Re-configurable Traffic Aware MAC Design for Virtualized Wireless Network via Reinforcement Learning

Priyanka Sanjay Giri
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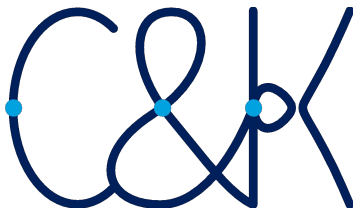
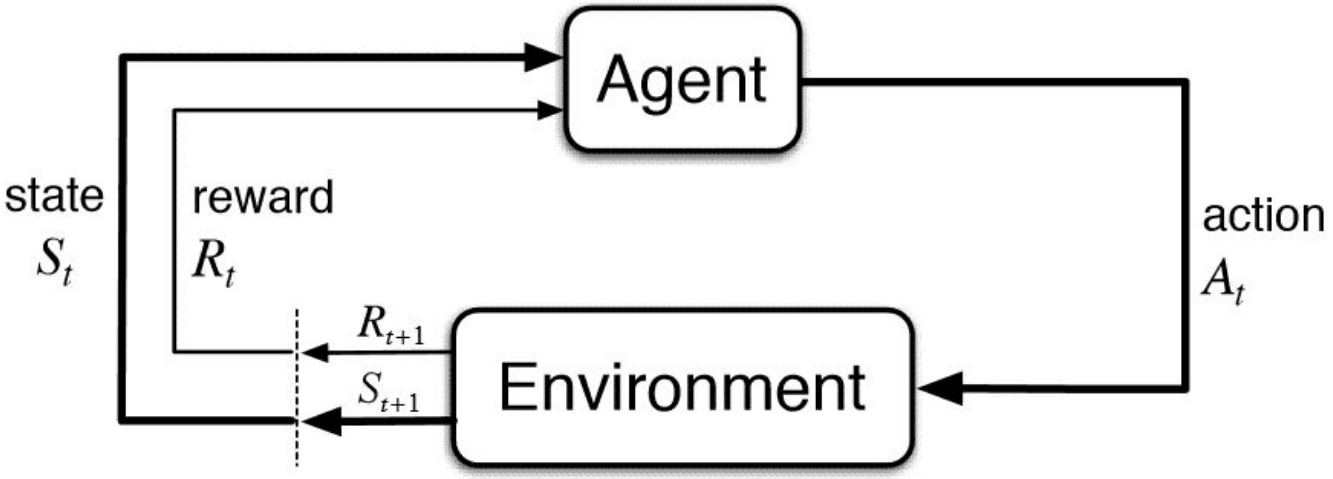


Introduction

- Reconfigurable MAC (Medium Access Control) scheme
- Advantages: handling traffic issues in the network by doing partitions
- Device traffic statistics is used for partitioning algorithms
- Using Thompson sampling



Problem Definition

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- The traffic statistics information necessary
- Absence of prior knowledge
- Issues in learning algorithms

Motivation

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- Using resource allocation and isolation
- Virtualized wireless network and the MAC protocol
- Slice reservations

Implementation

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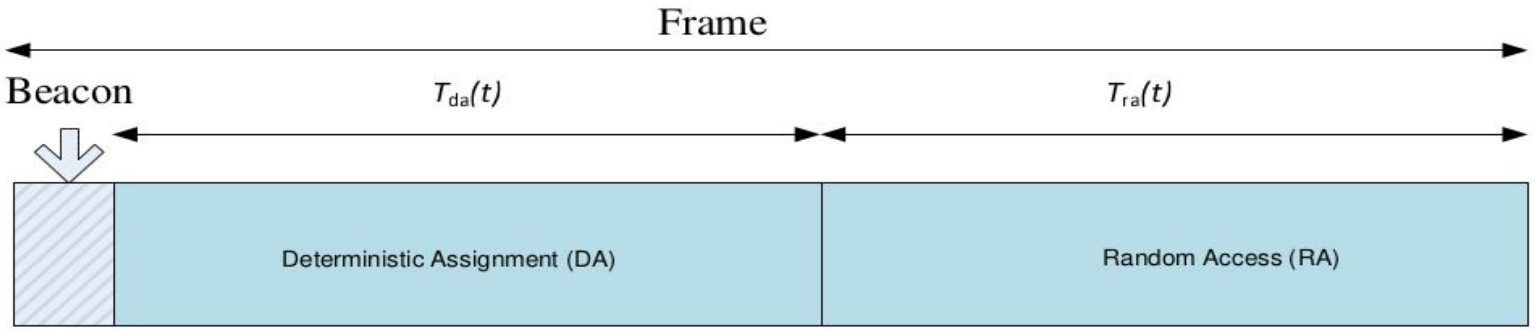
Described in four parts:

1. Contention-free and contention-based partition
2. Optimal output: CGP(Complementary Geometric Programming) based scheduling
3. Thompson sampling-based algorithm
4. Thresholding multi-armed bandits

System Model

- Network Model and Frame Structure
- Using access point(AP)
- Timeframe:
  Beacon: Initial part
  DA(Deterministic Assignment) regime: delay sensitive
  RA(Random Access) regime: CSMA(Combinatorial Multi-Armed Bandit) protocol



Formulation for problem

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- Device send packets with probability '*p*'
- Effective slicing
- Contention-free regime is more effective
- Drawback of using pure contention-free regime
- Formulation of RA and DA regime

Scheduling with Traffic Knowledge

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Based on approximation and two-step decomposition

Algorithm 1: Reconfigurable MAC scheduling via CGP

- Converting CGP problem into GP
- GPs are solved separately

Algorithm 2: Scalable Reconfigurable MAC for denser network

- Problems based linear optimization
- DC programming with iterative manner.

Using Thompson Sampling

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Without prior knowledge

Algorithm 3: In the case of unknown packet arrival

- Passing indices to the scheduler
- Time-slot allocation
- Updation in Probabilities of unknown packet arrival

Algorithm 4: To improve throughput

- Division of packets depending on probabilities
- Thresholding algorithm
- Apply Thompson Sampling

Finding Results

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Using following schemes:

- p-persistent CSMA
- Random Hybrid DA-RA
- Distributed queuing (DQ)

Conclusion

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This paper presents a reconfigurable MAC, where DA and RA are used for devices with different packet transmission probabilities and using simulation results, the effectiveness of the algorithms for both known and unknown packet arrival statistics are proven.

References

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