Task Offloading and Resource Allocation in Mobile-Edge Computing System

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Outline

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- Motivation
- Problem Description
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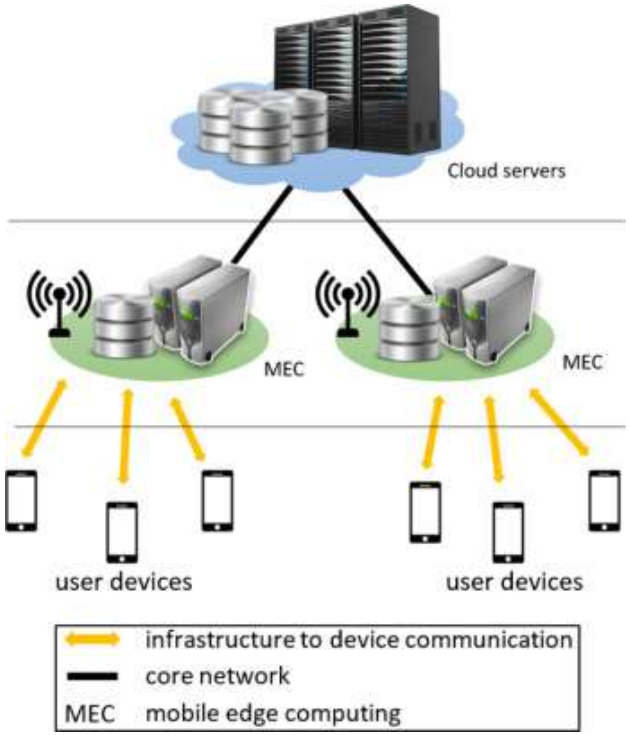
- Simulation Result
- Conclusion

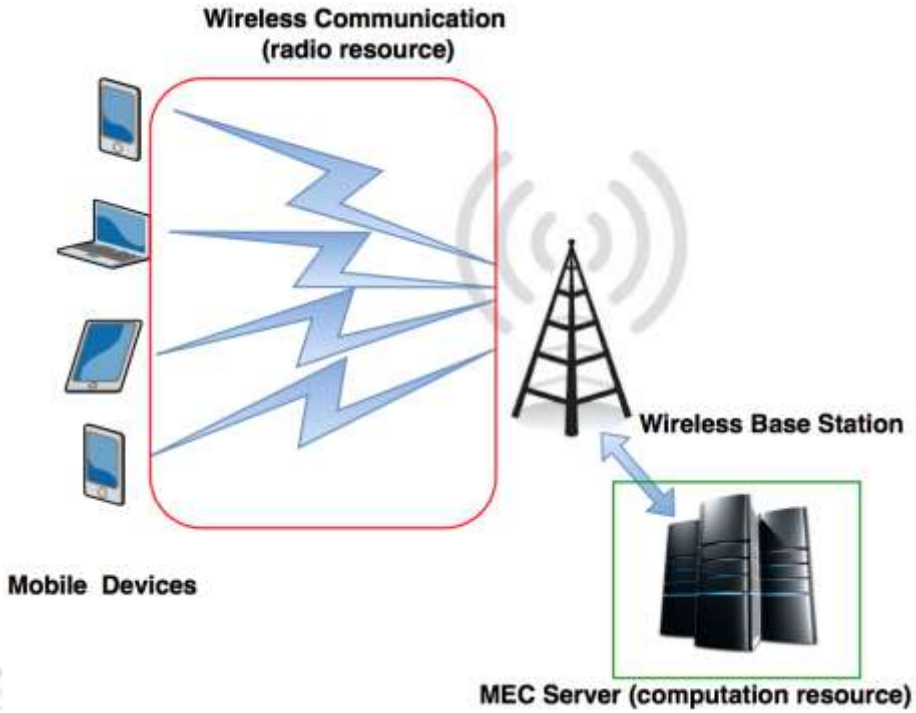
Introduction

- **Mobile-Edge Computing (MEC) system**
  - Lots of mobile applications are resource intensive.
  - Providing computation resources at the edge of RAN.



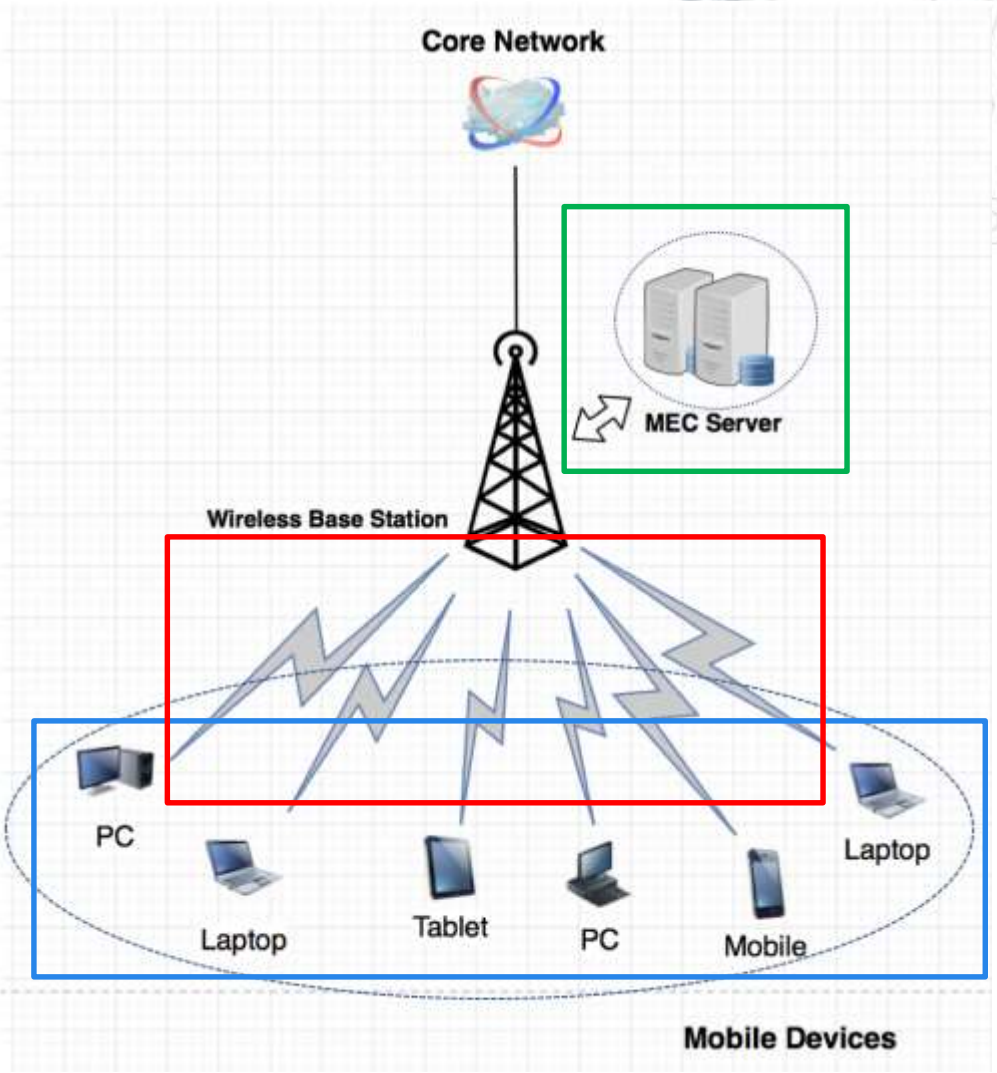
Motivation

- Promoting QoS as well as considering two critical features of tasks and devices.
  - Different tasks have different delay tolerance.
  - Task execution cannot run out of the energy of the device.
- We take two types of resource allocation into account.
  - **Radio resource allocation**
  - **Computation resource allocation**



Problem Description

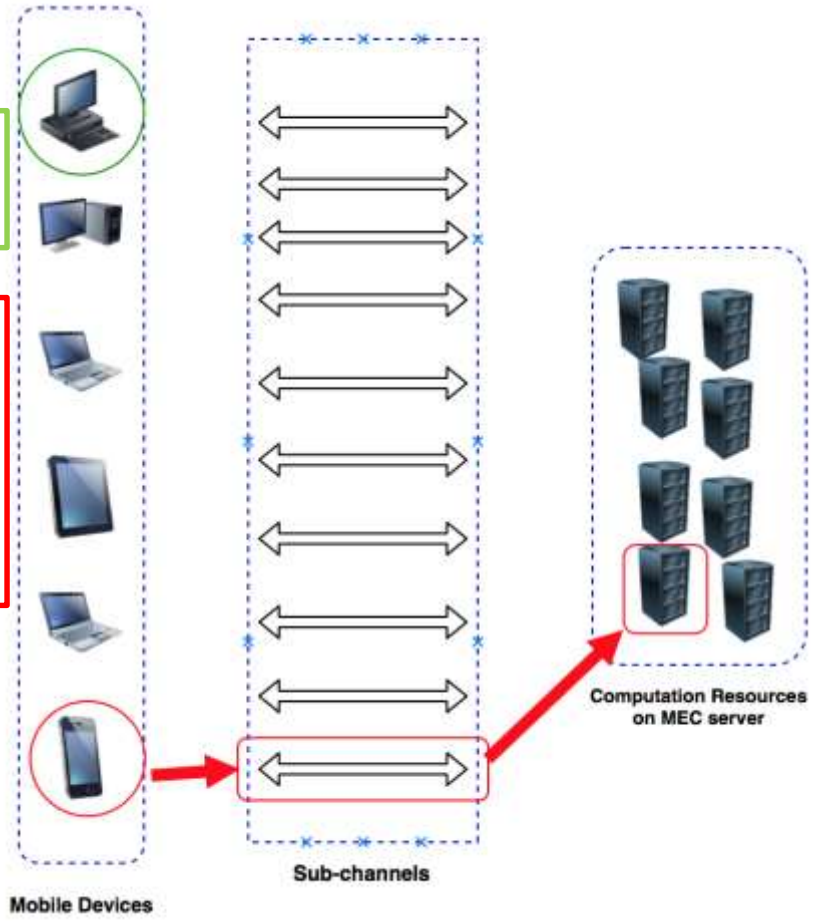
- **Three major parts:**
  - **Multiuser system**
    - Each device has exactly one task and its own remaining energy.
  - **Single MEC server**
    - This MEC server has limited computation resources.
  - **Multi-channel system**
    - Each sub-channel can be occupied by only one device.
- **Three correspond problems:**
  - **Offloading decision problem**
  - **Computation resource allocation**
  - **Radio resource allocation**



Problem Description

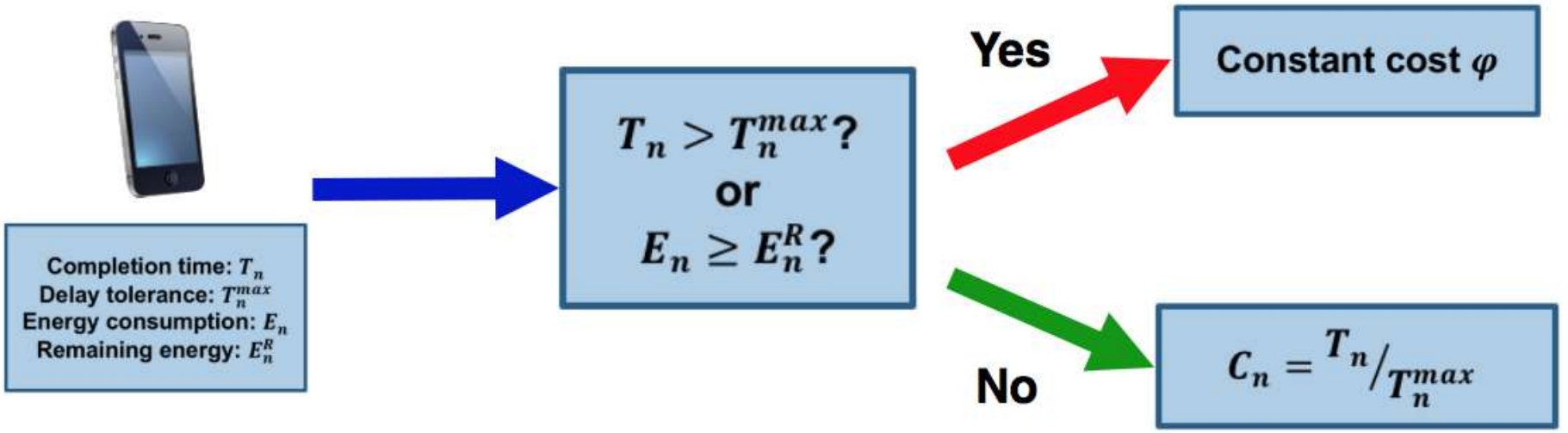
Formulation of these problems:

- Each device has its own offloading decision $x_n \in \{0,1,2,\ldots,M\}$.
- If $x_n = 0$:
  - This device select local execution.
- Otherwise, $x_n = m$:
  - This device select to offload its task via the sub-channel m
  - This device will acquire some computation resources.



Problem Description

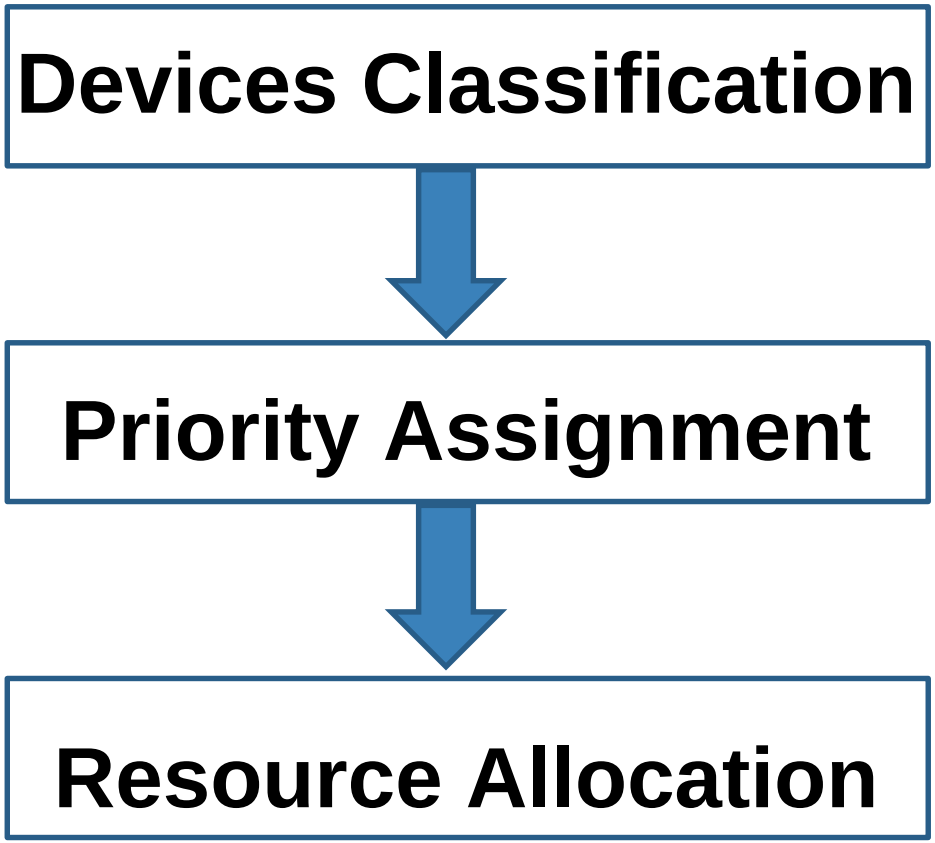
- **Cost function:**
  - To take delay tolerance and remaining energy into account.



  - The cost of failed task φ is much greater than normal cost.

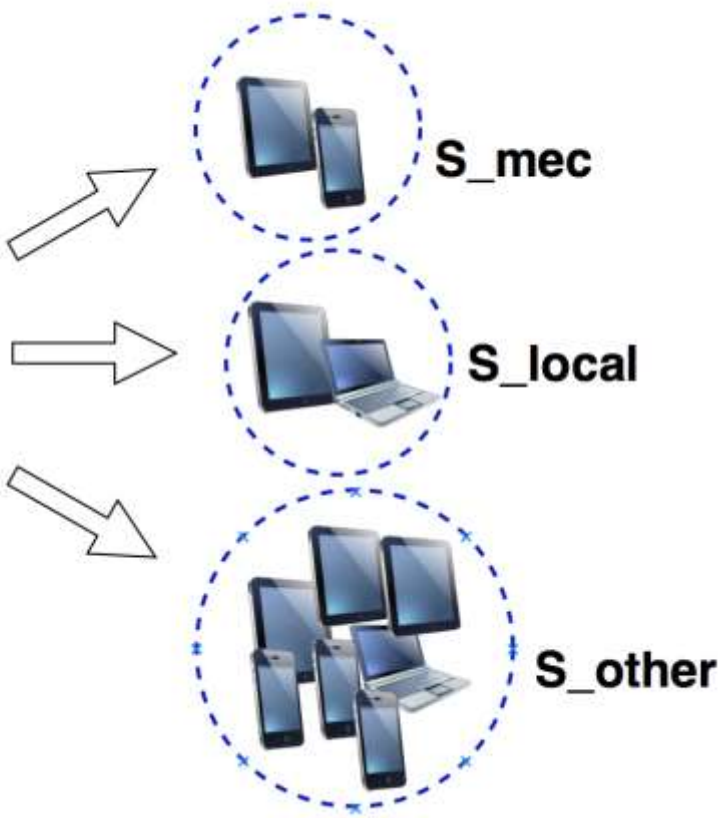
Proposed Algorithm

- **Three steps in our algorithm:**



Proposed Algorithm (Devices Classification)

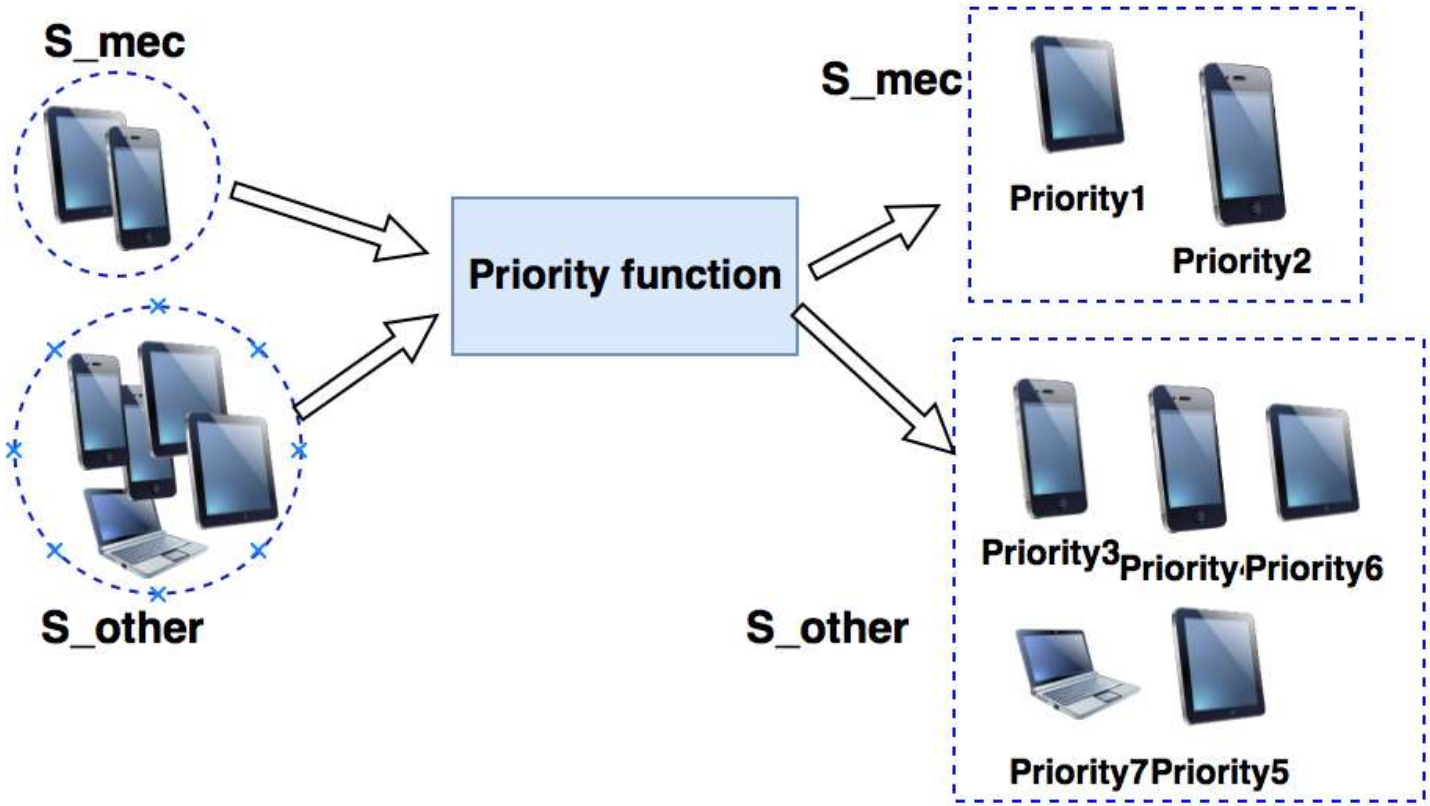
- **Devices Classification**
  - Three sets: S_{mec}, S_{local} and S_{other}
  - Task execution failure should be avoided.



Proposed Algorithm (Priority Assignment)

Priority Assignment

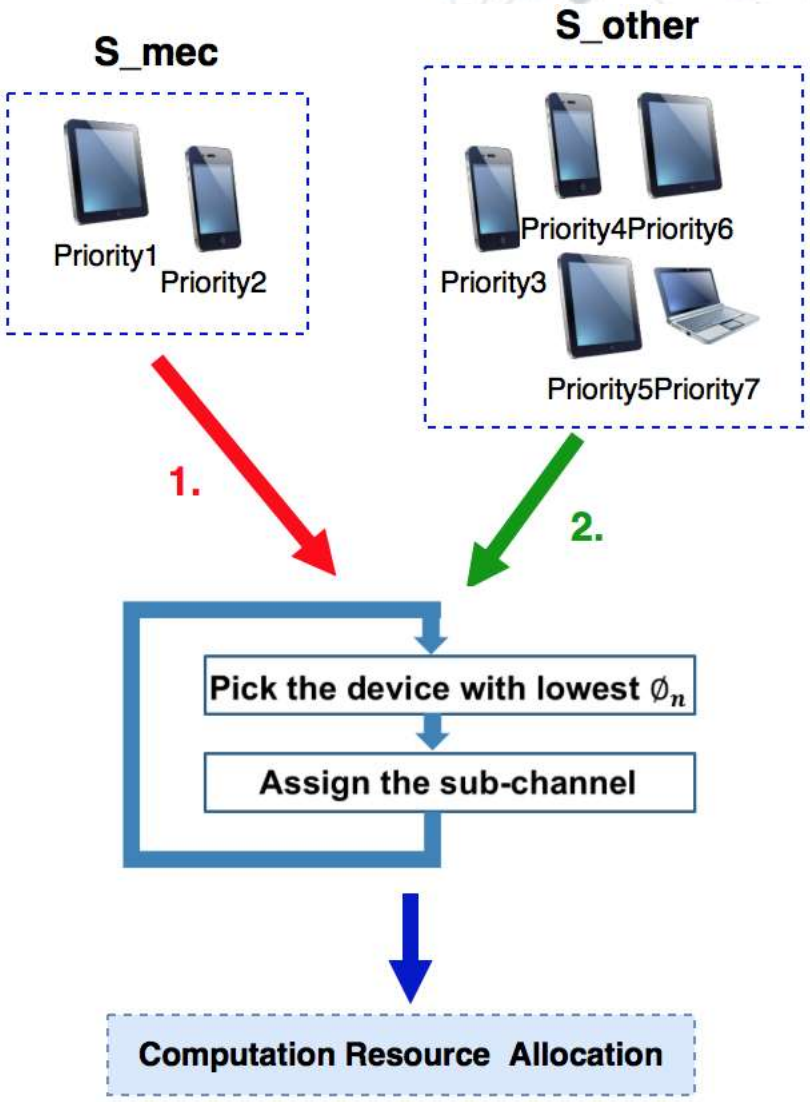
- Assigning a priority $\emptyset_n$ to each device in S_{mec} and S_{other}
- The devices which would reduce more cost by offloading have higher priority to offload.



Proposed Algorithm (Resource Allocation)

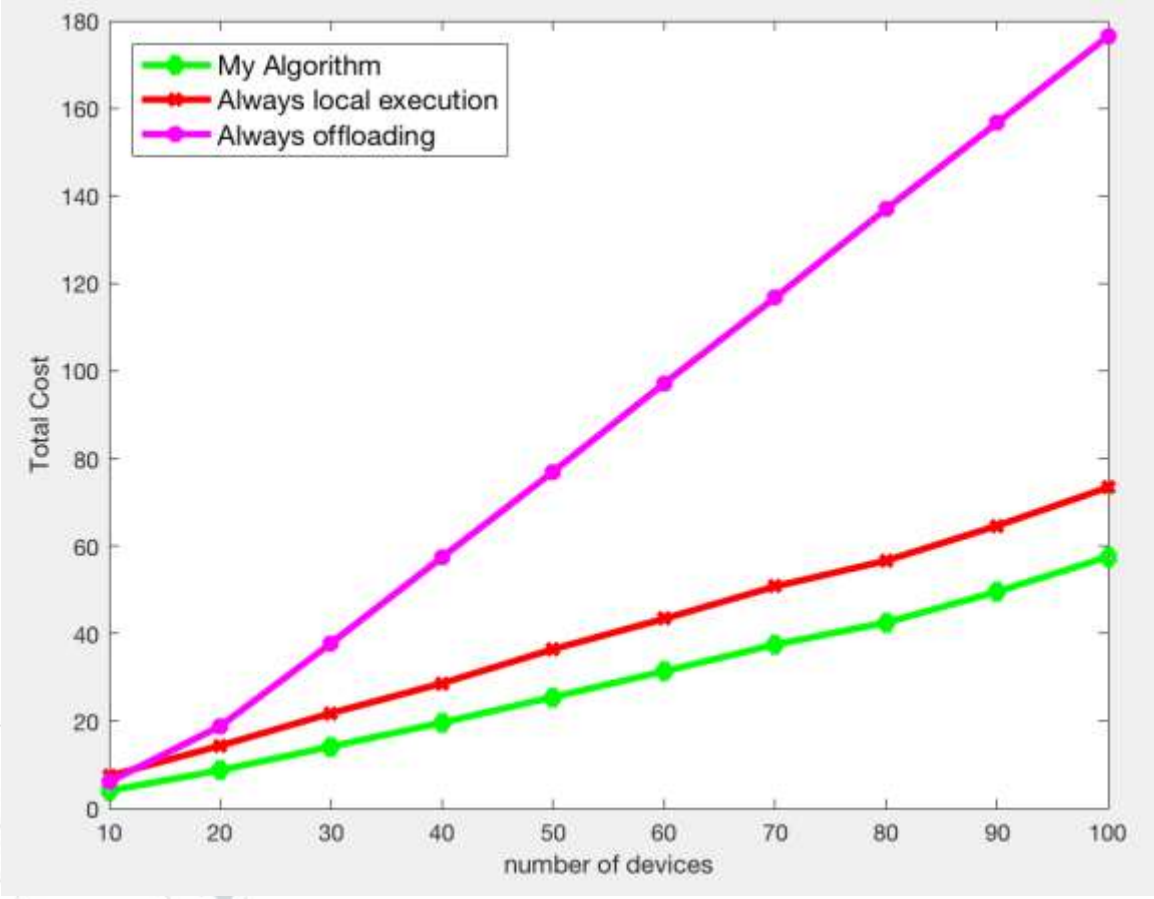
Resource Allocation

- First, assigning sub-channels to the devices in S_{mec}
- After assignment for S_{mec}, we'll consider S_{other}.
- Finally, allocating computation resources to those offloading devices.



Simulation Result

- **Comparison schemes:**
  - Always local execution
  - Always offloading



Conclusion

- **We discuss two issues in MEC system.**
  - Task offloading
  - Resource allocation
- **Formulating a cost minimization problem.**
  - To take delay tolerance and remaining energy into account.
- **Our solution is more efficient and consistent with reality.**
  - We consider three critical problems.
  - Taking delay tolerance and remaining energy into account.

Thanks for your attention!