Dataset Simulation for Multi-Objective Task Scheduling in Green Fog Computing

1. Attributes and Value Ranges

1.1 Task Attributes

Attribute	Symbol	Acceptable Value Range
CPU demand	R_i^{cpu}	$10^3 - 10^6$ cycles/second
Memory demand	R_i^{mem}	10 MB - 10 GB
Bandwidth demand	R_i^{bw}	$1 - 1000$ Mbps
Deadline	D_i^{deadline}	$0.1 - 5$ seconds
Data size to transfer	C_i^{data}	$0.1 - 500$ MB
Priority level	T_i^{priority}	$1 - 10$ (higher means higher priority)

1.2 Fog Node Attributes

Attribute	Symbol	Acceptable Value Range
Total CPU capacity	C_j^{cpu}	$10^6 - 10^9$ cycles/second
Total memory capacity	C_j^{mem}	1 GB - 128 GB
Total bandwidth capacity	C_j^{bw}	$100 - 10,000$ Mbps
Idle power consumption	P_j^{idle}	$5 - 50$ Watts
Active power consumption	P_j^{active}	$0.1 - 2$ Watts per resource unit
Usage cost	F_j^{cost}	$0.01 - 0.5$ USD per unit resource usage

1.3 Network Attributes

Attribute	Symbol	Acceptable Value Range
Available bandwidth	B_{ij}	$100 - 10,000$ Mbps
Communication latency	L_{ij}^{comm}	$0.01 - 0.2$ seconds

1.4 General Parameters

- Number of tasks (N_T): $50 - 1000$.

- Number of fog nodes (N_F): $5 - 50$.

2. Random Dataset Generation

The following rules apply for random dataset generation:

2.1 Tasks

For each task i:

- $R_i^{\text{cpu}} \sim \text{Uniform}(10^3, 10^6)$.

- $R_i^{\text{mem}} \sim \text{Uniform}(10, 10{,}000)$ MB.

- $R_i^{\text{bw}} \sim \text{Uniform}(1, 1000)$ Mbps.

- $D_i^{\text{deadline}} \sim \text{Uniform}(0.1, 5)$ seconds.

- $C_i^{\text{data}} \sim \text{Uniform}(0.1, 500)$ MB.

- $T_i^{\text{priority}} \sim \text{Uniform}(1, 10)$.

2.2 Fog Nodes

For each fog node j:

- $C_j^{\text{cpu}} \sim \text{Uniform}(10^6, 10^9)$ cycles/second.

- $C_j^{\text{mem}} \sim \text{Uniform}(1, 128)$ GB.

- $C_j^{\text{bw}} \sim \text{Uniform}(100, 10{,}000)$ Mbps.

- $P_j^{\text{idle}} \sim \text{Uniform}(5, 50)$ Watts.

- $P_j^{\text{active}} \sim \text{Uniform}(0.1, 2)$ Watts per resource unit.

- $F_j^{\text{cost}} \sim \text{Uniform}(0.01, 0.5)$ USD.

2.3 Network

For each task-node pair (i, j):

- $B_{ij} \sim \text{Uniform}(100, 10{,}000)$ Mbps.

- $L_{ij}^{\text{comm}} \sim \text{Uniform}(0.01, 0.2)$ seconds.