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SCHEDULING AND ROUTING PROBLEM IN MULTI HOP NETWORKS WITH TIME-VARYING CHANNELS AND RECONFIGURATION DELAYS

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Abstract: In dynamic server allocation problem is over a parallel queues with at random variable connectivity and server switchover delay between the queues. In each time slot the server decides either to stay with the current queue or switch to a different queue supported the current property and the data length of queue. Switchover delay happens in many telecommunications applications and could be a new modeling part of this problem that has not been previously addressed. We show that the simultaneous of at random variable property and switchover delay changes the system stability region and thus the structure of optimum policies. we think about a system of two parallel queues, to develop a novel approach is clearly characterize and support a section of the system using state action frequencies that are static result to a MDP (Markova-Decision process) formulation. We develop a FBDC (frame-based dynamic control) policy, it is supported the state-action frequencies, and show that it's throughput-optimal asymptotically among the length of frame. The frame-based dynamic control policy is relevant to a broad class of network control systems and it provides a new framework for developing throughput-optimal network control policies using state action prevalence.

Index Terms: Markov Decision Process, Reconfiguration Delay, Time-Varying Channels, Switching Delay;

I. INTRODUCTION

In wireless network system states that wireless channels are fluctuate in this time. The characteristics are involves designing resource allocation algorithms that are dynamically adapt to the random variation of the wireless channels. In programming algorithms are essential components of the resource allocation. A programming formula is meant to manage a group of users to consume the scarce network resources for example bandwidth, power, and time. Therefore the general network utility as an example throughput, fairness is maximized subject to link interference and queue stability constraint. The fast Channel State Information (CSI) is obtainable at the scheduler, maximum-weight-type programming algorithms are also known to be throughput-optimal, that is they will maintain system stability for arrival rates that are supportable by the other scheduler. The performance of inexpensive programming rule depends heavily on the proper fast Channel State Information at the scheduler. However, correct quick Channel State Information is tough to get at the hardware that is a major quantity of system resources should be spent to accurately estimate the fast Channel State Information. Therefore, effort Channel State Information continuously from all users is resource consuming and impractical because the size of network will increase. Hence, throughout this work we consider the vital situation where the quick Channel State Information is not directly accessible to the scheduler, though is instead learned at the user and maintain to the scheduler via ARQ-styled feedback once an explicit delay. Many programming algorithms are designed that consider imperfect Channel State Information, where the channel requirement as self-governing and identically distributed processes over time. However, though the independent and identically distributed channel models facilitate distinguishable analysis, it doesn't capture the time-correlation of the attenuation channels. As a result of good fast Channel State Information is expensive to acquire, the time-correlation or channel memory intrinsic among the reduction channels may be a very important resource that will be exploited by the scheduler to create lots of informed selections, and therefore to get vital throughput/utility gains. Imperfect Channel State Information, channel memory, and resources constraint, the scheduler should intelligently balance the tortuous ‘exploitation-exploration tradeoff’, i.e., to decide at each slot whether or not to exploit the channels with lots of up-to-date CSI, or to explore the channels with noncurrent CSI. We consider the downlink of one cell, where the packets destined to every user are keeping during a corresponding information queue for transmission. The difficult channel memory progression and queue evolution, ancient Dynamic Programming based approaches is used for development programming method, however are noncompliant because of the well-known ‘curse of dimensionality’. Recently, a low-complexity formula was projected in this considers throughput optimal downlink programming with imperfect Channel State Information over time-correlated reduction channels, below a constraint on the long average vary of transmissions. Scheduling in wireless systems is typically subject to tight fast constraints, like fast resource limitations from bandwidth, power, interference, etc. during this work, to review programming with imperfect Channel State Information over time-correlated Channels and under tight resource constraint where the quick programming calls is subject to constraint on the foremost vary of normal users. The tight constraint brings with it vital challenges, and to the only of our data the setting of imperfect Channel State Information, no low-complexity formula exists that is optimum for general scenarios. Under the limiting command where users have identical ON/OFF Markov channel statistics, round-robin based programming policies are shown to be throughput optimum. Further, Frame-based Max-Weight algorithm proposed for the case of freelance and identically distributed channel processing algorithms is used in throughput-optimal frame-based policies is projected.

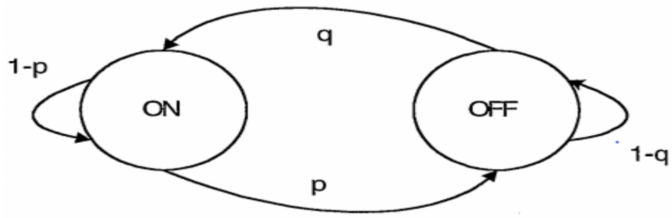


Figure 1: Markov modulated ON/OFF channel process

II. RELATED WORK

In that system the optimality of a myopic policy was established for one server and a pair of channels in, for random range of channels in, and for random range of channels and servers. The matter of increasing the throughput among the network whereas meeting average delay constraint for a small set of users was thought of within the typical delay constraints were changed into penalty functions in and thus the theory of random Shortest Path issues, that is used for finding Dynamic Programs with sure special structures, was used to reduce the following different penalty terms. Finally, a partially Noticeable Markov Decision process model was used in to investigate dynamic multichannel access in cognitive radio systems. Though, none of those existing works consider the server switchover delays. In switch over delay is considered as polling models in follow the process like community, however, randomly varied property wasn't consideration of since it's progressing to not arise in classical Polling applications. Similarly, scheduling in optimal networks under reconfiguration delay was thought of in once more among the absence of every that approach varied property, wherever the transmitters and receivers were assumed to be out of stock throughout re-configuration. The close survey of the works during this field is usually found in. To the most effective of our data, this paper is that the initial identical time considers random property and server switchover times the optimal executive of queue systems and communication networks has been a very dynamic analysis. Within the seminal paper, to characterized the stability region of multi-hop wireless networks and designed the output optimum Max-Weight programming algorithm. In indistinguishable authors thought of a parallel queuing system with randomly variable connectivity wherever they characterize the stability area of the system expressly and proven the throughput Optimality of the Longest-Connected-Queue programming strategy. These results were later extended to joint power allocation and routing in wireless networks in and excellent scheduling for switches in a lot of recently, the sub-optimal distributed programming algorithms with throughput guarantees were studied in whereas developed distributed algorithms that win throughput-optimality. The result of delayed channel state data was thought of in which showed that the stability region is reduced that a policy the same because the Max-Weight algorithm is throughput-optimal. Maybe the closest drawback to ours is that of dynamic server allocation by a parallel channels with each that approach varied property and restricted channel sensing that has been investigated in Gilbert-Elliot channel model.

III. FRAME WORK

In this paper, we propose a new approach toward higher queuing delay performance, supported our observation that the principles are desire, as long because it will be implemented during a distributed manner. Our proposed algorithm, termed delayed, updates following schedule not supported this standing, however on ‘several steps back’ state information, thus necessitate high order Markov chain modeling. This program update supported ‘delayed’ data, somewhat counter intuitively, provides a major gain in delay performance by effectively removing the robust correlations that continue the link state technique and so alleviating link starvation issues. It is additionally implementable throughout a totally distributed approach, without any additional message overhead. In specific, we prove that our algorithm achieves the throughput optimality, but provides much better delay performance within the steady state by ‘reshaping’ the correlation structure to our advantage, and whereas keeping the static is sharing of the schedules intact. Our intensive simulations show that the delay below our algorithm proposes a throughput-optimal dynamic control policy. Our analysis in addition offers a motivating point of view about the role of the mixing time on the delay performance by showing the trade-off between faster combining time within the transient section and slighter correlations within the steady state. to boot, since the most arrange behind our rule is to select on subsequent schedule looking on several-steps-back state data, thereby resulting in low delay, we expect that our approach will be equally invoked to enhance the delay performance of different scheduling algorithms modeled by Markov chains change subsequent schedule supported this standing. The FBDC (frame-based dynamic control) policy is provides a new framework set up throughput-optimal policies for network control. Throughput-optimal policies are able to take benefit of the diversity in independent. Identically distributed channels by instantly and opportunistically switching schedules.

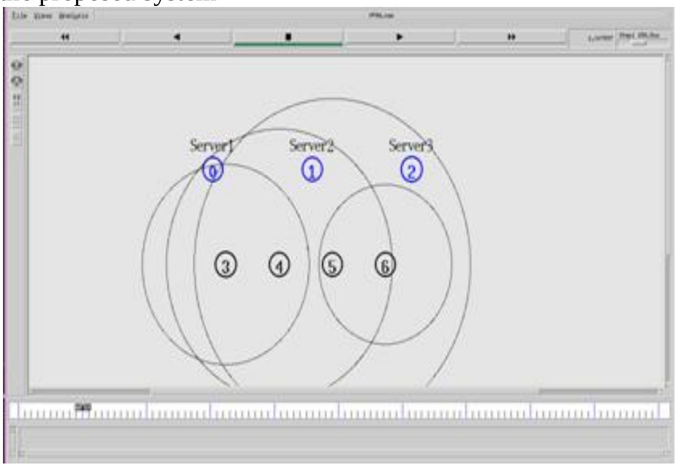
Variable Frame Based Max-Weight Algorithm:

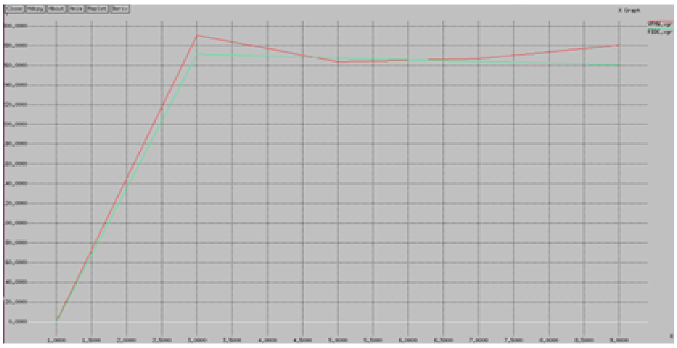
In this section we propose a throughput-optimal method based on the following intuition: provided that no policy will take advantage of the range in channel processes, giving infrequent reconfiguration decisions minimizes throughput lost to reconfiguration. For networks with nonzero reconfiguration delays, within the absence of arbitrarily varied property, we proved in this a variable-size frame-based Max-Weight algorithm that keeps an equivalent schedule over a frame of duration supported the queue lengths is throughput-optimal. We show here that an adaptation of the rule in that additionally takes into account the average channel gains of time-varying links is throughput-optimal for systems with memory less channel processes.

Frame Based Dynamic Control Policy:
We propose a frame-based dynamic control (FBDC) policy inspired by the state-action frequency approach and prove that it is throughput-optimal asymptotically within the frame length. The motivation behind the FBDC policy is that a policy $\pi*$ that achieves the optimization sure given weights $\alpha\ell$, $\ell \in L$, for the saturated system should achieve a good performance in the original system once the queue sizes Q are used as weights. This is because initial the policy $\pi*$ can result in similar average departure rates in each systems for sufficiently massive queue lengths, and second, the usage of queue lengths as weights creates self adjusting policies that dynamically capture the changes because of random arrivals, similar to the Max Weight scheduling algorithm.

III. EXPERIMENTAL RESULTS

In our experiments we performed simulation experimental results on the proposed system the present average queue occupancy results for the FBDC (frame-based dynamic control) and we can improve the stability region characterization in terms of state-action frequencies and also throughput optimality of the frame-based dynamic control policy to the general system with absolute variety of queues by using these system we can develop throughput-optimal policies for network control as this policy is also wont to stabilize a large category of various network management issues. The below images shows the experimental result of the proposed system





IV. CONCLUSION

We considered as the dynamic server allocation problem with at random varied property and server switchover time. For the case of two queues, we tend to analytically characterize the stability region of the system using state-action frequencies area unit static solutions to a Markov Decision Process formulation for the corresponding saturated system. We tend to develop the throughput-optimal frame-based dynamic control policy. Additionally we can developed simple Myopic Policies that achieve a large portion of the stability region and also we can increase the stability region characterization in terms of state-action frequencies and additionally the throughput-optimality of the frame-based dynamic control policy to the general system with absolute sort of queues. We define strong systematic outer bounds on the stability region using certain on the sum-rate and showed that a simple myopic policy achieves the stability region in terms of the state-action density are saturated system and additionally the throughput-optimality of the frame-based dynamic control policy hold for systems with fixed switch-over times and general Markov channels. Furthermore, the frame-based dynamic control policy provides a new framework for developing throughput-optimal policies for network management as this policy is also wont to stabilize a large category of various network management issues.

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