International Journal of Multidisciplinary Research and Modern Education (IJMRME)
Impact Factor: 7.315, ISSN (Online): 2454 - 6119
(www.rdmodernresearch.org) Volume 4, Issue 2, 2018

POINT-TO-POINT UNCONSUMMATED UNIT WIRELESS NETWORKS TRANSMISSION CAPACITY

S. Mirdula*, Dr. R. A. Jaikumar & R. Kuttimani*****
Assistant Professor, Department of Electronics and Communication Engineering,
Dhanalakshmi Srinivasan Institute of Technology, Samayapuram,
Trichy, Tamilnadu

Cite This Article: S. Mirdula, Dr. R. A. Jaikumar & R. Kuttimani, "Point-to-Point Unconsummated Unit Wireless Networks Transmission Capacity", International Journal of Multidisciplinary Research and Modern Education, Volume 4, Issue 2, Page Number 97-102, 2018.

Abstract:

Mobile Computing is a human-Computer interaction and its involving mobile Communications. The Communications are include either Adhoc or infrastructure manner. The Decentralized Wireless networks to have the throughput optimization Problem. Here Proposed a Poisson Point Process (ppp) is to point to the transmitter's location and calculate the Packets inter arrival time, and Random Access Transport Capacity technique is to capture the effect of multi-hop Communication on the end-to-end throughput Performance. The Automatic Repeat Request (ARQ) protocol is used to measure the success or failure of the packet, and the Undelivered Packets are returns to the Head-of-line (HOL), its immediately returns to Destination. To analyses the two key performance such as effective link throughput and Network Spatial Throughput .The System Configuration to achieve the throughput through the Network density and arrival rate. To decide the best technology to used in order to optimize the overall system performance metric in terms of throughput and capacity limitation.

Index Terms: Poisson point process, queue stability, Automatic Repeat Request & Adhoc Networks

1. Introduction:

The improvement of the network technologies has provided the use of them in several different fields. The throughput of a wireless data communication s system depends on a number of variables such as packet size, transmission rate ,number of overhead bits in each packet, received signal power, received noise power spectral density, modulation technique, and channel conditions. The key to maximizing the throughput rate is maintaining the signal-to-noise ratio at an optimum level determined by nature of the modem and the channel. The Decentralized wireless network is a adhoc it does not need any pre-existing infrastructure. The each node acts as a server and client (example) peer-to-peer network and the nodes are communicating independent manner. The Wireless adhoc networks are highly appealing for many reasons. They can be rapidly deployed and reconfigured. They can be tailored to specific applications. They are also highly robust due to their distributed nature, node redundancy, and the lack of single points of failure. Robustness is especially important in military applications for which the first wireless adhoc network protocols were developed. The previous days to use the cellular networks to using the heterogeneous elements to communicate using picocells, microcells and distributed antenna systems, but overall the network management is very difficult. In such a heterogeneous network, various classes of low power nodes (LPNs) are distributed throughout the macro cell network. There are various types of LPNs including micro base stations (often called eNodeBs, or eNBs), pico eNBs, home eNBs (also called femtocells),relays and distributed antenna systems(DAS, also called remote radio heads or RRHs).wide area coverage umbrella while the LPNs are deployed in a more targeted manner to alleviate coverage dead zones, and more importantly, traffic hot zones. A HetNet topology fundamentally challenges many time-honoured aspects of cellular system design and analysis. The fundamental performance bounds could provide insight to improve network design and performance, as well as an upper bound against which to compare the performance of existing protocols, as Shannon capacity has done for point-to-point and multiuser channels. The network information theory is to provide a scientific –foundations for the development of most advanced technologies include computer, cell phone, and internet. The central concept of information theory is Capacity, which is boundary between the physically possible and impossible in terms of reliable data rate. The link capacity for the Gaussian noise channel is called as Shannon limit, it also have the upper and lower bounds. To identify the capacity of the distributed wireless networks to using the information theory is very difficult. Before analyzing the capacity of regular networks, to provide a characterization of the capacity region of arbitrary networks. This characterization shows that every rate in the capacity region can be achieved by a class of policies that do randomized medium access and routing. The formulation also suggests a natural outer bound on the capacity region in terms of the transport capacity of the network. The Transport Capacity (TC) of the adhoc network, which quantifies the bits per second that can be reliably communicated over a network. The transmission capacity of an ad hoc network is the maximum allowable density of transmitting nodes, satisfying a per transmitter receiver rate, and outage probability constraints. The transmission capacity is computed under the assumption that the transmitter locations are distributed as a Poisson point process (PPP) using the tools from stochastic geometry. The transmission capacity framework allows for tractable analysis with different physical layer transmission techniques, such as use of multiple antennas, bandwidth partitioning, and successive interference cancelation .The novels tools are describe the upper and lower bounds of the network performance region, but the fundamental limits is identified is very difficult. To also develop a flexible and dynamic interface between network applications and the network performance regions to obtain the best end-to-end performance. The proposed framework for determining performance limits of wireless networks embraces an interdisciplinary approach to this challenging problem that incorporates Shannon Theory along with network theory, combinatorics, optimization, stochastic control, and game theory. Multihop routing, whereby intermediate nodes relay data toward its final destination, is typically used to increase network performance and throughput as well as the distances over which network source and destination nodes can communicate .The RTC and TC are used in single-hop to multi-hop communications. The capacity region is shown to be strictly larger in general than the achievable rate regions when treating interference as noise, using successive interference cancellation decoding, and using joint decoding. The gains in coverage and achievable rate using the optimal decoder are analyzed in terms of ensemble averages using stochastic geometry. The wireless communication systems employ point-to-point codes with receivers that treat interference as noise (IAN).Interference is the main limiting factor of the performance of the wireless networks, its depends on the set of transmitters ,path loss and the fading. The several factor to causes the packet loss in the networks, the aloha mechanism to adopts the simplified packet collision models but during the simultaneous transmissions are never successful. The Automatic Repeat Request (ARQ) and Head-Of-Line buffer are used to maintain to transmit the packets between the source and destination effectively. The ARQ protocol is used to measured to whether the packets are successfully received or not, the undelivered packets are returns to the Head-of-line, in which the packets are returns to the destination immediately. The throughput is to measure the amount of successful transmissions between the source and destination. To increase the throughput and capacity metrics to improve the network performance. The rest of the paper is organized as follows: Section 2 explains related work. Section 3 discusses the spatial throughput optimization of Poisson networks. Section 4 discusses the system model. Finally, section 5 concludes the survey.

2. Related Work:

2.1 Network Model:

To consider a decentralized (ad hoc) wireless network, in which the spatial locations of transmitters (TXs) at each timeslot N+ are distributed according to a homogeneous (stationary and isotropic) point process R2 with non null intensity $\lambda 0$ [TXs/m2]. Each TX is associated with one receiver (RX) and packets arrive at the buffer of TXk, according to a stochastic arrival process $Xk\ (t)$, where $N0$ denotes the set of all TXs generated by 0. The arrival process to transmitter TXk is assumed to be stationary with an average rate μk packets/slot. We assume buffers of infinite capacity and that time is slotted with slot duration equal to the packet duration. At the end of each timeslot t, the locations of the nodes are shuffled following a high mobility random walk as proposed in [18]. Due to this particular mobility model, the displacement theorem can be applied and hence the TXs' locations in each timeslot t are generated as a different sample of the point process. This assumption results in independence between the nodes' positions across timeslots.1.We focus on point-to-point links, in which each TXk employs Gaussian point-to-point (G-ptp) codes and its corresponding receiver RXk treats interference as noise (IAN) [22]. The communication between TXk -RXk is considered to be successful (i.e. not in outage) using G-ptp codes and IAN decoding rule if the received signal-to interference-plus-noise ratio (SINR) throughout the packet duration satisfies at timeslot t SINR $k(t) = Skk(t)N0 + j\in N(t)\setminus\{k\}Sjk(t)\geq \beta k,$ (1)where $N(t) \subseteq N0$ refers to the subset of active TXs in timeslot t, $Sxy(t)$ is the total received power at RXy from TXx and $N0$ is the power (variance) of the independent additive white complex Gaussian noise of zero mean. The SINR threshold βk required by RXk to successfully decode the packets is a system parameter, which depends – among others - on the coding rate, the modulation scheme, and the target bit error rate (BER). We assume that each TXk employs G-ptp codes with rate Rk [bits/s/Hz], which can be related using the Shannon formula with the minimum SINR as2 $Rk = \log2(1 + \beta k)$. Automatic repeat-request (ARQ) protocol [24] is considered, hence the success or failure (outage) of the packet detection at RX is reported back to TX through an error and delay-free control channel. In that case, the undelivered packet returns to the head-of-line (HOL) of the queue, waiting to be retransmitted in the next medium access. Assuming that a packet can be retransmitted through the TXk–RXk link at most mk times, then there are two possible outcomes for packet departure from the queue of TXk, namely (i) it is either correctly received or (ii) it is not successfully received after 1 + mk attempts and then dropped from the queue, declaring a packet loss event. Hence, the packet loss probability for TXk–RXk, denoted P, k, is a function of the number of allowed retransmissions and the outage probability, i.e. $P\_, k = f\,(P\text{o},k,mk)$, where the outage probability is given by $P\text{o},k$ P[SINR$k < \beta k$].

2.2 Queue Stability:

Assuming here a single-server discrete-time queuing system, the backlog $Qk\ (t)$ (queue length) for TXk is evolving for $t \in \{0, 1, 2, . . .\}$ as [15]:

$Qk(t + 1) = \max [Qk(t) - Yk(t), 0] + Xk(t),$ (2)where $\{Xk(t)\}\infty$ t=0 and $\{Yk(t)\}\infty$ t=0 are the arrival and the server process at TXk in timeslot t and the initial queue lengths $\{Qk(0)\}$ are chosen independently across TXs according to some probability distribution. Note that packet arrivals and channel access events are independent across sources and slots. For the definition of queue stability,

Definition 1: Stability

A multidimensional stochastic process(not necessarily Markovian) Q(t) = (Q1(t), . . . ,Q1(t))is stable if for x ∈ NM0 the following holds limit→∞P[Q(t) < x] = F(x) and limx→∞F(x) = 1, (3) where F(x) is the limiting distribution function and x→∞means that xk→∞, ∀ k. If a weaker condition holds, namely, limx→∞lim inf t→∞ P[Q(t) < x] = 1, (4) then the process is called substable (tight or bounded in probability).The queue stability evidently depends on both {Xk(t)}∞ t=0 and {Yk(t)}∞ t=0. While the former is an input parameter that the network operator cannot always control, the latter is determined by the medium access (MAC) protocol, the retransmission policy, and the probability that a packet is successfully received during a transmission attempt. Such a success probability is in fact a physical layer figure, which in turn is related to the decoding strategy, co-channel interference, noise power, and desired signal strength.

2.3 Performance Metrics:

Based on the system model presented above, to define the performance metrics of interest, which are the effective throughput of a point-to-point link and the spatial throughput of the network. Definition 2: effective link throughput

Given that the network is in steady state, the effective link throughput of a given link TXk–RXk,denoted by Rk and measured in [bits/s/Hz], is defined as Rk = (1 − P_,k) pk ρkRk1 + mk, (5)

Where ρk is the probability that the queue of TXk is not empty in a given timeslot, pk is the probability that TXk is granted to access the radio channel in a given timeslot, and mk is the average number of packet retransmissions.

Definition 3: Network Spatial Throughput

Given that the network is in steady state, the spatial throughput, denoted by S and measured in [bits/s/Hz/m2], is defined as the sum of the effective link throughputs Rk ∀ k ∈ N0 divided by the total network area |A| [m2] of Borel subset A where the points of process are distributed, i.e. = 1|A|_k∈ N0 Rk.

3. Spatial Throughput Optimization in Poisson Networks:

To analyze the aggregate performance of the network using the spatial throughput metric introduced in stable achievable spatial throughput such that the packet loss probability is bounded for all links. To consider the Poisson random network described in the previous section and formulate an optimization problem in order to maximize the spatial throughput under queue stability and bounded packet loss probability for all links. Note that the infinite Poisson network model is equivalent in distribution to the limit of a sequence of finite networks with a fixed density as the area increases to infinity. To derive an approximated closed-form solution for such a problem, this allows us to compare the optimal spatial throughput to the spatial throughput by product of the optimal individual decisions.

3.1 Numerical Results:

In this section, we provide numerical results in order to verify the aforementioned analytical results.

Table 2: Optimal Spatial Throughput Design Setting for $\alpha = 4$, $d = 1$, and _ = 0.02

(λ_0, μ)	$(p^*, R^*, 1 + m^*)$	$\mathcal{S}^*_{\text{ind}}$	$\mathcal{S}^*$	$\mathcal{S}_{\text{up}}$
$(0.1, 0.2)$	$(0.53, 3, 95, 8.5)$	0.070	0.077	0.0865
$(0.1, 0.8)$	$(1, 0.31, 2.6)$	0.025	0.025	0.0865
$(0.5, 0.2)$	$(0.51, 0.66, 8.5)$	0.051	0.065	0.0865
$(0.5, 0.8)$	$(1, 0.014, 2.6)$	0.005	0.005	0.0865

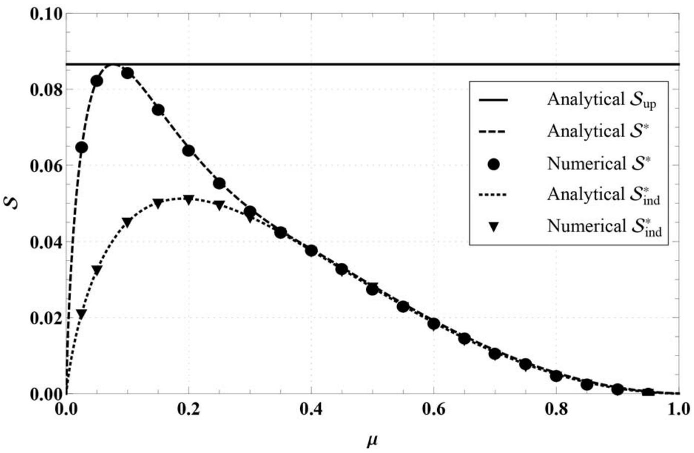


Figure 3: Optimal network spatial throughput S*, its upper bound Sup(see Proposition 7) and the spatial throughput S* find obtained with the best individual choice as a function of the arrival rate μ for $\lambda 0$ = 0.5,α = 4, d = 1 and _ = 0.02. The spatial throughputs S* and S*ind find are analytically assessed using Proposition 5 and Corollary 5, respectively, and they are also computed via numerical optimization NMaximize or NMax Value from Wolfram Mathematical package.

Present the design setting (p*, β*, m*) that leads to the highest spatial throughput achieved when stability and packet loss constraints are required for all links, considering different combinations of the input parameters $\lambda 0$ and μ. From Table 2, it is verified that in scenarios with low values of μ, e.g. μ = 0.2, the acces probability p* is about 0.5, whereas when μ = 0.8, it approaches the value of the link optimization case, i.e. p* = 1. These facts from Fig. 3 that the constrained spatial throughput S* can achieve values very close to its upper bound given by the unconstrained spatial throughput optimization is considered, To reach the optimal performance under queue stability constraint, all TXs have to transmit with high probability when the arrival rate increases. When the unconstrained optimization problem. the optimal performance is achievable by decreasing the access probability, thus controlling the interference level of the network by contention . In other words, increasing the arrival rates μ, the stability constraint makes the access probability be far away from its optimal unconstrained value.

Interestingly, for lower values of $\lambda 0$, S* is very close to its upper bound Sup when arrival rates μ = 0.5 and μ = 0.7are considered, while the network has poorer performance for μ = 0.2. These facts indicate that a sparse network subject to low traffic conditions operates below its limit, which can be archived when the arrival rates it is possible to achieve the unconstrained parameter via a suitable parameter design ,even through strong requirements in terms packet loss and stability are imposed.. When the network has a density $\lambda 0$ = 0.5 and TX0 experiences an arrival rate of $\mu 0$ = 0.2, the effective link throughput R*0 achieves its upper bound R0, up. This indicates that low values of $\mu 0$ do not impose a strict restriction to the feasible design options for the density $\lambda 0$.

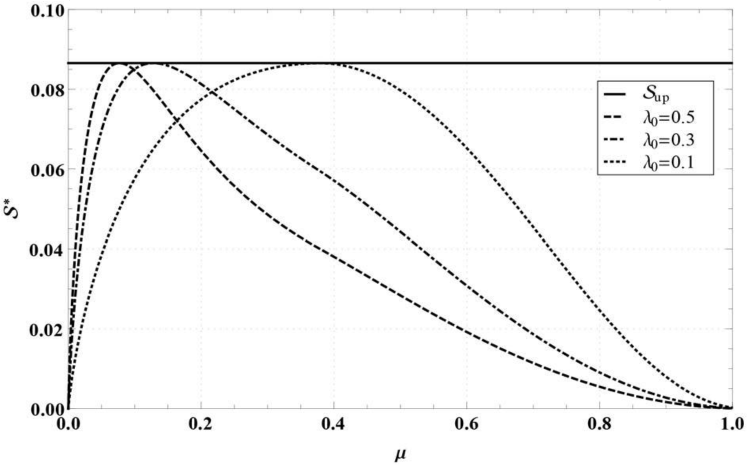
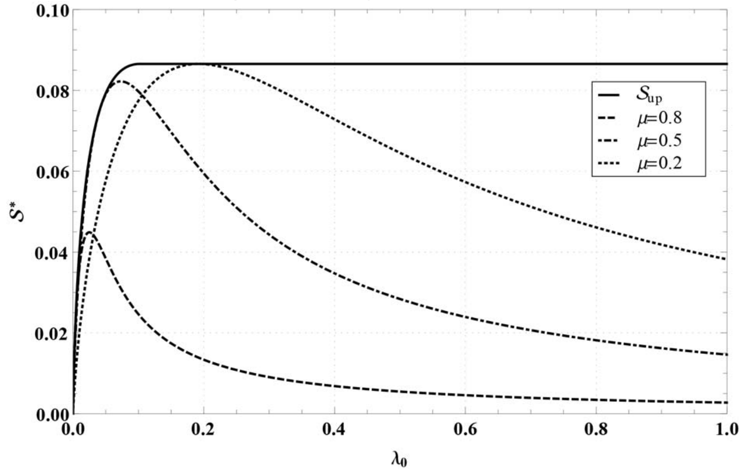


Figure 4 optimal spatial throughput S* and its upper bound Sup versus the arrival rate for different densities. To consider the symmetric case where all transmitter and receivers are subject to the same arrival rates and employ the same design parameters namely access probability P, rate R. and maximum number of retransmissions of packets decoded in error m. to reach the optimal performance under queue stability constraint, all TXs have to transmit with high probability when the arrival rate increases.

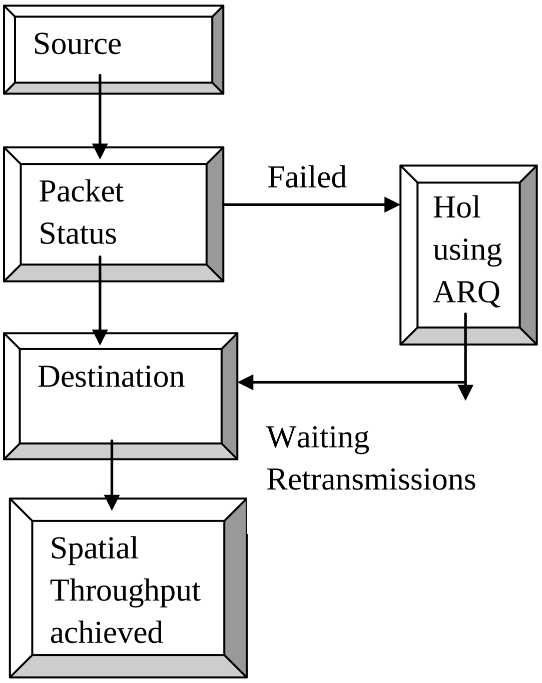


When the unconstrained optimization problem is considered, however, the opposite happens: the optimal performance is achievable by decreasing the access probability, thus controlling the interference level of the network by contention. In other words, increasing the arrival rates μ, the stability constraint makes the access probability be far away from its optimal unconstrained value. Nevertheless, S^* can still reach the unconstrained spatial throughput for some specific combinations of μ and $\lambda 0$, as shown by Figs. 4 and 5. Fig. 4 presents how S^* behaves as a function of the arrival rates μ for different values of density $\lambda 0$. For low values of μ, S^* increases as μ increases until it reaches Sup. At lower densities, $\lambda 0$ can be viewed as the limiting factor of S due to low spatial reuse, therefore such an inflection point is reached at higher arrival rates μ for lower densities $\lambda 0$. After its maximum value, S^* decreases as μ increases, approaching zero when μ goes to 1, regardless of the density considered. This once again corroborates

4. System Model:

In this section, we present the system model, including the HOL and ARQ .The source will be sending the data from source to Destination, The intermediate node will be receiving the Data and again it will pass to the destination through the intermediate node. To check the Packet Status to whether the data was to reach the Destination or not. If any packet fail its goes to the HOL and ARQ buffer then immediately to the destination, and also provide the security to the HOL buffer.

4.1 System Model Diagram:



4.2 Discovery of Nodes:

The Node name, Internet protocol address and Port number is get from the user and the user details are stored in the database successfully. The user can enter in to the network through the login. If the user can enter the correct port number and user name in login means login successfully, otherwise the login failed.

4.3 Random Access Transport Capacity:

The details of the nodes have been retrieved from the data base and the Random access transport capacity splits the nodes in the different parts of the network, the link between the nodes have been created through by creating dynamic path between the node the HOL and ARQ have been set successfully in the network.

4.4 Poisson Point Processing:

The source sends the data to the destination through dynamic path and the intermediate node receives the message. Poisson Point Processing has been checked for the message and Sending the Acknowledgment to next neighbour node if the message is not belongs to that node.

4.5 Hol & Automatic Repeat Request:

If the acknowledgment has not arrived from the neighbour node means the intermediate node sends the data to HOL & ARQ server and the HOL and ARQ server finds the path for routing and sends that path to the source. The detail of node that not responds correctly is stored in the data base if the acknowledgment have been received successfully means the intermediate node sends the data to the neighbouring node.

4.6 Hol as Authenticator

If any data loss in the intermediate node automatically it will transferred to the HOL. The HOL to get data to transferred to the Destination. Suppose if the Hacker tries to get data from the HOL then the HOL should be highly authenticated. So to make the HOL as highly secured authenticated Technique.

4.7 Time Delay Reduction:

During the packet loss the data will transfer to HOL and then it will be send to the destination in this process the time delay during the retransmission will be so high. So as to reduce the time, even when the data takes pass through the HOL the time should be less taken.

5. Conclusion:

This article to investigate the performance of the decentralized wireless networks link throughput and network spatial throughput .The adhoc network in which transmitting nodes are located in Poisson point process manner. The Poisson point process and HOL and ARQ techniques are used to increase the throughput during the packet retransmission, and also to limits the packet retransmission. The HOL and AQR server may send falsified data report due to node compromise by malicious users and there is time delay due to multipath routing to avoid these problems. Finally to monitor the networks parameters and also to improve the performance.

6. References:

1. Ghosh., “Heterogeneous cellular networks: From theory to practice,” [Online]. Available: www.engr.ur conn.edu\..\het-net-theory, IEEE Commun. Mag., vol. 50, no. 6, pp, 2012.
2. Andrews.J, “Rethinking information theory for mobile ad hoc networks,” [Online]. Available: arxiv. org/pdf/1303.2933, IEEE Commun. Mag., vol. 46, no. 12, pp, 2008.
3. Goldsmith. A., “Beyond Shannon: The quest for fundamental performance limits of wireless ad hoc networks,” [Online]. Available:www.researchgate.net/../Beyond-sh, IEEE Commun. Mag., vol. 49, no. 5, pp, 2011.
4. Gupta. P and Kumar., “The capacity of wireless networks,” [Online]. Available: www3.nd.edu/ pminero/iT2009.pdf, IEEE Trans. Inf. Theory, vol. 46, no. 2, pp, 2000.
5. Xue. F and Kumar., “Scaling laws for ad hoc wireless networks: An information theoretic approach,” [Online]. Available: arxiv.org/pdf/0909.5119 NOW Found. Trends Netw. vol. 1, no. 2, PP, 2006.
6. Weber. V., “Transmission capacity of wireless ad hoc networks with outage constraints,” [Online]. Available: arxiv.org/pdf/0809.0016 IEEE Trans. Inf. Theory, vol. 51, no. 12, pp, 2005.
7. Baddeley. A, “Spatial Point Processes and their Applications”. Berlin, Germany: Springer, PP, 2007 [8] Baccelli. F and Blaszczyszyn. B, “Stochastic geometry and wireless networks: Theory,” [Online]. Available: arxiv.org/pdf/ NOW Found. Trends Netw., vol. 3, no. 3–4, pp,2009.
8. Baccelli. F and Blaszczyszyn. B, “Stochastic geometry and wireless networks: Applications,” [Online]. Available: www.ee.ouluo.fi/Tmc/final.pdf NOW Found. Trends Netw., vol. 4, no. 1–2, pp,2009.
9. Weber. S and Andrews. J, “Transmission capacity of wireless networks, “NOW Found. Trends Netw., vol. 5, no. 2–3, pp,2012.
10. Nardelli. P. H. J, Cardieri. P, and Latva-aho. M, “Efficiency of wireless networks under different hopping strategies,” [Online]. Available: Arxiv.org/pdf/1303.2173 IEEE Trans. Wireless Commun., vol. 11, no. 1, pp, 2012.
11. Nardelli. P. H. J, Cardieri. P, and Latva-aho.M, “Optimal transmission capacity of ad hoc networks with packet retransmissions,” IEEE Trans. Wireless Commun., vol. 11, no. 8, pp,2012.
12. Andrews.J, “Random access transport capacity,” IEEE Trans. Wireless Commun., vol. 9, no. 6, pp, 2010.
13. Vaze.R, “Throughput-delay-reliability trade-off with ARQ in wireless ad hoc networks,” IEEE Trans. Wireless Commun., vol. 10, no. 7, pp,2 011.
14. Neely. M, “Stochastic network optimization with application to communication and queueing systems,” Synth. Lect. Commun. Netw., vol. 3, no. 1, pp, 2010.
15. Luo. W and Ephremides. A, “Stability of N interacting queues in random-access systems,” arxiv.org/ pdf/1112.5995, IEEE Trans. Inf. Theory, vol. 45, no. 5, pp, 1999.
16. Mergen. G and Tong. L, “Stability and capacity of regular wireless networks,” citeseerx.ist.psu.edu/.../ download?doi=10..IEEETrans. Inf. Theory, vol. 51, no. 6, pp, 2005.
17. Stamatiou. K and Haenggi. M, “Random-access Poisson networks: Stability and delay,” arxiv.org/ pdf/1303.2933, IEEE Commun. Lett., vol. 14, no. 11,pp,2010.
18. Ephremides. A and Hajek. B, “Information theory and communication networks: An unconsummated union,” www.ifp.illinois.edu/~hajek/.../EphremidesHajek... IEEE Trans. Inf. Theory, vol. 44, no. 6, pp, 1998.
19. Ganti .R and Haenggi. M, “Spatial and temporal correlation of the interference in ALOHA ad hoc networks,” arxiv.org/pdf/1004.4432, IEEE Commun. Lett., vol. 13, no. 9, pp,2009.
20. Baccelli. F and Baszczyszyn. B, “A new phase transitions for local delays in MANETs,” raweb.inria.fr/ 2009/Raweb/trec/trec.pdf in Proc. IEEE INFOCOM, San Diego, CA, USA, 2010.
21. Baccelli. F, El Gamal. A, and Tse. D, “Interference networks with point-to-point codes,” https://web. stanford.edu/~dntse/papers/bet.pdf IEEE Trans. Inf. Theory, vol. 57, no. 5, pp, 2011.