EECE7205

FINAL PROJECT

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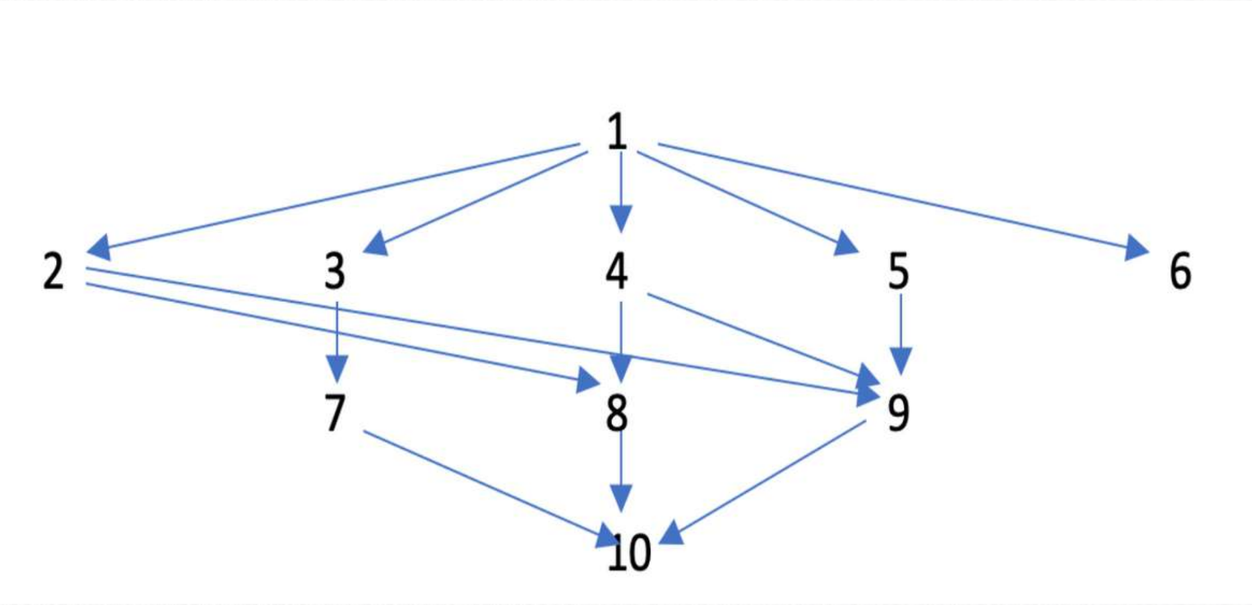
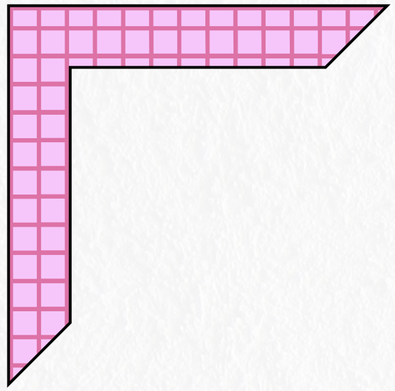
TASK GRAPH 1

Task Graph 1

- Task Graph 1 consists of 10 tasks.
- There is one entry task and one exit task.





Execution Time for Task Graph 1

Slowest Core - Core 1
Fastest Core - Core 3

Task	Core 1	Core 2	Core 3
1	9	7	5
2	8	6	5
3	6	5	4
4	7	5	3
5	5	4	2
6	7	6	4
7	8	5	3
8	6	4	2
9	5	3	2
10	7	4	2

INITIAL SCHEDULING FOR TASK GRAPH 1

```
Initial schedule:
Task1: local core3, start time is: 0,finish time is: 5
Task3: local core3, start time is: 5,finish time is: 9
Task2: cloud, start time is: 5,finish time is: 10
Task6: local core2, start time is: 5,finish time is: 11
Task4: local core1, start time is: 5,finish time is: 12
Task5: local core3, start time is: 9,finish time is: 11
Task7: local core3, start time is: 11,finish time is: 14
Task8: local core2, start time is: 12,finish time is: 16
Task9: local core3, start time is: 14,finish time is: 16
Task10: local core3, start time is: 16,finish time is: 18
 Now the total energy is: 100.5
 Now the completion time is: 18
Running time of initial schedule of Graph is 0.025 ms
```

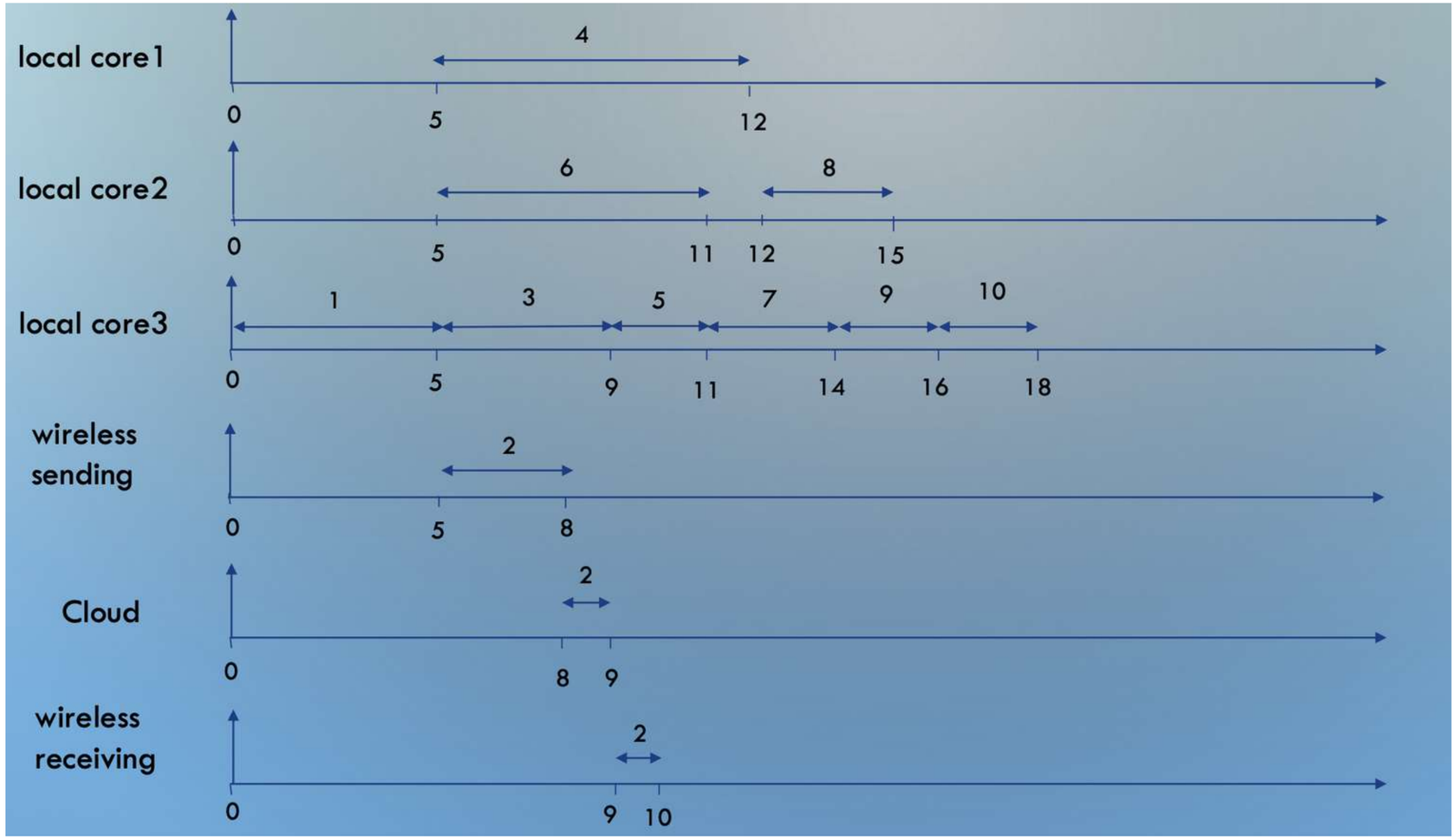
Program Output for Energy Consumption (Initial Scheduling)

THE COMPLETION TIME OF THE SCHEDULE IS 18.

THE TOTAL ENERGY CONSUMED IS 100.5.

THE RUNNING TIME OF THE INITIAL SCHEDULE PROGRAM IS 0.025 MS.

INITIAL SCHEDULING TASK GRAPH



Task Priority Order: 1,2,3,6,4,5,7,8,9,10

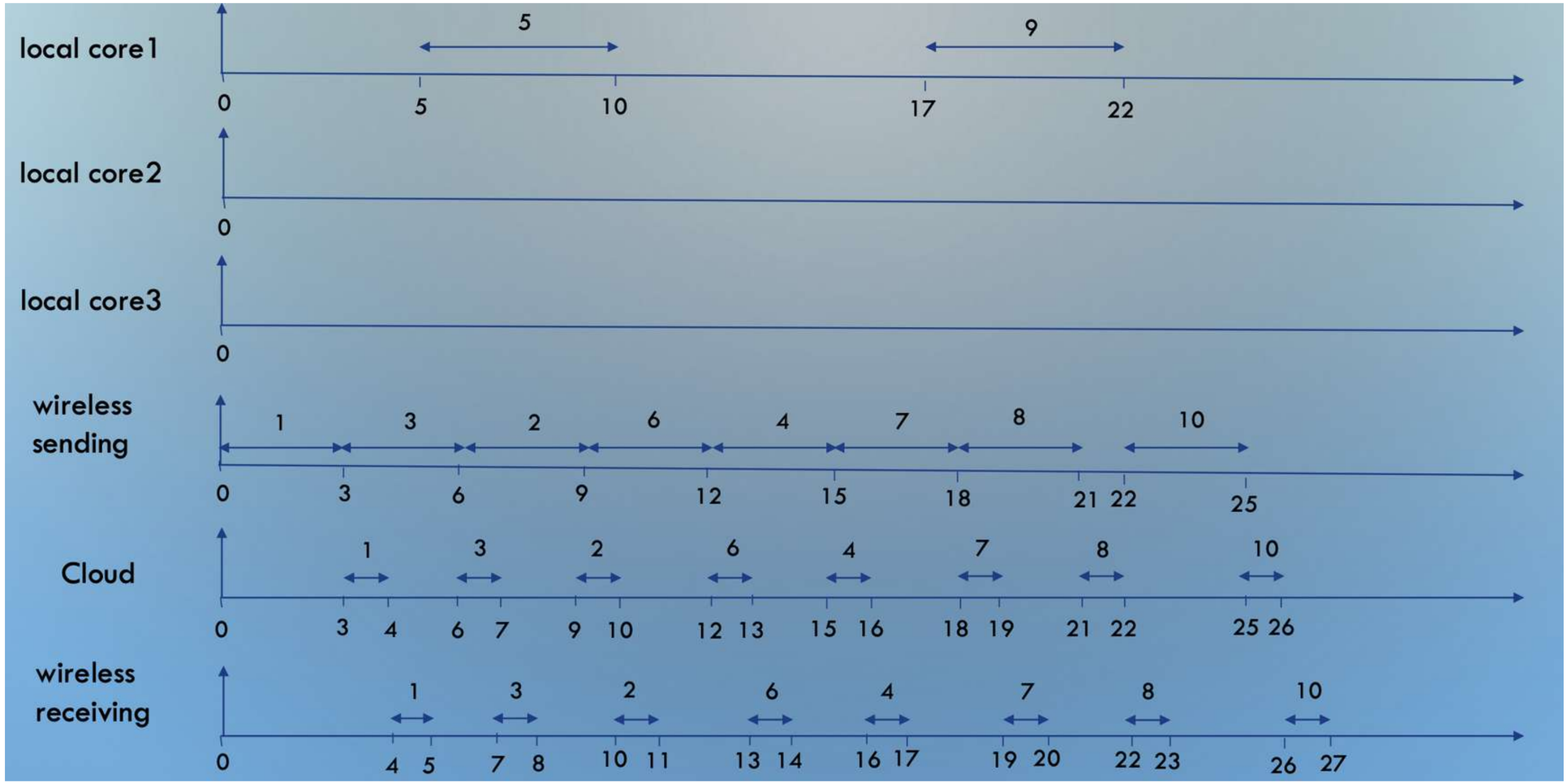
FINAL SCHEDULING FOR TASK GRAPH 1

```
After Task Migration:
Task1: cloud, start time is: 0,finish time is: 5
Task3: cloud, start time is: 3,finish time is: 8
Task2: cloud, start time is: 6,finish time is: 11
Task6: cloud, start time is: 9,finish time is: 14
Task4: cloud, start time is: 12,finish time is: 17
Task5: local core1, start time is: 5,finish time is: 10
Task7: cloud, start time is: 15,finish time is: 20
Task8: cloud, start time is: 18,finish time is: 23
Task9: local core1, start time is: 17,finish time is: 22
Task10: cloud, start time is: 22,finish time is: 27
 Now the total energy is: 22
 Now the completion time is: 27
Running time of task migration of Graph is 1.569 ms
```

Manual Calculation of Energy Consumption (Initial Scheduling)

$E1=(7*1)=7;\ E2=(6+4)*2=20;E3=(5+4+2+3+2+2)*4=72;Es=(3*0.5)=1.5;\ E=7+20+72+1.5=100.5$

Final Scheduling Task Graph



Program Output for Energy Consumption (Final Scheduling)

Total Energy:22

Total Time Taken: 27

The last task is Task 10 on Cloud.

Energy consumption has decreased as compared to the initial scheduling, while total time taken is lesser than T_max derived.

Manual Calculation of Energy Consumption (Final Scheduling)

E1=(5+5)*1=10; E2=0;E3=0;Es=(3*8*0.5)=12; E=10+12=22

Summary of Task Graph 1

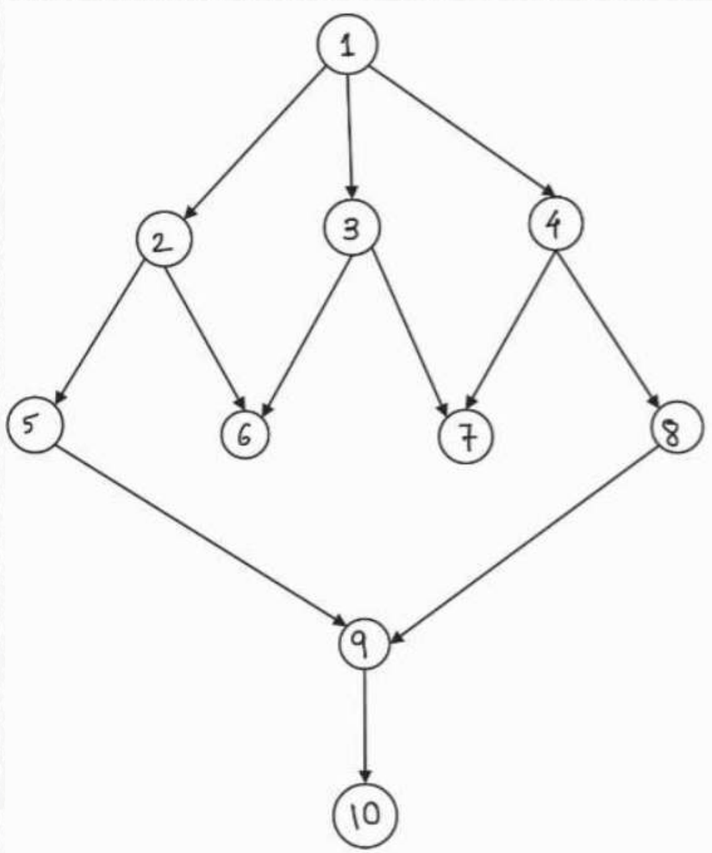
Total Time Taken for Initial Scheduling: 15
Total Time Taken for Final Scheduling:18
Compared to Initial Scheduling. Energy Consumption in Final Scheduling is lesser while time constraint is also considered.

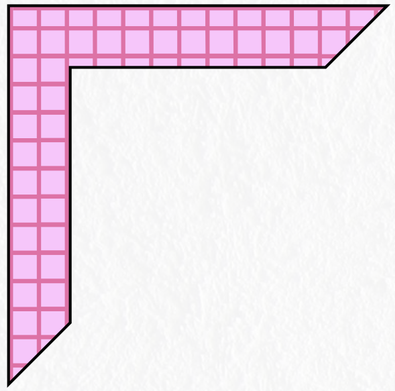
	Value
T_total (Initial)	15
T_total (Final)	18
E_total (Initial)	100.5
E_total (Final)	22

TASK GRAPH 2

Task Graph 2

- Task Graph 2 consists of 10 tasks.
- There is one entry task and one exit task.





Execution Time for Task Graph 2

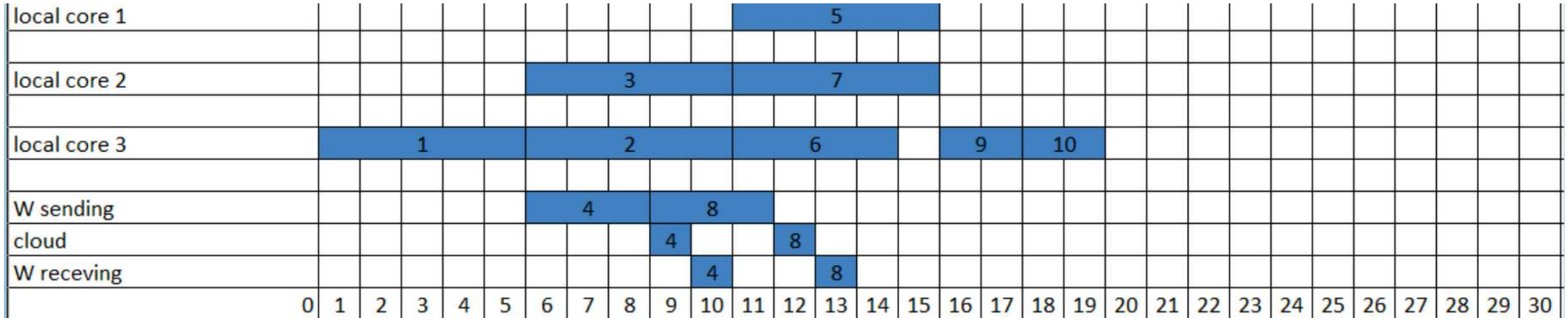
Slowest Core - Core 1
Fastest Core - Core 3

Task	Core 1	Core 2	Core 3
1	9	7	5
2	8	6	5
3	6	5	4
4	7	5	3
5	5	4	2
6	7	6	4
7	8	5	3
8	6	4	2
9	5	3	2
10	7	4	2

INITIAL SCHEDULING FOR TASK GRAPH 2

```
Initial schedule:
Task1: local core3, start time is: 0,finish time is: 5
Task2: local core3, start time is: 5,finish time is: 10
Task3: local core2, start time is: 5,finish time is: 10
Task4: cloud, start time is: 5,finish time is: 10
Task6: local core3, start time is: 10,finish time is: 14
Task7: local core2, start time is: 10,finish time is: 15
Task8: cloud, start time is: 8,finish time is: 13
Task5: local core1, start time is: 10,finish time is: 15
Task9: local core3, start time is: 15,finish time is: 17
Task10: local core3, start time is: 17,finish time is: 19
 Now the total energy is: 100
 Now the completion time is: 19
Running time of initial schedule of Graph is 0.025 ms
```

INITIAL SCHEDULING TASK GRAPH



Program Output for Energy Consumption (Initial Scheduling)

Total Energy: 100

Total Time Taken: 9

The last task is Task 10 on Local Core 3

Running Time: 0.025 ms

Manual Calculation of Energy Consumption (Initial Scheduling)

E1=5*1=5;

E2 = (5 + 5)*2 = 20;

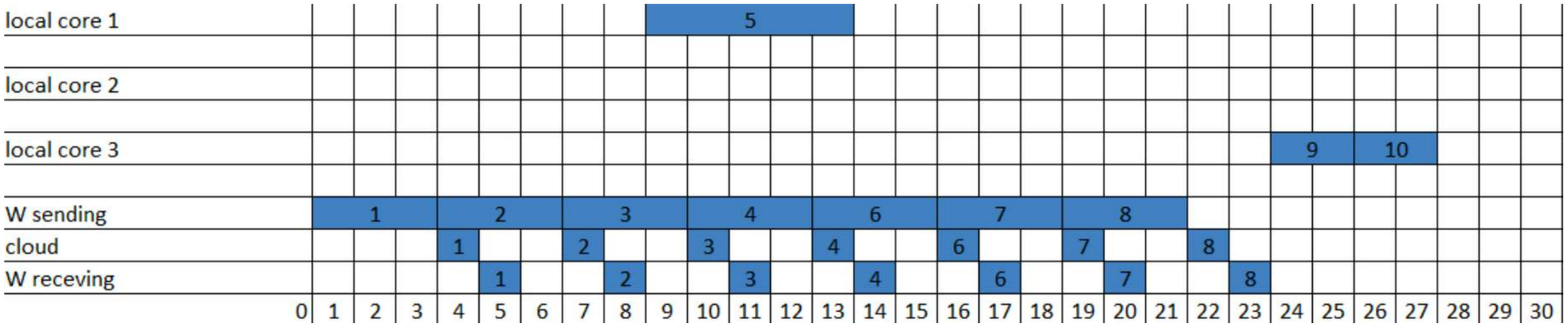
E3 = (5 + 5 + 4 +2+2)*4=72; ES = (3 + 3)*0.5 = 3;

E = 5+10+72+3 =100

Final Scheduling for Task Graph2

```
After Task Migration:
Task1: cloud, start time is: 0,finish time is: 5
Task2: cloud, start time is: 3,finish time is: 8
Task3: cloud, start time is: 6,finish time is: 11
Task4: cloud, start time is: 9,finish time is: 14
Task6: cloud, start time is: 12,finish time is: 17
Task7: cloud, start time is: 15,finish time is: 20
Task8: cloud, start time is: 18,finish time is: 23
Task5: local core1, start time is: 8,finish time is: 13
Task9: local core3, start time is: 23,finish time is: 25
Task10: local core3, start time is: 25,finish time is: 27
 Now the total energy is: 31.5
 Now the completion time is: 27
Running time of task migration of Graph is 1.596 ms
```

Final Scheduling Task Graph



Program Output for Energy Consumption (Final Scheduling)

Total Energy: 31.5

Total Time Taken: 27

Running Time: 1.596 ms

Manual Calculation of Energy Consumption (Final Scheduling)

ES=(3*7)*0.5 = 10.5; E1=5*1=5; E3=4*4=16;
E = 10.5+5+16 = 31.5;

Summary of Task Graph 2

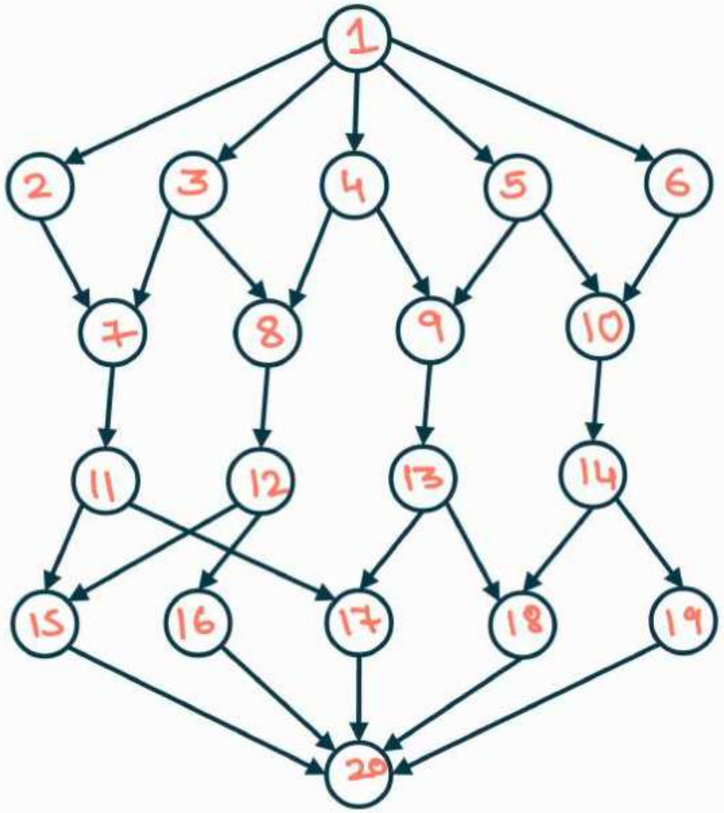
- Total Time Taken for Initial Scheduling:19
- Total Time Taken for Final Scheduling:27
- Compared to Initial Scheduling. Energy Consumption in Final Scheduling is lesser .

	Value
T_total (Initial)	19
T_total (Final)	27
E_total (Initial)	100
E_total (Final)	31.5

TASK GRAPH 3

Task Graph 3

- Task Graph 3 consists of 20 tasks.
- There is one entry task and one exit task.



Execution Time for Task Graph 3

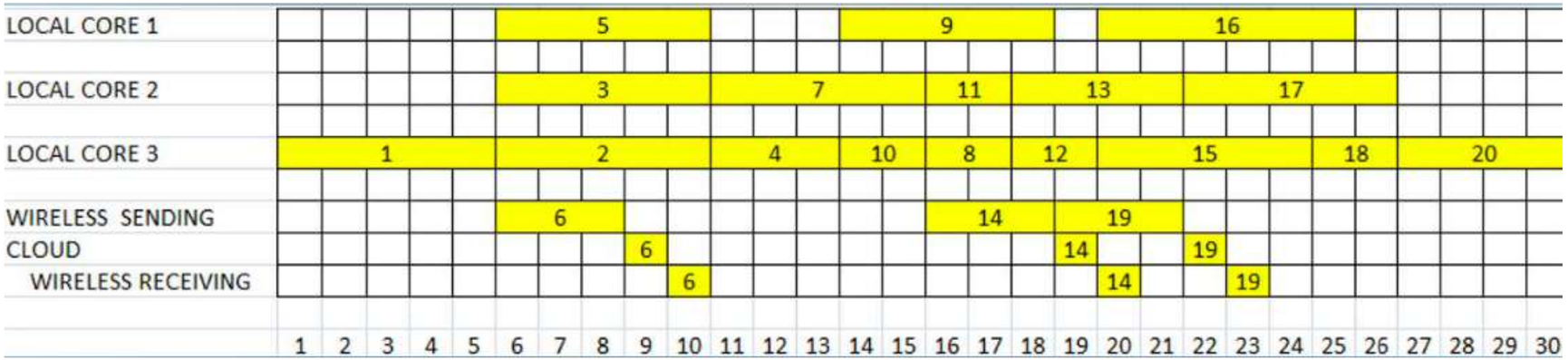
Slowest Core - Core 1
Fastest Core - Core 3

Task	Core 1	Core 2	Core 3
1	9	7	5
2	8	6	5
3	6	5	4
4	7	5	3
5	5	4	2
6	7	6	4
7	8	5	3
8	6	4	2
9	5	3	2
10	7	4	2
11	7	4	2
12	6	3	2
13	5	3	3
14	8	7	4
15	9	8	5
16	6	4	2
17	7	5	3
18	8	4	2
19	9	6	3
20	7	6	4

INITIAL SCHEDULING FOR TASK GRAPH 3

```
Initial schedule:
Task1: local core3, start time is: 0,finish time is: 5
Task2: local core3, start time is: 5,finish time is: 10
Task6: cloud, start time is: 5,finish time is: 10
Task3: local core2, start time is: 5,finish time is: 10
Task5: local core1, start time is: 5,finish time is: 10
Task4: local core3, start time is: 10,finish time is: 13
Task7: local core2, start time is: 10,finish time is: 15
Task10: local core3, start time is: 13,finish time is: 15
Task8: local core3, start time is: 15,finish time is: 17
Task14: cloud, start time is: 15,finish time is: 20
Task9: local core1, start time is: 13,finish time is: 18
Task11: local core2, start time is: 15,finish time is: 17
Task12: local core3, start time is: 17,finish time is: 19
Task13: local core2, start time is: 18,finish time is: 21
Task15: local core3, start time is: 19,finish time is: 24
Task19: cloud, start time is: 18,finish time is: 23
Task17: local core2, start time is: 21,finish time is: 26
Task18: local core3, start time is: 24,finish time is: 26
Task16: local core1, start time is: 19,finish time is: 25
Task20: local core3, start time is: 26,finish time is: 30
 Now the total energy is: 180.5
 Now the completion time is: 30
The running time of initial schedule of Graph is 0.061 ms
```

INITIAL SCHEDULING TASK GRAPH



Program Output for Energy Consumption (Initial Scheduling)

THE COMPLETION TIME OF THE SCHEDULE IS 30.

THE TOTAL ENERGY CONSUMED IS 180.5.

THE RUNNING TIME OF THE INITIAL SCHEDULE PROGRAM IS 0.061 ms

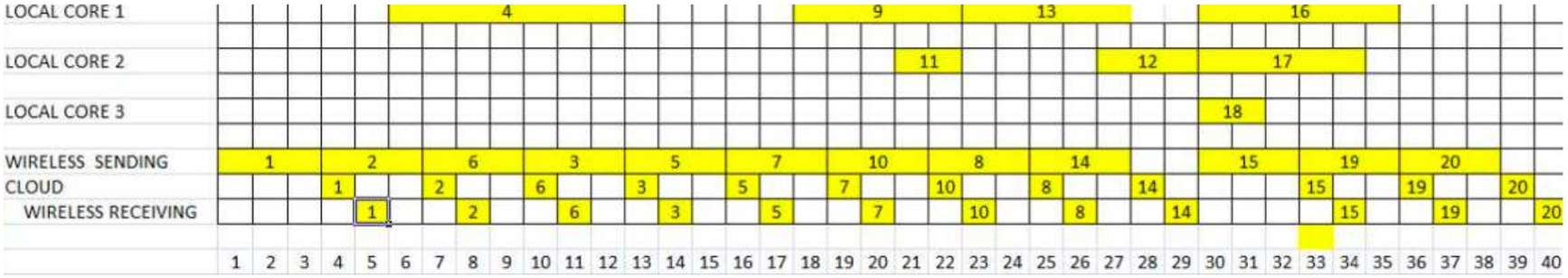
Manual Calculation of Energy Consumption (Initial Scheduling)

$$E1=5+5+6=16;$$
$$E2=(20)*2=40;$$
$$E3=30*4=120;$$
$$Es=(3*3*0.5)=4.5;$$
$$E=16+10+120+4.5=180.5$$

Final Scheduling for Task Graph 3

```
After Task Migration:
Task1: cloud, start time is: 0,finish time is: 5
Task2: cloud, start time is: 3,finish time is: 8
Task6: cloud, start time is: 6,finish time is: 11
Task3: cloud, start time is: 9,finish time is: 14
Task5: cloud, start time is: 12,finish time is: 17
Task4: local core1, start time is: 5,finish time is: 12
Task7: cloud, start time is: 15,finish time is: 20
Task10: cloud, start time is: 18,finish time is: 23
Task8: cloud, start time is: 21,finish time is: 26
Task14: cloud, start time is: 24,finish time is: 29
Task9: local core1, start time is: 17,finish time is: 22
Task11: local core2, start time is: 20,finish time is: 22
Task12: local core2, start time is: 26,finish time is: 29
Task13: local core1, start time is: 22,finish time is: 27
Task15: cloud, start time is: 29,finish time is: 34
Task19: cloud, start time is: 32,finish time is: 37
Task17: local core2, start time is: 29,finish time is: 34
Task18: local core3, start time is: 29,finish time is: 31
Task16: local core1, start time is: 29,finish time is: 35
Task20: cloud, start time is: 35,finish time is: 40
 Now the total energy is: 69
 Now the completion time is: 40
The running time of task migration of Graph 1 is 25.615 ms
```

Final Scheduling Task Graph



Program Output for Energy Consumption (Final Scheduling)

- THE COMPLETION TIME OF THE SCHEDULE IS 40.
- THE TOTAL ENERGY CONSUMED IS 69.
- THE RUNNING TIME OF THE INITIAL SCHEDULE PROGRAM IS 25.615 ms.

Manual Calculation of Energy Consumption (Final Scheduling)

$$E1=7+5+5+6=23;$$
$$E2=(10)*2=20;$$
$$E3=2*4=8;$$
$$Es=(3*12*0.5)=18;$$
$$E=23+20+8+18=69$$

Summary of Task Graph 3

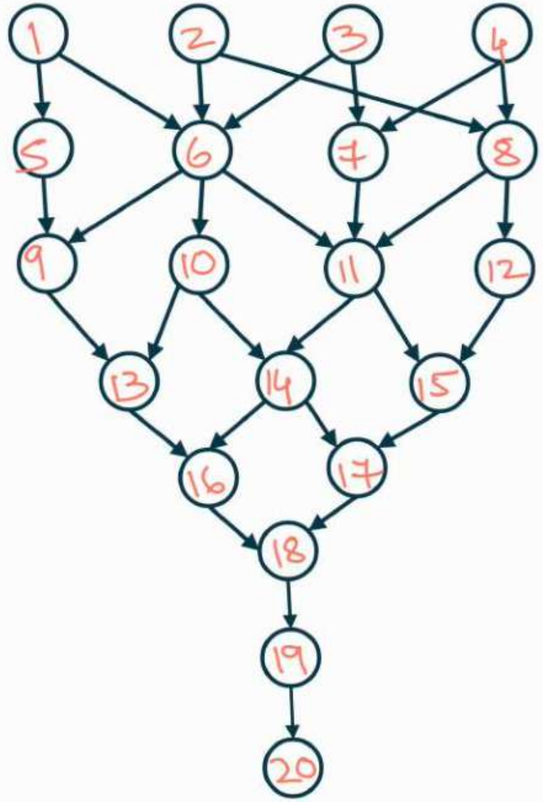
- Total Time Taken for Initial Scheduling: 27
- Total Time Taken for Final Scheduling: 39
- Compared to Initial Scheduling. Energy Consumption in Final Scheduling is lesser

	Value
T_total (Initial)	30
T_total (Final)	40
E_total (Initial)	180.5
E_total (Final)	69

TASK GRAPH 4

Task Graph 4

- Task Graph 4 consists of 20 tasks.
- There are multiple entry tasks and one exit task.



Execution Time for Task Graph 4

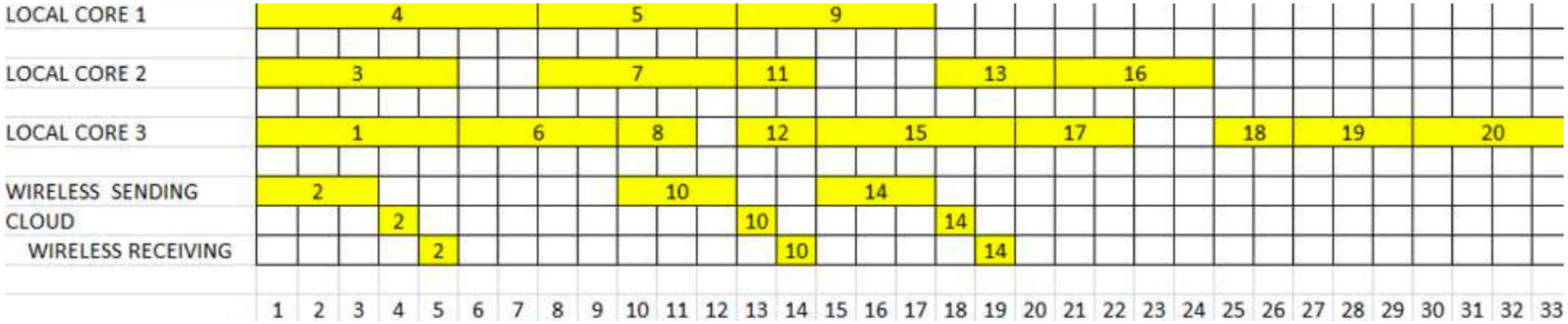
Slowest Core - Core 1
Fastest Core - Core 3

Task	Core 1	Core 2	Core 3
1	9	7	5
2	8	6	5
3	6	5	4
4	7	5	3
5	5	4	2
6	7	6	4
7	8	5	3
8	6	4	2
9	5	3	2
10	7	4	2
11	7	4	2
12	6	3	2
13	5	3	3
14	8	7	4
15	9	8	5
16	6	4	2
17	7	5	3
18	8	4	2
19	9	6	3
20	7	6	4

INITIAL SCHEDULING FOR TASK GRAPH 4

```
Initial schedule:
Task1: local core3, start time is: 0,finish time is: 5
Task2: cloud, start time is: 0,finish time is: 5
Task3: local core2, start time is: 0,finish time is: 5
Task4: local core1, start time is: 0,finish time is: 7
Task6: local core3, start time is: 5,finish time is: 9
Task7: local core2, start time is: 7,finish time is: 12
Task8: local core3, start time is: 9,finish time is: 11
Task11: local core2, start time is: 12,finish time is: 14
Task12: local core3, start time is: 11,finish time is: 13
Task10: cloud, start time is: 9,finish time is: 14
Task5: local core1, start time is: 7,finish time is: 12
Task15: local core3, start time is: 14,finish time is: 19
Task14: cloud, start time is: 14,finish time is: 19
Task9: local core1, start time is: 12,finish time is: 17
Task13: local core2, start time is: 17,finish time is: 20
Task17: local core3, start time is: 19,finish time is: 22
Task16: local core2, start time is: 20,finish time is: 24
Task18: local core3, start time is: 24,finish time is: 26
Task19: local core3, start time is: 26,finish time is: 29
Task20: local core3, start time is: 29,finish time is: 33
 Now the total energy is: 179.5
 Now the completion time is: 33
The running time of initial schedule of Graph is 0.067 ms
```

INITIAL SCHEDULING TASK GRAPH



Program Output for Energy Consumption (Initial Scheduling)

THE COMPLETION TIME OF THE SCHEDULE IS 33.

THE TOTAL ENERGY CONSUMED IS 179.5.

THE RUNNING TIME OF THE INITIAL SCHEDULE PROGRAM IS 0.067 ms.

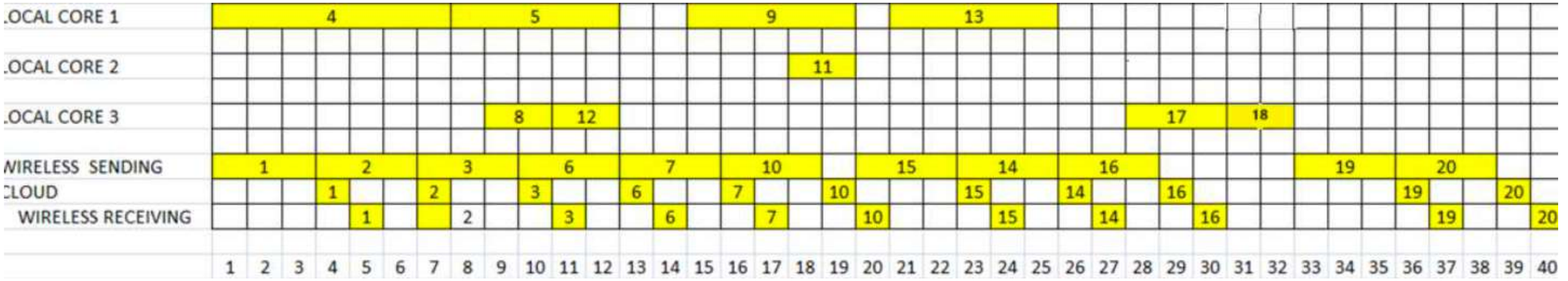
Manual Calculation of Energy Consumption (Initial Scheduling)

$$E1=7+5+5=17;$$
$$E2=(5+5+2+3+4)*2=38;$$
$$E3=30*4=120;$$
$$Es=(3*3*0.5)=4.5;$$
$$E=17+38+120+4.5=179.5$$

Final Scheduling for Task Graph 4

```
After Task Migration:
Task1: cloud, start time is: 0,finish time is: 5
Task2: cloud, start time is: 3,finish time is: 8
Task3: cloud, start time is: 6,finish time is: 11
Task4: local core1, start time is: 0,finish time is: 7
Task6: cloud, start time is: 9,finish time is: 14
Task7: cloud, start time is: 12,finish time is: 17
Task8: local core3, start time is: 8,finish time is: 10
Task11: local core2, start time is: 17,finish time is: 19
Task12: local core3, start time is: 10,finish time is: 12
Task10: cloud, start time is: 15,finish time is: 20
Task5: local core1, start time is: 7,finish time is: 12
Task15: cloud, start time is: 19,finish time is: 24
Task14: cloud, start time is: 22,finish time is: 27
Task9: local core1, start time is: 14,finish time is: 19
Task13: local core1, start time is: 20,finish time is: 25
Task17: local core3, start time is: 27,finish time is: 30
Task16: cloud, start time is: 25,finish time is: 30
Task18: local core3, start time is: 30,finish time is: 32
Task19: cloud, start time is: 32,finish time is: 37
Task20: cloud, start time is: 35,finish time is: 40
 Now the total energy is: 78.5
 Now the completion time is: 40
The running time of task migration of Graph 1 is 32.09 ms
```

Final Scheduling Task Graph



Program Output for Energy Consumption (Final Scheduling)

- THE COMPLETION TIME OF THE SCHEDULE IS 40.
- THE TOTAL ENERGY CONSUMED IS 78.5.
- THE RUNNING TIME OF THE INITIAL SCHEDULE PROGRAM IS 32.09 ms.

Manual Calculation of Energy Consumption (Final Scheduling)

$$E1=(7+5+5+5)*1=22;$$
$$E2=(2)*2=4;$$
$$E3=(2+2+3+2)*4=36;$$
$$Es=(3*11*0.5)=16.5;$$
$$E=22+4+36+16.5=78.5$$

Summary of Task Graph 4

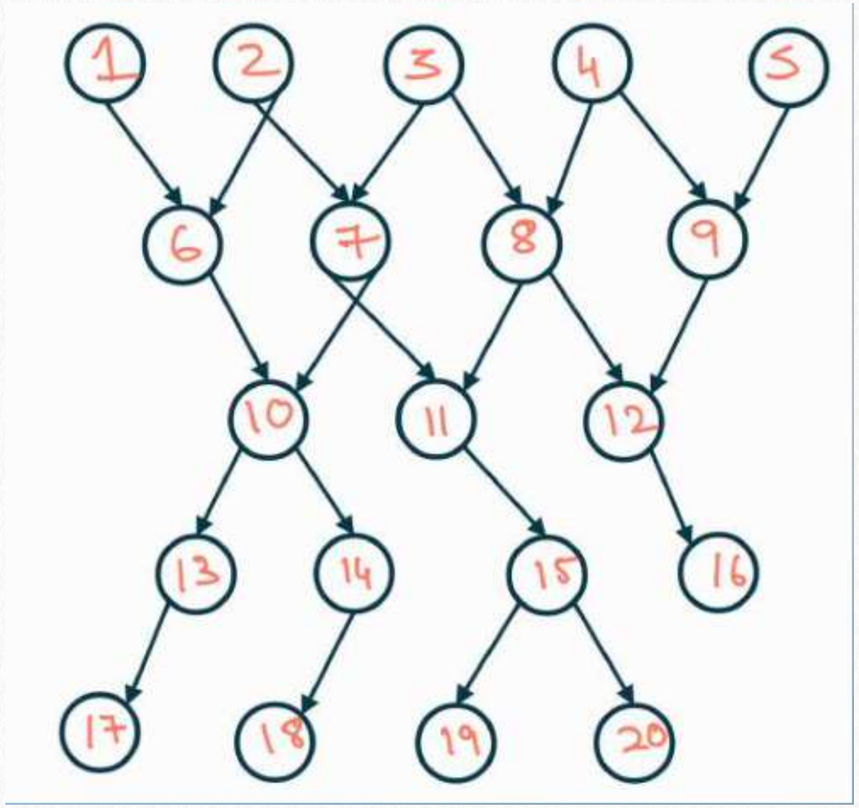
- Total Time Taken for Initial Scheduling:33
- Total Time Taken for Final Scheduling:40
- Compared to Initial Scheduling. Energy Consumption in Final Scheduling is lesser.

	Value
T_total (Initial)	33
T_total (Final)	40
E_total (Initial)	179.5
E_total (Final)	78.5

TASK GRAPH 5

Task Graph 4

- Task Graph 5 consists of 20 tasks.
- There are multiple entry tasks and multiple exit tasks.



Execution Time for Task Graph 5

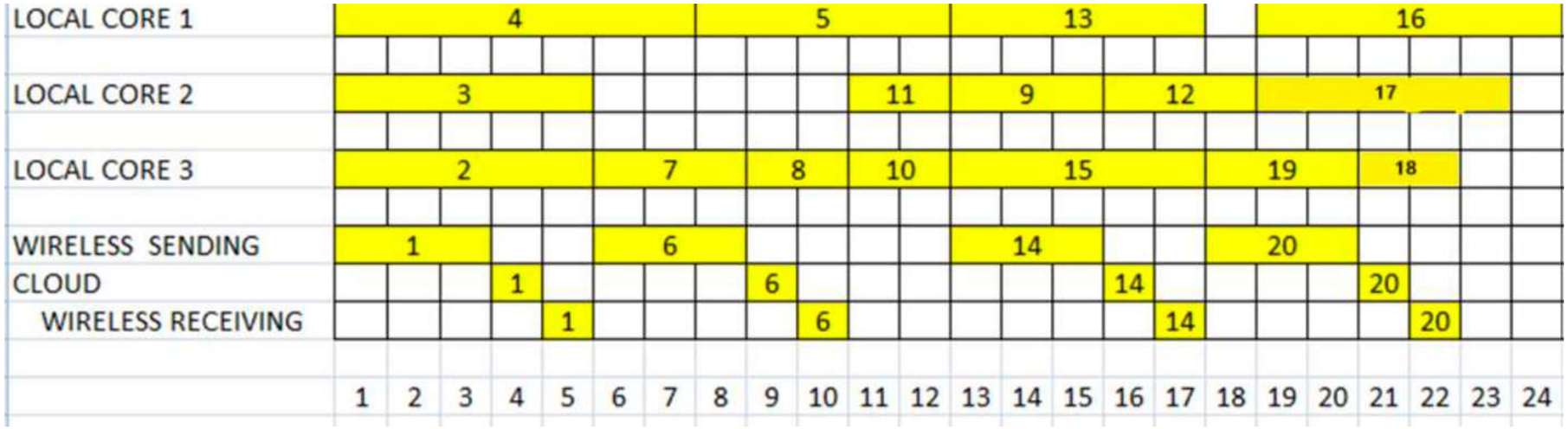
Slowest Core - Core 1
Fastest Core - Core 3

Task	Core 1	Core 2	Core 3
1	9	7	5
2	8	6	5
3	6	5	4
4	7	5	3
5	5	4	2
6	7	6	4
7	8	5	3
8	6	4	2
9	5	3	2
10	7	4	2
11	7	4	2
12	6	3	2
13	5	3	3
14	8	7	4
15	9	8	5
16	6	4	2
17	7	5	3
18	8	4	2
19	9	6	3
20	7	6	4

INITIAL SCHEDULING FOR TASK GRAPH 5

```
Initial schedule:
Task2: local core3, start time is: 0,finish time is: 5
Task1: cloud, start time is: 0,finish time is: 5
Task3: local core2, start time is: 0,finish time is: 5
Task4: local core1, start time is: 0,finish time is: 7
Task7: local core3, start time is: 5,finish time is: 8
Task8: local core3, start time is: 8,finish time is: 10
Task6: cloud, start time is: 5,finish time is: 10
Task11: local core2, start time is: 10,finish time is: 12
Task10: local core3, start time is: 10,finish time is: 12
Task5: local core1, start time is: 7,finish time is: 12
Task15: local core3, start time is: 12,finish time is: 17
Task9: local core2, start time is: 12,finish time is: 15
Task14: cloud, start time is: 12,finish time is: 17
Task13: local core1, start time is: 12,finish time is: 17
Task12: local core2, start time is: 15,finish time is: 18
Task19: local core3, start time is: 17,finish time is: 20
Task20: cloud, start time is: 17,finish time is: 22
Task17: local core2, start time is: 18,finish time is: 23
Task18: local core3, start time is: 20,finish time is: 22
Task16: local core1, start time is: 18,finish time is: 24
 Now the total energy is: 153
 Now the completion time is: 24
The running time of initial schedule of Graph is 0.056 ms
```

INITIAL SCHEDULING TASK GRAPH



Program Output for Energy Consumption (Initial Scheduling)

The completion time of the schedule is 24.

The total energy consumed is 153.

The running time of the initial schedule program is 0.056 ms

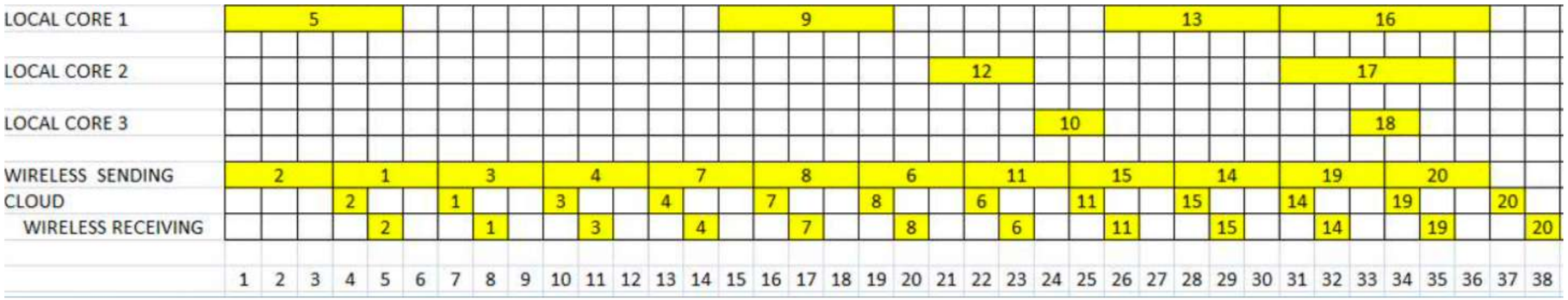
Manual Calculation of Energy Consumption (Initial Scheduling)

$$E1=(7+5+5+6)*1=23;$$
$$E2=(5+2+3+3+5)*2=36;$$
$$E3=(5+3+2+2+5+3+2)*4=88;$$
$$Es=(3*4*0.5)=6;$$
$$E=23+36+88+6=153$$

Final Scheduling for Task Graph 5

```
After Task Migration:
Task2: cloud, start time is: 0,finish time is: 5
Task1: cloud, start time is: 3,finish time is: 8
Task3: cloud, start time is: 6,finish time is: 11
Task4: cloud, start time is: 9,finish time is: 14
Task7: cloud, start time is: 12,finish time is: 17
Task8: cloud, start time is: 15,finish time is: 20
Task6: cloud, start time is: 18,finish time is: 23
Task11: cloud, start time is: 21,finish time is: 26
Task10: local core3, start time is: 23,finish time is: 25
Task5: local core1, start time is: 0,finish time is: 5
Task15: cloud, start time is: 24,finish time is: 29
Task9: local core1, start time is: 14,finish time is: 19
Task14: cloud, start time is: 27,finish time is: 32
Task13: local core1, start time is: 25,finish time is: 30
Task12: local core2, start time is: 20,finish time is: 23
Task19: cloud, start time is: 30,finish time is: 35
Task20: cloud, start time is: 33,finish time is: 38
Task17: local core2, start time is: 30,finish time is: 35
Task18: local core3, start time is: 32,finish time is: 34
Task16: local core1, start time is: 30,finish time is: 36
 Now the total energy is: 71
 Now the completion time is: 38
The running time of task migration of Graph 1 is 22.255 ms
```

Final Scheduling Task Graph



Program Output for Energy Consumption (Final Scheduling)

- The completion time of the schedule is 38.
- The total energy consumed is 71.
- The running time of the initial schedule program is 22.255 ms.

Manual Calculation of Energy Consumption (Final Scheduling)

$$E1=(5+5+5+6)*1=21;$$
$$E2=(3+5)*2=16;$$
$$E3=(2+2)*4=16;$$
$$Es=(3*12*0.5)=16.5;$$
$$E=21+16+16+18=71$$

Summary of Task Graph 5

- Total Time Taken for Initial Scheduling: 24
- Total Time Taken for Final Scheduling: 38

Compared to Initial Scheduling. Energy Consumption in Final Scheduling is lesser.

	Value
T_total (Initial)	24
T_total (Final)	38
E_total (Initial)	153
E_total (Final)	71