EECE 7205 Project 2: Task Scheduling

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MCC Task Scheduling Algorithm

Initial Scheduling:

- Assigns to cloud any tasks that have lower execution time on cloud
- Prioritizes tasks by taking recursive sum of execution time (calculated as average core time if not on cloud) per task with max successor priority
- Assigns tasks in priority order while minimizing time of completion per task

Task Migration:

- Chooses one task on local core for migration onto another core, while minimizing energy and time (task migration will not occur if it will not improve)

Baseline Algorithms

Baseline 1:

- Minimizes energy and time out of 10000 random core assignments
  - N tasks assigned to one of K+1 choices, so $(K+1)^N$ possible schedulings, meaning this algorithm does exponentially poorly on average after $N = \log_{K+1}(10000) \quad \sim 7 \,|_{K=3}$

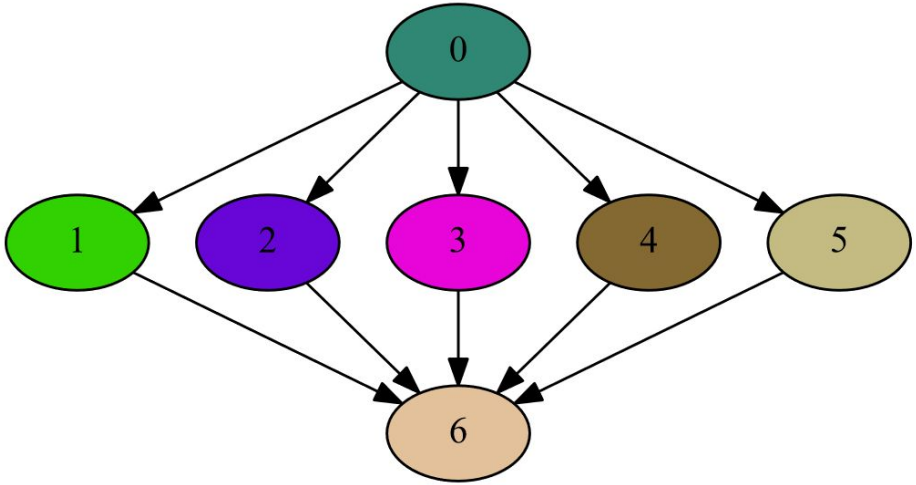
Baseline 2:

- Same as MCC Task Scheduling but cannot assign to cloud

Sample Runs: N=7

Params:

NUM_TASKS: 7
NUM_CORES: 3
CORE_CONSUMPTION: 1, 2, 4,
P_S: 0.5
T_AVG_L: 120
T_AVG_S: 3
T_AVG_R: 6
T_AVG_C: 9
CORE_TIME_FACTOR: 1.1
GRAPH_DENSITY: 0.4

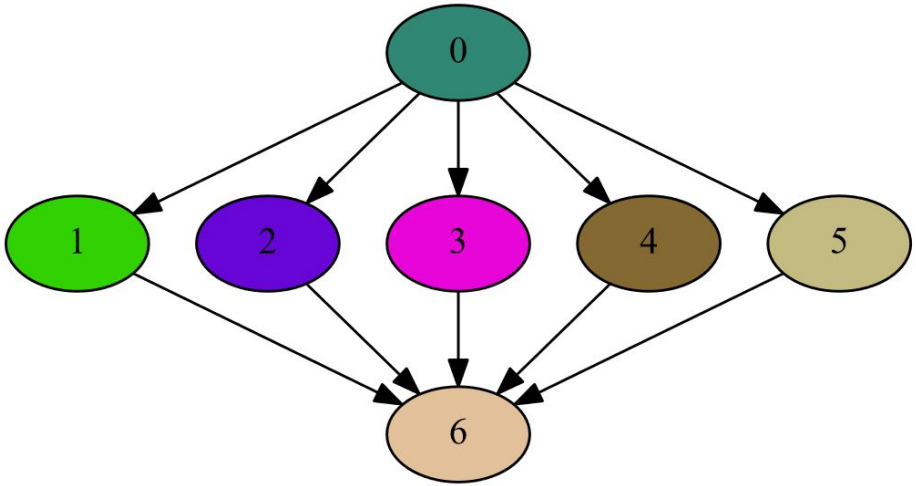


task_0: T_s=3.56687, T_r=8.40471, T_c=10.7174
T_l=79.2999,27.4023,22.0336,
task_1: T_s=2.20168, T_r=3.3047, T_c=5.81922
T_l=95.2159,71.7507,62.4848,
task_2: T_s=4.12279, T_r=4.1243, T_c=10.3059
T_l=159.598,123.764,89.6202,
task_3: T_s=2.07405, T_r=3.2461, T_c=11.3216
T_l=84.4124,30.3938,21.48,
task_4: T_s=3.35034, T_r=3.39625, T_c=9.57172
T_l=155.097,94.4083,56.8461,
task_5: T_s=2.59198, T_r=3.37373, T_c=9.25091
T_l=64.6986,30.1758,10.218,
task_6: T_s=3.11541, T_r=6.27256, T_c=7.16729
T_l=104.181,71.8382,34.7096,

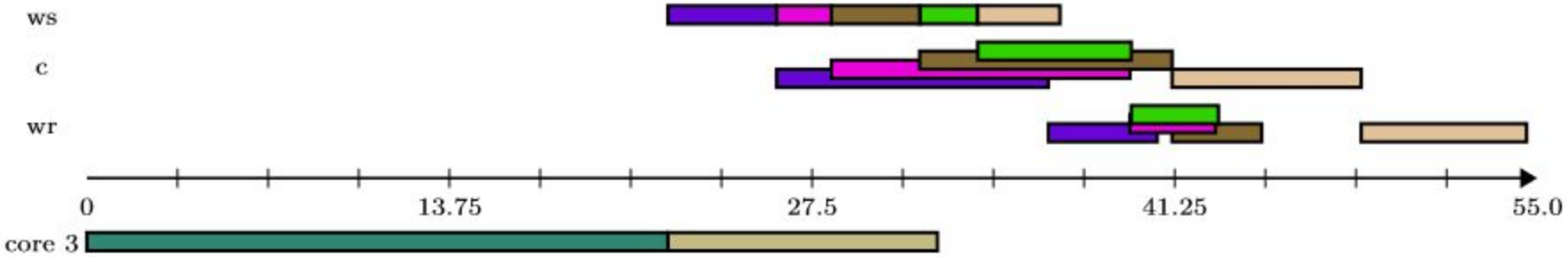
Results: N=7

T_MAX: 81.8886

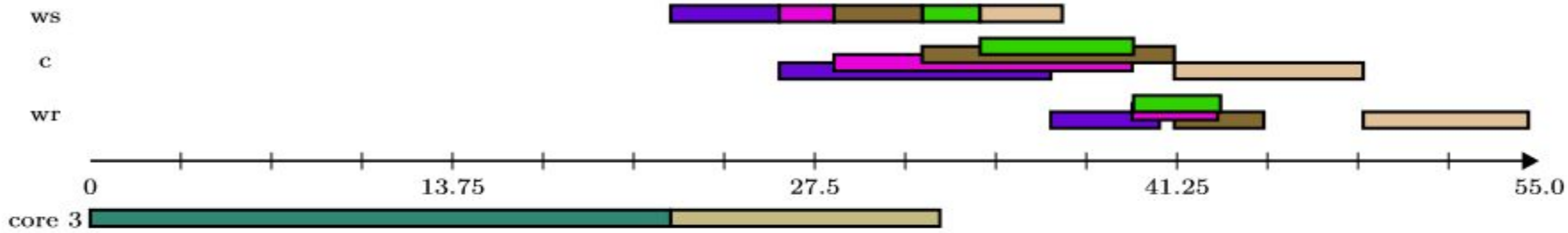
[calculated as 1.5*(initial_scheduling_time)]



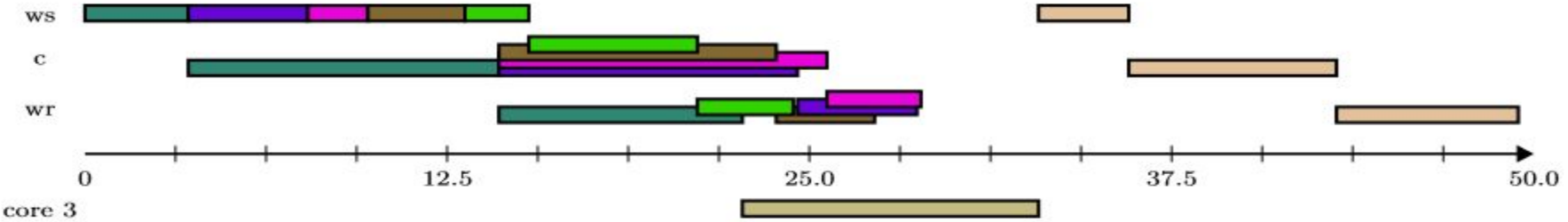
Initial Scheduling:



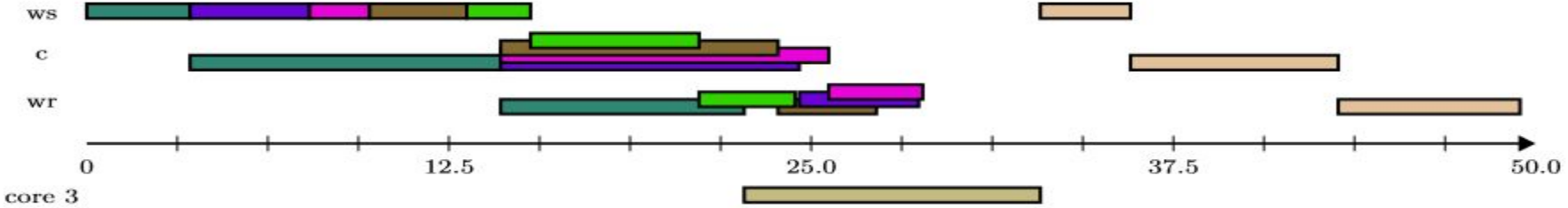
Initial Scheduling: t_total = 54.5924, e_total = 136.439



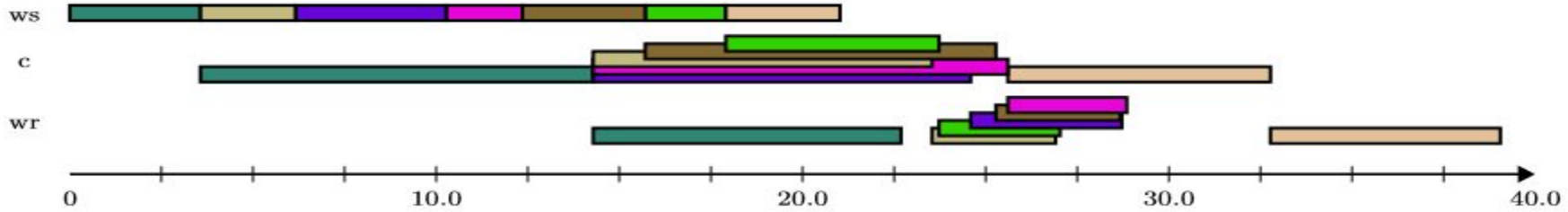
MCC Task Scheduling: (after task migration) t_total = 49.4622, e_total = 50.0877



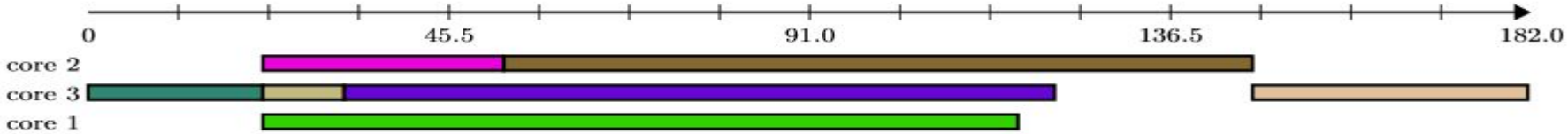
MCC Task Scheduling: t=49.4622, e=50.0877, runtime=~0ms

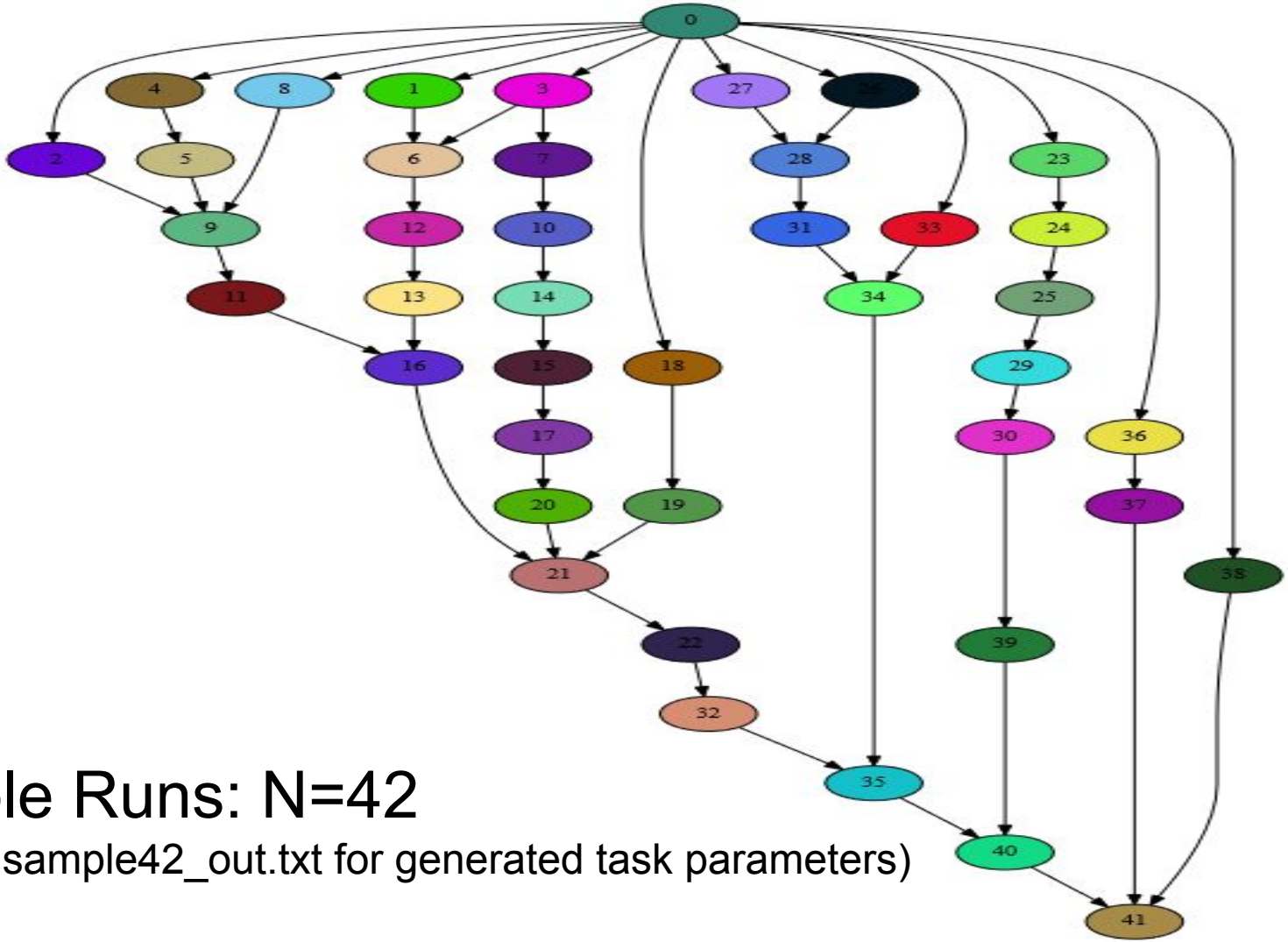


Baseline 1: t=39.0457, e=10.5116, runtime=80.262ms



Baseline 2: t=181.545, e=971.146, runtime=~0ms

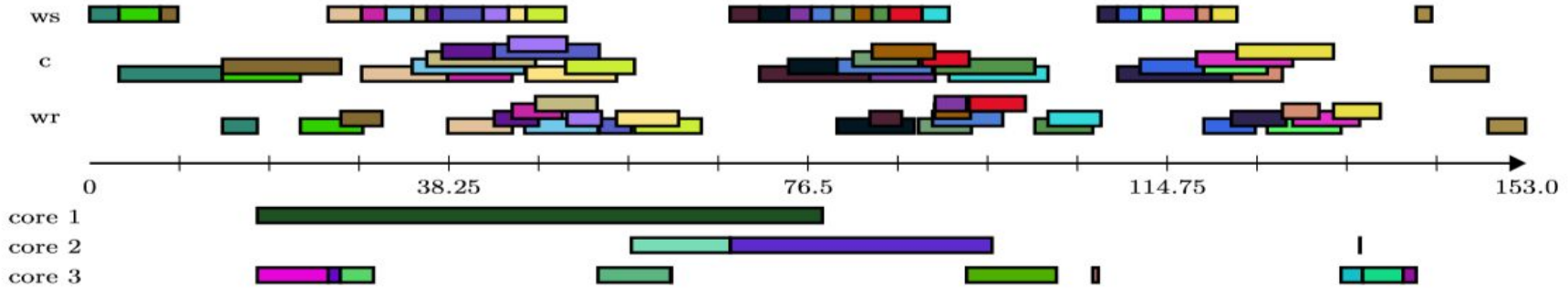




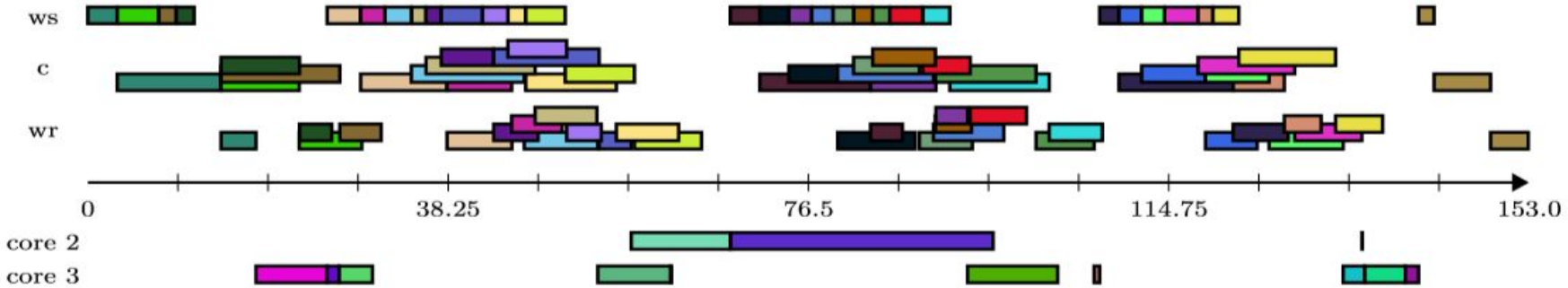
Sample Runs: N=42

(See sample42_out.txt for generated task parameters)

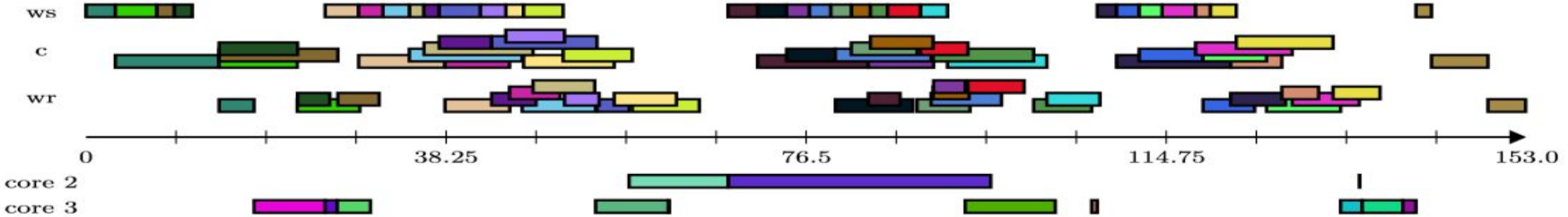
Initial Scheduling: t_total = 152.918, e_total = 327.697



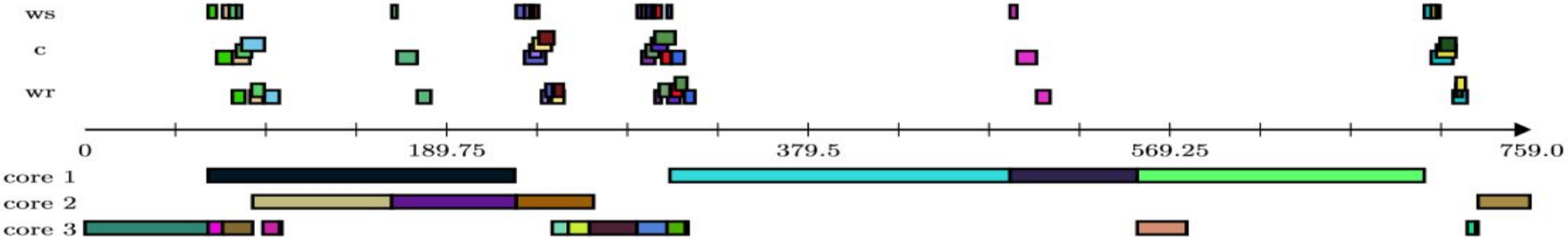
MCC Task Scheduling: (after task migration) t_total = 152.918, e_total = 268.469



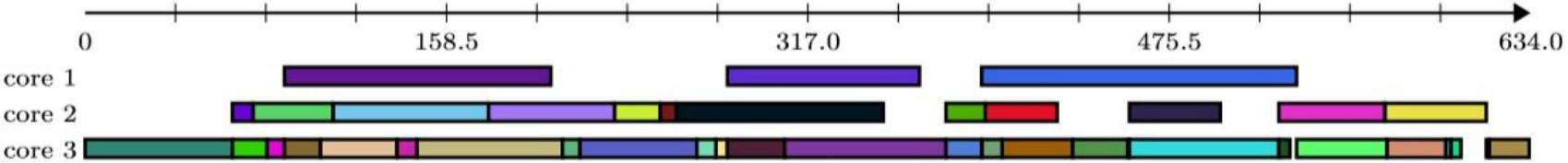
MCC Task Scheduling: t=152.918, e=268.469, runtime=15.622ms



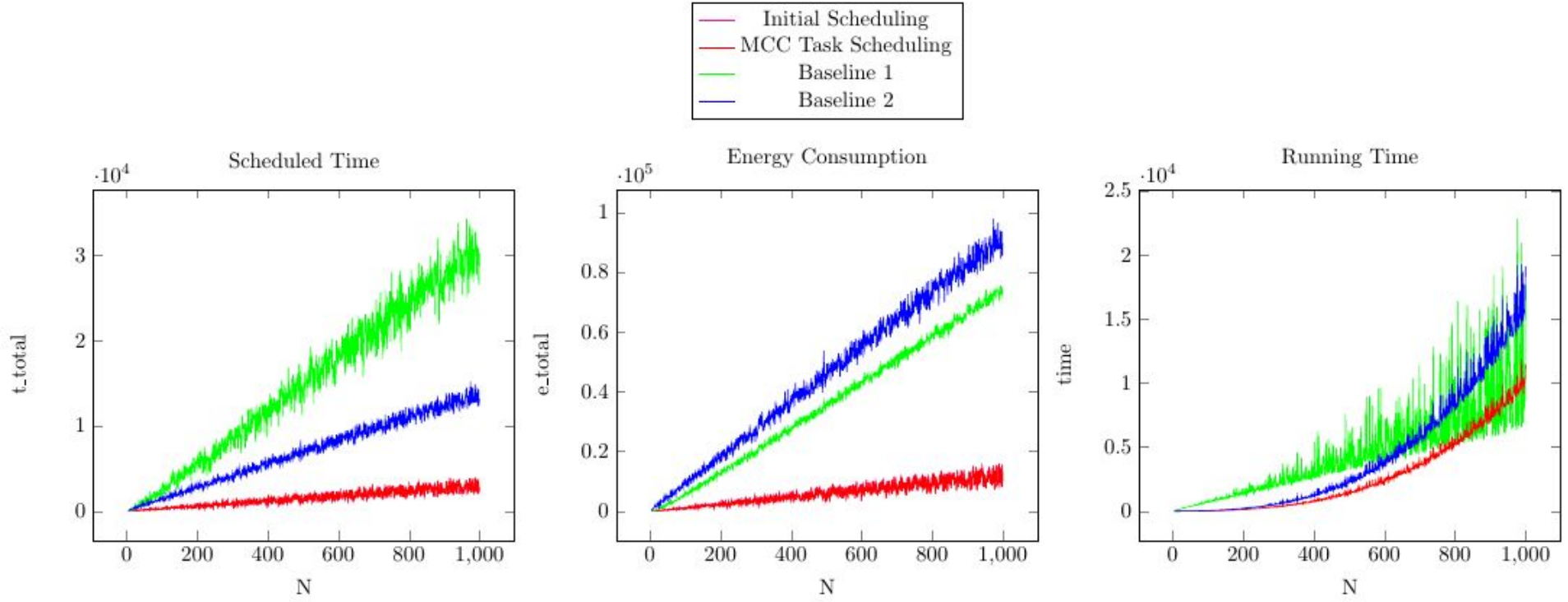
Baseline 1: t=758.181, e=1796.57, runtime=382.725ms

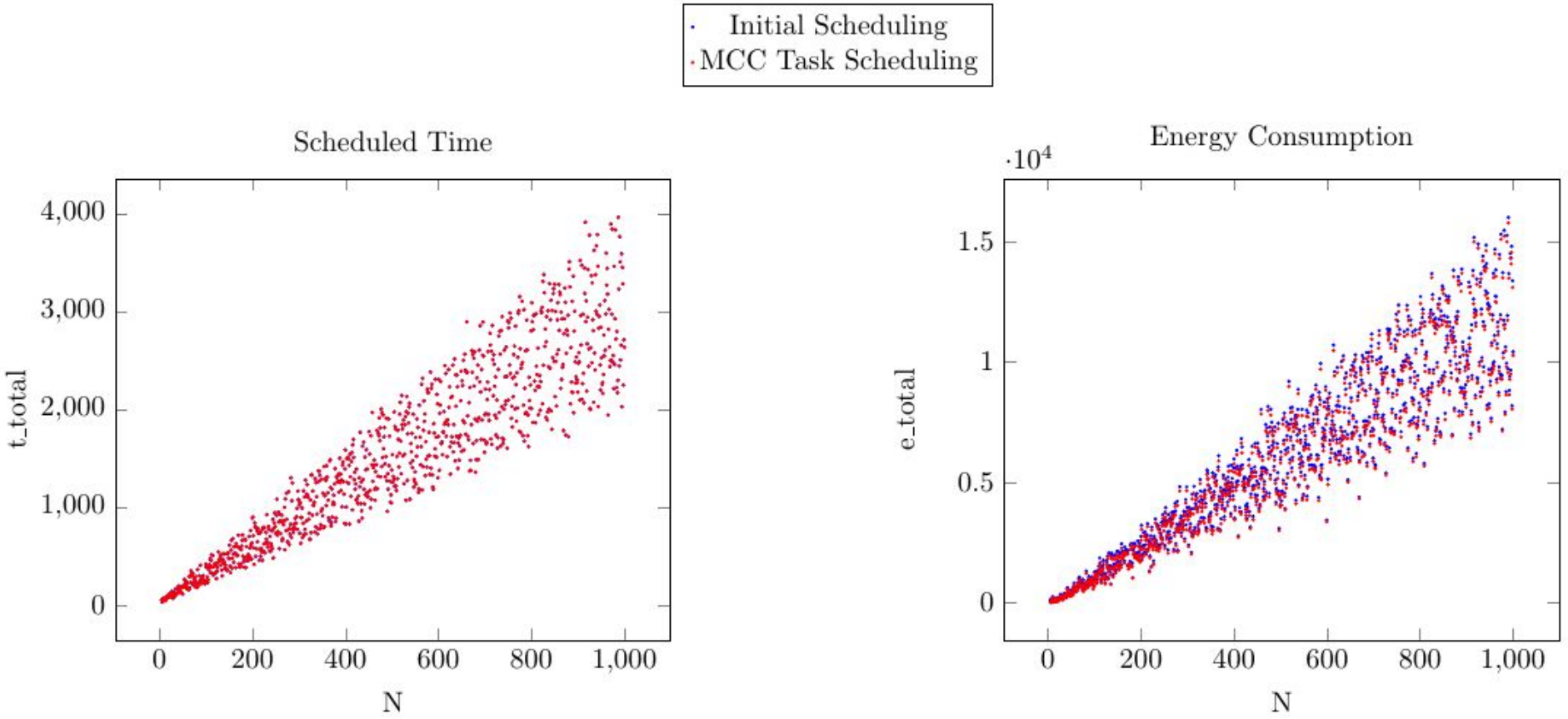


Baseline 2: t=633.39, e=3747.21, runtime=15.621ms



Data


Initial Scheduling
MCC Task Scheduling
Baseline 1
Baseline 2
Scheduled Time
·10^4
t_total
N
Energy Consumption
·10^5
e_total
N
Running Time
·10^4
time
N


Initial Scheduling
MCC Task Scheduling
Scheduled Time
t_total
N
0
1,000
2,000
3,000
4,000
0
200
400
600
800
1,000
Energy Consumption
$\cdot 10^4$
e_total
N
0
0.5
1
1.5
0
200
400
600
800
1,000