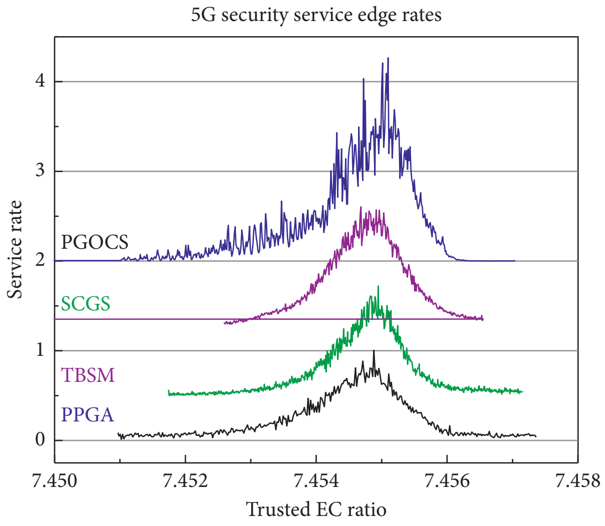

Figure 5: 5G security service edge rates.

$$S_c = \begin{pmatrix} 1 & sr_c \\ s_c & r_c \end{pmatrix}. \tag{3}$$

(2) 5G wireless network deployment strategy in the construction of a 5G wireless network for tourism cities. The deployment strategy should be formulated in different areas. At the early stage of 5G network construction, the deployment will be mainly in local hotspot areas, such as ancient towns and commercial streets. With the development of 5G services and the old phase-out of traditional EPC equipment, the core network is gradually clouded, the EPC gradually migrates to the 5G core network, and after replacing all 4G core networks with 5G core networks, option3 networking method evolves to option7 networking method, and when the layout of 5G wireless network sites is completed and the 4G wireless network is not needed for coverage, the EPC can be removed. 4G antennas finally realize the transformation from the preNSA deployment to the SA deployment of 5G wireless network at a later stage. And for the area where the construction time is relatively late in 5G planning, the option 2 networking method can be directly adopted to complete the 5G wireless network SA deployment in one step. 5G cell edge rate is shown in Figure 5. Evolving user demand poses great challenges to key 5G technologies, including

transmission and network technologies. 5G will work together to meet the growing demand for mobile service traffic through higher spectrum efficiency, more spectrum resources, and denser cell deployments.

(3) Target of 5G wireless network planning for special towns. 5G wireless network planning is to promote the development of 5G mobile communication network, improve the scientific, economic, and reasonable planning and construction of 5G mobile communication base stations as the overall goal, meet the development demand of full coverage of 5G wireless network within a certain period, and strongly support economic and social development. Based on meeting SS-RSRP and SS-SINR indicators, 5G wireless network planning should first realize continuous coverage of the target area. 5G wireless network coverage degree is related to 5G technology development and urban construction strategy, and for tourist cities, various types of scenic spots above a level are required to be covered with priority and focus. In general, the coverage of the planned area should be guaranteed to be above 95% and meet the edge rate requirements of each scene. The network capacity needs to meet the user demand in general, and each scenario also needs to meet the user demand and needs to examine the uplink and downlink capacity to meet the situation, respectively:

$$Ms_xDs_y = \frac{(x_1y_1 + xy)}{\sqrt{x_1^2 + y_1^2}}. \tag{4}$$

4. Analysis of Results

4.1. Analysis of Edge Computing Systems. In the traditional edge computing scheduling architecture, the edge cloud acts as an intermediate layer between the terminal and the central cloud and collaborates with the central cloud together with each other. As shown in Figure 6, after receiving a task request, the edge cloud completes the task request together by communicating with the terminal and the cloud center, finally transmits the data back to the cloud center, although this approach solves the problem of excessive communication load generated by the terminal communicating directly with the cloud center to a certain extent, and also shares the computational pressure of the cloud center through the computing nodes of the edge cloud.However, with the development of edge applications, more and more latency-sensitive applications (e.g., self-driving car networking, augmented/virtual reality games, and lightweight deep learning) have very high latency requirements.The communication between the edge cloud and the central cloud will inevitably generate a large amount of communication latency that cannot meet the demands of the application scenarios. Therefore, research in mobile edge computing needs to find ways to reduce the scheduling between the edge and the center and enhance the computing power and resource allocation at the edge, thus reducing the overall time cost.

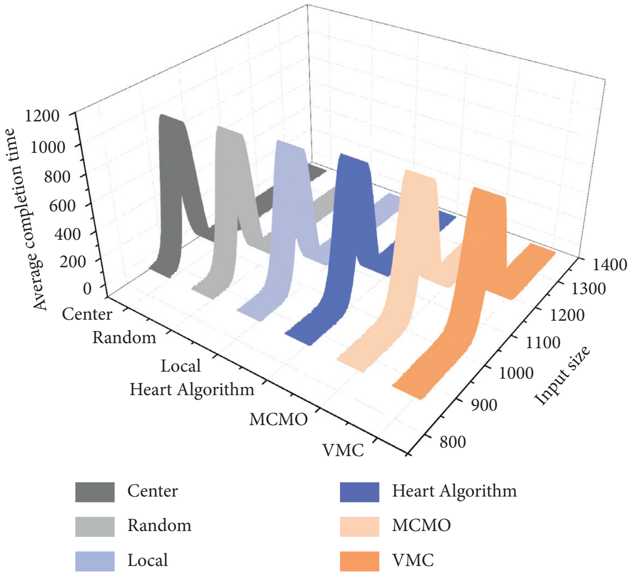

Figure 6: Effect of application input size on computational scheduling.

The drone-assisted edge computing architecture, which takes advantage of the simplicity of deployment and mobility of drones, as well as having certain computing capabilities, allows drones to fly in a certain area at a certain altitude, and end devices that enter the flight distance can obtain services through the drones. Although the Internet has a wide scope and deep influence, the explosive growth and dissemination of information often make the truly effective information quickly swallowed up in the huge flow of information, while the complexity of information sources makes the quality and authenticity of information lack assurance and the highly homogeneous reports cause the waste of network resources. The drone acts as an aerial base station to interconnect the end devices through downlink wireless communication and interconnects the edge servers through uplink low latency wireless links to collaboratively perform computational tasks [19]. Therefore, when processing delay-sensitive applications or services at the edge, a part of the parallel services can be scheduled to be executed on the drone, which reduces the communication time cost between the edge and the cloud center and effectively improves the service quality, so the subsequent research mainly considers how to match the distributed microservices with the drone or edge nodes for scheduling when the drone has limited computational capacity:

$$f_i = \sqrt{Q_i(t)} + \sqrt{\frac{3V}{aL_i}}. \tag{5}$$

To verify the performance of the proposed PGOCS scheme and GIA algorithm, we have conducted many numerical simulation experiments. Firstly, we introduce the simulation experimental environment. During the experiments, we assume that there are 1 central cloud platform CC, 8 edge cloud platforms EC, and 30 mobile users MU in the

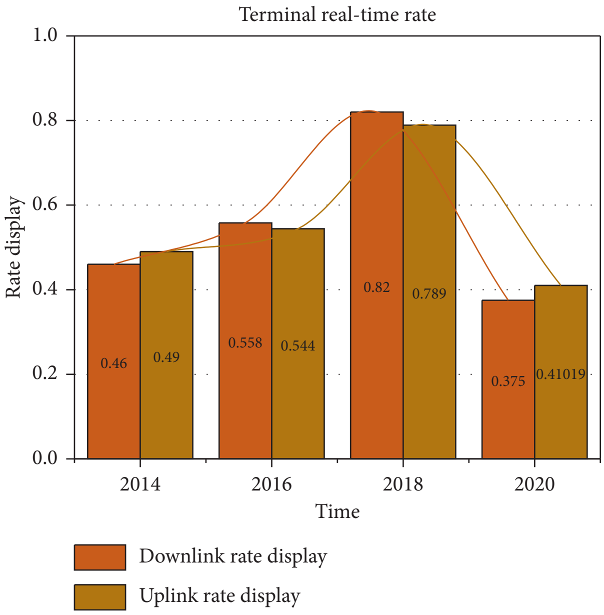

Figure 7: Terminal real-time rate.

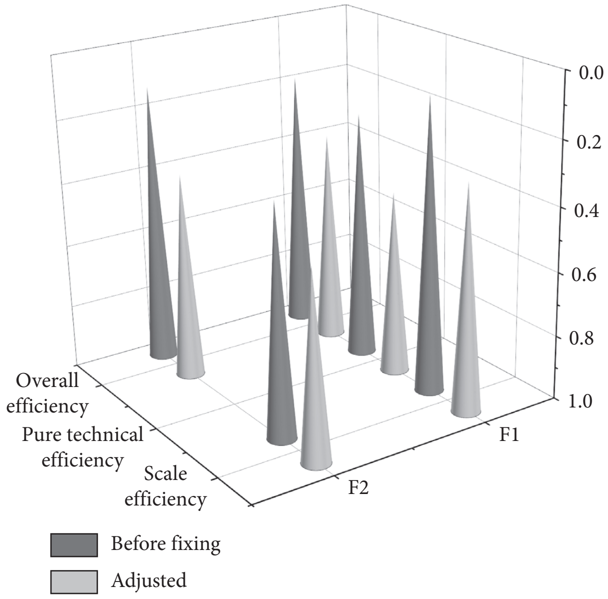

Figure 8: Comparison of phase 1 and phase 3 means.

5G cloud network. We assume that the request process of video services is continuous. The trustworthiness evaluation of the mobile users is initialized by the variable value [0, 1]. The central cloud platform CC is usually considered trustworthy due to its ability to provide full coverage streaming services. In contrast, the edge cloud platform EC is trusted with a certain probability and set with different trustworthiness probability values. On the other hand, depending on reality, the central cloud is usually more expensive to serve than the prevailing edge cloud platform due to its higher trustworthiness. Also, since the central cloud platform is usually farther away from the mobile users than the edge cloud, its service consumption will be higher. Finally, we set all simulation processes to 300 seconds. The terminal real-time speed is shown in Figure 7.

4.2. 5G Special Town Construction Realization. 5G cloud network service adopts the optimization method PGOC-S,and the central cloud and edge cloud provide services for mobile users through price competition. First, this section designs a cloud platform trustworthiness mechanism to evaluate the trustworthiness of the cloud service platform through the interaction behavior between users and the 5G cloud platform. Second, this section also proposes a blockchain-based content trustworthiness approach to verify the reputation level of video content provided by the cloud platform. Subsequently, this section also examines the Stackelberg game model based on the trustworthiness mechanism to elaborate the interaction between the 5G cloud platform and mobile users. Further, by constructing a gradient descent method based on reverse induction, the utility maximization objective of the parties in the game model is achieved while finding the game equilibrium. Tourism has a very important position as a pillar industry in tourist cities; therefore, the 5G wireless network in the planning should not only play a role in enriching tourism content but also promote the tourism industry to a smarter direction, so that the 5G wireless network becomes a necessary infrastructure for the operation of scenic spots. Finally, it is verified through simulation experiments that the proposed PGOCS method can effectively guarantee the reliability and cost-effectiveness of streaming services:

$$S = \sum_{2}^{n} (skh - ski) + \sqrt{sk_i h_1 + sk_i}. \quad (6)$$

The practicality and scientific of the special town system, on the other hand, on the basis of the established evaluation index system, the indicators with high correlation are eliminated, the three-stage DEA model is applied, and for its calculation results, the three environmental variables of infrastructure completeness, greening coverage, and per capita income of urban residents are taken as explanatory variables, regression analysis is conducted, external environmental factors and random disturbance factors are identified in the original input data through the result data and are eliminated, and the DEA model analysis is again conducted with the adjusted input variables as the new input variables with the original output variables, so that each characteristic town is in the same business environment or under the “opportunity,” the real production efficiency is examined, the analysis results of the third stage are obtained, the measurement results are analyzed, and the corresponding optimization and enhancement paths are given [20]. Finally, the first stage measurement results are compared and analyzed with the third stage measurement results, and the directions for improvement are given. The first stage and the third stage mean value comparison is shown in Figure 8

Although the Internet has a wide scope and deep influence, the explosive growth and dissemination of information often make the truly effective information quickly swallowed up in the huge flow of information, while the complexity of information sources make the quality and authenticity of information lack of assurance, and highly homogeneous reports cause waste of network resources. Therefore, for the online media, although it occupies the mainstream of information dissemination, effective use of online resources and good gatekeeping of information still cannot be slackened. The solution idea is proposed, and it is worth noting that the strategy of rural cultural communication explored in this section is oriented to the vast rural areas including the characteristic town that is interested in preserving and developing local culture, and the construction of the characteristic town is not an end, but a path for rural cultural preservation. If the human resources, media resources, and cultural resources elements of the region are integrated and utilized according to the above strategy to maximize the value of the local communication, and cultural resources of the region are integrated and utilized according to the above strategies, the value of the local communication environment is maximized, any region can form unique cultural competitiveness.

5. Conclusion

In the context of the prosperous image economy and the popularized new media environment, the influence of the media image of the special town on the development of the town cannot be underestimated. In the context of networking, media tentacles extend to all aspects of society. The people-centered, multi-layered integration of the new information circulation form provides the convenience of communication, which will penetrate the whole process of rural cultural communication. This study discovers the way of constructing the media image of the characteristic town and the cultural logic behind it through the research on the classification of the overall image of the 5G characteristic town, the construction strategy of the image, the symbol production, and the communication strategy of the media image in several aspects of edge computing, argues that the characteristic town has the characteristics and laws in the process of construction, and explores the image subject. This study researches the production and dissemination of media images of characteristic towns but does not specifically analyze the part of audience research, which occupies a rather important position in media image research. The nature and characteristics of the content of the feedback can be analyzed through the collection of data. As the development history of characteristic towns is still short, although there are many theories about characteristic towns on the Internet, few of them have risen to the academic level, and there are many places worth studying in characteristic towns, which need to be explored by subsequent scholars. As an emerging thing, the development of a characteristic town has just started, and as a key object of national support, the characteristic town has a vigorous vitality, and the research on it is of considerable significance both at the academic level and at the economic level.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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References

[1] J. Zhang, H. Zhong, J. Cui, M. Tian, Y. Xu, and L. Liu, “Edge computing-based privacy-preserving authentication framework and protocol for 5G-enabled vehicular networks,” *IEEE Transactions on Vehicular Technology*, vol. 69, no. 7, pp. 7940–7954, 2020.

[2] S. Garg, A. Singh, S. Batra, N. Kumar, and L. T. Yang, “UAV-empowered edge computing environment for cyber-threat detection in smart vehicles,” *IEEE network*, vol. 32, no. 3, pp. 42–51, 2018.

[3] S. A. A. Hakeem, A. A. Hady, and H. W. Kim, “5G-V2X: Standardization, architecture, use cases, network-slicing, and edge-computing,” *Wireless Networks*, vol. 26, no. 8, pp. 6015–6041, 2020.

[4] S. P. Singh, A. Nayyar, R. Kumar, and A. Sharma, “Fog computing: from architecture to edge computing and big data processing,” *The Journal of Supercomputing*, vol. 75, no. 4, pp. 2070–2105, 2019.

[5] F. Liu, G. Tang, Y. Li, Z. Cai, X. Zhang, and T. Zhou, “A survey on edge computing systems and tools,” *Proceedings of the IEEE*, vol. 107, no. 8, pp. 1537–1562, 2019.

[6] S. Deng, H. Zhao, W. Fang, J. Yin, S. Dustdar, and A. Y. Zomaya, “Edge intelligence: The confluence of edge computing and artificial intelligence,” *IEEE Internet of Things Journal*, vol. 7, no. 8, pp. 7457–7469, 2020.

[7] Z. Xu, G. Han, H. Zhu, L. Liu, and M. Guizani, “Adaptive DE algorithm for novel energy control framework based on edge computing in IIoT applications,” *IEEE Transactions on Industrial Informatics*, vol. 17, no. 7, pp. 5118–5127, 2020.

[8] L. Lin, X. Liao, H. Jin, and P. Li, “Computation offloading toward edge computing,” *Proceedings of the IEEE*, vol. 107, no. 8, pp. 1584–1607, 2019.

[9] P. Porambage, J. Okwuibe, M. Liyanage, and M. Ylianttila, T. Taleb, Survey on multi-access edge computing for internet of things realization,” *IEEE Communications Surveys & Tutorials*, vol. 20, no. 4, pp. 2961–2991, 2018.

[10] G. Carvalho, B. Cabral, V. Pereira, and J. Bernardino, “Edge computing: current trends, research challenges and future directions,” *Journal of Computers*, vol. 103, no. 5, pp. 993–1023, 2021.

[11] A. Zhou, S. Wang, S. Wan, and L. Qi, “LMM: latency-aware micro-service mashup in mobile edge computing environment,” *Neural Computing & Applications*, vol. 32, no. 19, pp. 15411–15425, 2020.

[12] X. Wang, Y. Han, V. C. M. Leung, D. Niyato, X. Yan, and X. Chen, “Convergence of edge computing and deep learning: A comprehensive survey,” *IEEE Communications Surveys & Tutorials*, vol. 22, no. 2, pp. 869–904, 2020.

[13] Y. Ai, M. Peng, and K. Zhang, “Edge computing technologies for Internet of Things: a primer,” *Digital Communications and Networks*, vol. 4, no. 2, pp. 77–86, 2018.

[14] X. Li, S. Liu, F. Wu, and J. J. P. C. Rodrigues, “Privacy preserving data aggregation scheme for mobile edge computing assisted IoT applications,” *IEEE Internet of Things Journal*, vol. 6, no. 3, pp. 4755–4763, 2018.

[15] H. Xing, L. Liu, J. Xu, and A. Nallanathan, “Joint task assignment and resource allocation for D2D-enabled mobile-edge computing,” *IEEE Transactions on Communications*, vol. 67, no. 6, pp. 4193–4207, 2019.

[16] F. Jiang and H. W. Tseng, “Trust model for wireless network security based on the edge computing,” *Microsystem Technologies*, vol. 27, no. 4, pp. 1627–1632, 2021.

[17] C. Wang, Y. Zhang, X. Chen, K. Liang, and Z. Wang, “SDN-based handover authentication scheme for mobile edge computing in cyber-physical systems,” *IEEE Internet of Things Journal*, vol. 6, no. 5, pp. 8692–8701, 2019.

[18] M. Li, P. Si, and Y. Zhang, “Delay-tolerant data traffic to software-defined vehicular networks with mobile edge computing in smart city,” *IEEE Transactions on Vehicular Technology*, vol. 67, no. 10, pp. 9073–9086, 2018.

[19] W. Dai, H. Nishi, V. Vyatkin, V. Huang, Y. Shi, and X. Guan, “Industrial edge computing: Enabling embedded intelligence,” *IEEE Industrial Electronics Magazine*, vol. 13, no. 4, pp. 48–56, 2019.

[20] D. Chen, Y. C. Liu, B. G. Kim, J. Xie, C. S. Hong, and Z. Han, “Edge computing resources reservation in vehicular networks: A meta-learning approach,” *IEEE Transactions on Vehicular Technology*, vol. 69, no. 5, pp. 5634–5646, 2020.