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Radio Resource Management Satellite Communication Network MCDM Method

Dr. Devika SV1, Dr.Siva Shankar S2, Gayatri Parasa3, P. Ramana4, M.Srinivasa Rao5
1Professor, Department of ECE Hyderabad Institute of Technology and Management, Hyderabad
Mail: devikasv.ece@hitam.org
2Associate Professor & Dean Foreign Affairs Department of CSE KG Reddy College of Engineering and Technology Chilukuru village Hyderabad -501504
Mail : drsivashankars@gmail.com
3Assistant Professor Department of CSE Koneru Lakshmaiah Education Foundation
Vaddeswaram, Andhra Pradesh, India – 522502 Mail : gayathriparasa20@gmail.com
4Assistant Professor, Department of CSE, Hyderabad Institute of Technology and Management,
Mail : pochaboinarama@gmail.com
5Associate Professor MLR Institute of Technology, Dundigal, Hyderabad
Mail : msrinivasarao700@mlrinstitutions.ac.in , msrinivasarao700@gmail.com

Abstract: Worldwide deployment of heterogeneous wireless networks is growing as a result of consumer demand for connectivity at all times and in all places. These customers' interest in multimedia apps like video streaming and VoIP, which demand tight Quality of Service (QoS) support, is growing at the same time. With such limitations, provisioning network resources is a difficult undertaking. In fact, it might be challenging for a network operator to identify trustworthy criteria to choose the optimum network that ensures user happiness while maximising network utilisation, given the availability of numerous access technologies (WiFi, WiMAX, or cellular networks). To solve this problem, each eNB just needs to learn the traffi c conditions or patterns of its owncell in our proposal. Wireless communication systems depend heavily on radio resource management (RRM). To ensure the efficient and successful operation of wireless networks, it involves the allocation and control of radio frequency spectrum, power, and other resources. RRM is significant because it can use scarce radio resources as efficiently as possible, enhancing capacity, lowering interference, and improving service quality. Successful deployment and operation of wireless communication systems like cellular networks, Wi-Fi, and Bluetooth depend on effective RRM approaches. The need for wireless communication is growing, and new technologies and standards are constantly being developed. The methodology of radio resource management (RRM) involves a variety of techniques and algorithms designed to allocate radio resources in a way that maximizes network performance while minimizing interference. Taken as alternate parameter is Laser communication, optical networks, satellite optical communication, vibrations, satellite networks. Taken as is solar radiation power, thermal bending, micro meteorite impact, solar and lunar gravity, earth oblations method. satellite optical communication has reached near 2000 data set compare other data set. The operation of wireless communication networks depends on radio resource management (RRM). Wireless networks would have interference, congestion, and a lacklustre level of service if effective RRM procedures weren't used. RRM is therefore a key component in ensuring that wireless communication systems can provide users with dependable and high-quality services.

Keywords: resource management, wireless communication, radio frequency, networks.

1. INTRODUCTION

A key element of wireless communication systems, radio resource management (RRM) facilitates the effective and efficient functioning of wireless networks. To maintain optimum network performance, RRM entails the allocation and control of power, radio frequency spectrum, and other resources. Effective RRM approaches are crucial for the successful deployment and operation of wireless communication systems including cellular networks, Wi-Fi, and Bluetooth because to the rising demand for wireless communication services. Due to the dynamic nature of wireless channels, interference from outside sources, and the constrained amount of radio frequency spectrum available, radio resource allocation in wireless networks is a challenging challenge. To maximise the use of scarce radio resources while enhancing service quality, raising capacity, and minimising interference, effective RRM approaches are needed. . The necessity to address issues with wireless communication systems, such as the rising demand for faster data rates, bettering coverage and capacity, and lowering energy consumption, has sparked active research and development in the field of RRM. In order to optimise the use of radio resources in these new systems, new technologies and standards are continuously being developed. RRM is an essential component of wireless communication systems that makes it possible for wireless networks to operate effectively and efficiently while also enhancing service quality, expanding capacity, and minimising interference. An essential component of wireless communication systems is radio resource management (RRM), which permits the effective and efficient use of power, radio frequency spectrum, and other resources. This is necessary because wireless communication systems are inherently constrained by the limited availability of radio frequency spectrum, which is a finite resource that must be shared among multiple users and applications. RRM techniques are used to allocate and manage radio resources in a way that maximizes network performance, while minimizing interference and ensuring adequate quality of service (QoS) for all users. These techniques are typically implemented in the network infrastructure and the user devices, such as smartphones, laptops, and IoT devices. One of the key challenges in RRM is the dynamic nature of wireless channels, which are subject to fading, interference, and other environmental factors, making it difficult to allocate radio resources optimally. To address this challenge, RRM techniques often involve adaptive algorithms that adjust resource allocation based on real-time measurements of the wireless environment. The following are some common methodologies used in RRM: Channel allocation: This involves assigning radio channels to users based on their quality of service (QoS) requirements and the availability of channels. Power control: This technique involves adjusting the transmit power of a user's device to minimize interference and improve network coverage. 3. Admission control: This involves determining whether new users can be admitted to the network based on available resources and QoS requirements. 4. Load balancing: This technique involves distributing traffic across multiple cells or access points to prevent congestion and improve network performance. 5. Interference management: This technique involves identifying and mitigating sources of interference, such as overlapping cells or co-channel interference. Overall, the methodology of RRM requires a combination of these techniques and algorithms to optimize the use of radio resources and ensure efficient and effective operation of wireless networks. The effective distribution of radio resources is one of the main problems with RRM. This is crucial in the current wireless communication environment, where the demand for wireless services is rising quickly. Radio resource management (RRM) strategies must be able to control the distribution of radio resources in a dynamic manner, ensuring that resources are distributed effectively and efficiently to suit changing user needs. Management of interference is a significant RRM problem. Both distinct wireless networks and users on the same network may experience interference. For wireless networks to be able to provide users with dependable and high-quality services, RRM approaches must be able to locate and eliminate sources of interference. RRM is an intricate and difficult field that calls for knowledge of wireless communication systems, signal processing, and network administration. Future applications and services will be made possible by ongoing RRM research and development, which will also continue to spur innovation and boost the effectiveness and performance of wireless communication networks. A crucial component of wireless communication systems, radio resource management (RRM) permits the effective and economical use of power, radio frequency spectrum, and other resources. Utilising RRM approaches, radio resources are allocated and managed to optimise network performance, reduce interference, and guarantee acceptable quality of service (QoS) for all users.

2. MATERIALS AND METHOD

The materials and methods used in radio resource management (RRM) vary depending on the specific wireless communication system and the RRM techniques employed. However, some common materials and methods used in RRM include: **Radio frequency spectrum:** The primary component of RRM, this is the band of electromagnetic frequencies used for wireless communication. Network infrastructure, which consists of the base stations, access points, and other network hardware utilised for wireless signal transmission and reception. 3. User devices are wireless gadgets that interact with the network infrastructure, such as mobile phones, computers, Internet of Things gadgets, and other gadgets. Sensors and measurement tools are used to assess the wireless environment, including interference, signal strength, and other factors. Channel allocation: This entails giving users access to radio frequency channels depending on their QoS needs and the channels' availability. Power control: In order to maximise coverage, capacity, and interference, this technique modifies the transmit power of user devices or network equipment. Admission control: Using the network's resources and QoS criteria, this technique decides whether or not new users can be admitted. Load balancing: To avoid congestion and enhance network performance, this technique splits traffic among several cells or access points. Interference management: This technique locates and reduces sources of interference, like co-channel interference or overlapping cells. Machine learning algorithms: Based on real-time measurements of the wireless environment, these algorithms are utilised to adaptively allot radio resources. **Weighted product method:** By Bridgeman (1922), the Weighted Product Method had been developed. Although the approach has not been extensively used, Yoon and Hwang (1995) claim that it has solid logic and is operationally simple.[1] WPM are frequently used to describe scoring techniques. The Bridgeman-proposed weighted averaged sum product assessment (WASPAS) is a member of the more recent generation of MCDM techniques. With

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this technique, well-known weighted sum model (WSM) and weighted product model (WPM) methodologies are combined in a novel way.[3] In instances with dynamic environments, it enables excellent ranking correctness. Since it might be difficult for consumers to describe their degree of happiness or discontent with the cloud service providers with regard to the qualities, there is generally confusion in the sharp data.[4]. The approach was used in actual hackers, especially the widespread assaults on Latvia and the Islamic Republic, and the outcomes of the evaluation of the online assaults were given.[5] WPM normalises the performance values of alternatives using equations. It uses many formulae to determine the scores of the choices. The options are ranked by WPM in decreasing order of overall score [10]. In this model, the attribute values are the CSP performance in each measure that is recorded in the history log, while the weights are the QoS preferences supplied by the requesting user.[11] One benefit of WPM is its applicability in both single- and multi-faceted MADMs. The drawback is that there is no solution with an equal weight of the choice vectors instead of real values[12]. The AHP approach is used to determine the relative weights of the various criteria. As a result, the WPM approach is used to rank the potential networks. This technique uses a combination of nets of neurons and utility functions to choose a network. The suggested approach takes use of a fuzzy neural network to gather network-, user-, and terminal-related input criteria and assess each access network's performance [14]. T Multiple Criteria Decision Making (MCDM) models and fuzzy synthesised choices are the foundation of several service choosing methodologies. [21]he findings we have acquired to assess our choice of services offered by the cloud indicated that our model outperforms previous MDMC approaches like TOPSIS, WPM, and the original AHP[17], captures the BDTP extremely well, guarantees Big Data QoS, and scales with the growing number of cloud providers. Through a variety of cloud services from several CSPs, WPM, the SAW, and imposed QoS requirements of Big Data workflows were used[16]. Similar to WSM is the Weighted Product Method (WPM). The primary distinction is that multiplication is required in WPM rather than addition. The score for total performance is calculated as [18].WPM should be used to promote strict cyber security regulations, according to further research.[13] When choosing a cloud-based cyber security solution, organisations may make educated selections by adhering to the Weighted Product Methodology. The methodical assessment of various criteria and the weights given to them aids in the prioritisation of needs and the choice of a solution that best fits the organization's cyber security goals[25].

3. RESULT AND DISCUSSION

The table includes different technologies or systems on the left column, and the corresponding values for Solar Radiation Pressure, Thermal Bending, Micro Meteorite Impacts, and Solar and Lunar Gravity on the following columns.

TABLE 1. data set

	Solar Radiation Presssure	**Thermal Bending**	**Micro Meteorite impacts**	**Solar and Lunar Gravity**
Laser communication	1550	1650	75.6	57.8
optical networks	1350	1480	60.6	86.5
satellite optical communication	1560	1950	40.5	97.8
vibrations	1750	1750	50.5	90.5
satellite networks	1560	1350	67.6	50.6

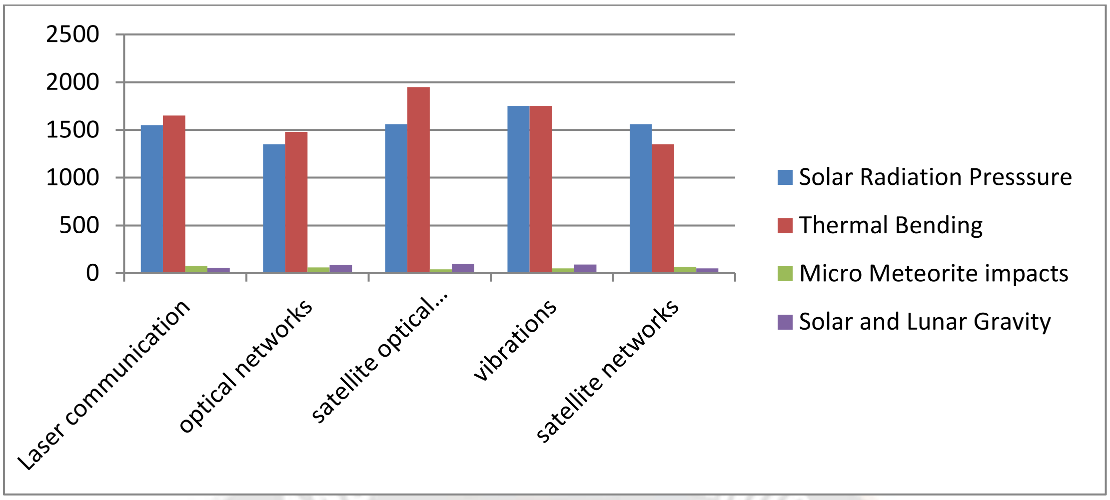

Figure 1. shows data set

Figure 1 shows that solar radiation pressure, Thermal bending ,Micro meteorite impacts ,Solar and lunar Gravity.

Table 2 Performance value

Laser communication	0.88571	0.84615	1.00000	0.59100	1.00000
optical networks	0.77143	0.75897	0.80159	0.88446	0.66632
satellite optical communication	0.89143	1.00000	0.53571	1.00000	0.71670
vibrations	1.00000	0.89744	0.66799	0.92536	0.64533
satellite networks	0.89143	0.69231	0.89418	0.51738	0.90987

TABLE 2 gives Performance value for solar radiation pressure, Thermal bending, Micro meteorite impacts, and Solar and lunar Gravity.

Table 3 weightaged

Laser communication	0.20	0.20	0.20	0.20	0.20	0.20
optical networks	0.20	0.20	0.20	0.20	0.20	0.20
satellite optical communication	0.20	0.20	0.20	0.20	0.20	0.20
vibrations	0.20	0.20	0.20	0.20	0.20	0.20
satellite networks	0.20	0.20	0.20	0.20	0.20	0.20

Table 3 Shows each technology or solution is represented by a row in the table, and the values in each row (0.20 for each category) seem to indicate equal weight or importance assigned to each criterion. However, without further context or information, it is difficult to determine the specific meaning or interpretation of these values..

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TABLE 4 Weighted normalized decision matrix

Laser communication	0.97602	0.96714	1.00000	0.90016	1.00000
optical networks	0.94942	0.94634	0.95673	0.97574	0.92201
satellite optical communication	0.97728	1.00000	0.88265	1.00000	0.93555
vibrations	1.00000	0.97859	0.92247	0.98460	0.91613
satellite networks	0.97728	0.92909	0.97788	0.87652	0.98129

Table 4 Shows Weighted normalized decision matrix as seeing Figure 2.

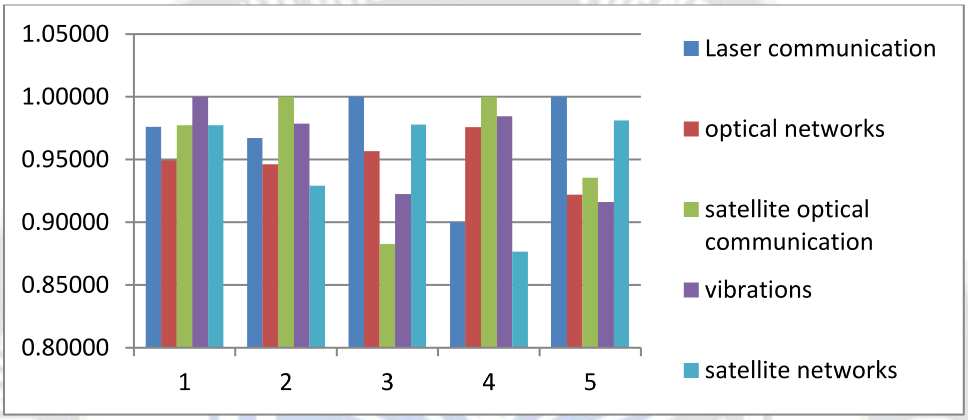

Figure 2. Weighted normalized decision matrix

Table 5 Preference Score

Laser communication	0.84970
optical networks	0.77333
satellite optical communication	0.80700
vibrations	0.81428
satellite networks	0.76370

Table 5 gives Laser communication Preference Score values is 0.84970, optical networks Preference Score values is0.77333, satellite optical communication Preference Score values is 0.80700, vibrations Preference Score values is 0.81428, and satellite networks Preference Score values is 0.76370.

Table 6 Ranking

Laser communication	**1**
optical networks	**4**
satellite optical communication	**3**

vibrations	**2**
satellite networks	**5**

Table 6 gives 1st rank Laser communication, 2nd rank Vibrations, satellite optical communication of third level, Optical networks of the fourth rank, Networks on satellites in fifth place

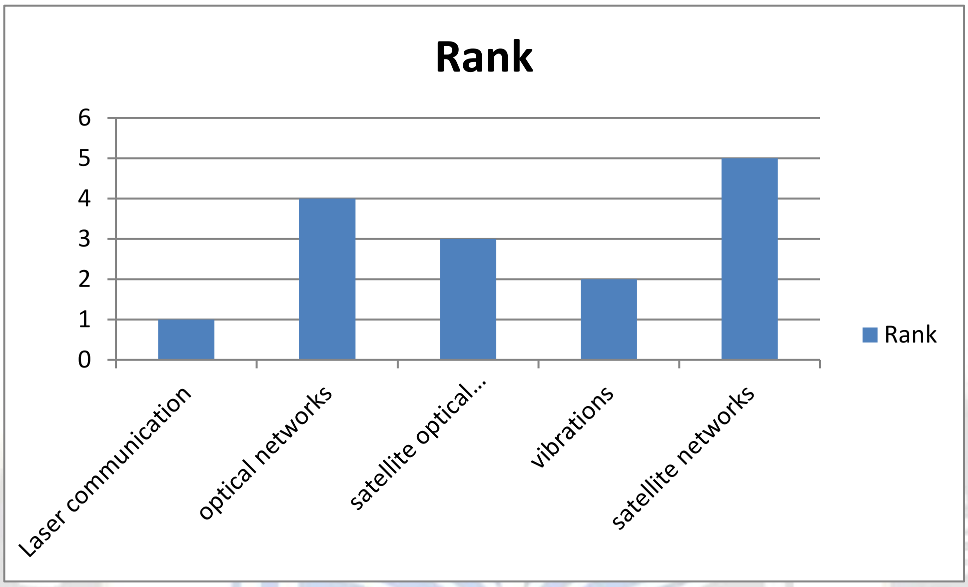

Figure 3 ranking

Figure 3 1st rank Laser communication, 2nd rank Vibrations, satellite optical communication of third level, Optical networks of the fourth rank, Networks on satellites in fifth place

Conclusion

The operation of wireless communication networks depends on radio resource management (RRM). Wireless networks would have interference, congestion, and a lackluster level of service if effective RRM procedures weren't used. RRM is therefore a key component in ensuring that wireless communication systems can provide users with dependable and high-quality services. The effective distribution of radio resources is one of the main problems with RRM. This is crucial in the current wireless communication environment, where the demand for wireless services is rising quickly. Radio resource management (RRM) strategies must be able to control the distribution of radio resources in a dynamic manner, ensuring that resources are distributed effectively and efficiently to suit changing user needs. Management of interference is a significant RRM problem. Both distinct wireless networks and users on the same network may experience interference. For wireless networks to be able to provide users with dependable and high-quality services, RRM approaches must be able to locate and eliminate sources of interference. RRM is an intricate and difficult field that calls for knowledge of wireless communication systems, signal processing, and network administration. Future applications and services will be made possible by ongoing RRM research and development, which will also continue to spur innovation and boost the effectiveness and performance of wireless communication networks. A crucial component of wireless communication systems, radio resource management (RRM) permits the effective and economical use of power, radio frequency spectrum, and other resources. Utilising RRM approaches, radio resources are allocated and managed to optimise network performance, reduce interference, and guarantee acceptable quality of service (QoS) for all users. Depending on the individual wireless communication system and the RRM procedures, several materials and techniques are employed in RRM.

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