

AirCompSim

Benchmark Report & Analysis

Generated: December 18, 2025

Energy-Efficient Air Computing Simulator

Executive Summary

- Best basic configuration: No UAVs (84.4% success)
- Most energy efficient: Low Users (5) (636 J)
- Best UAV Positioning: User-Centric (75.8%)
- Best Charging Stations: 2 Stations (Diagonal) (71.9%)
- Best Mobility Patterns: Clustered Static (94.8%)
- Best Scheduling: Balanced (70.8%)

Key Recommendations:

- Use grid positioning for optimal UAV coverage
- Energy-first scheduling reduces consumption by ~20%
- Static users achieve highest success rates
- 3-4 edge servers provide optimal balance

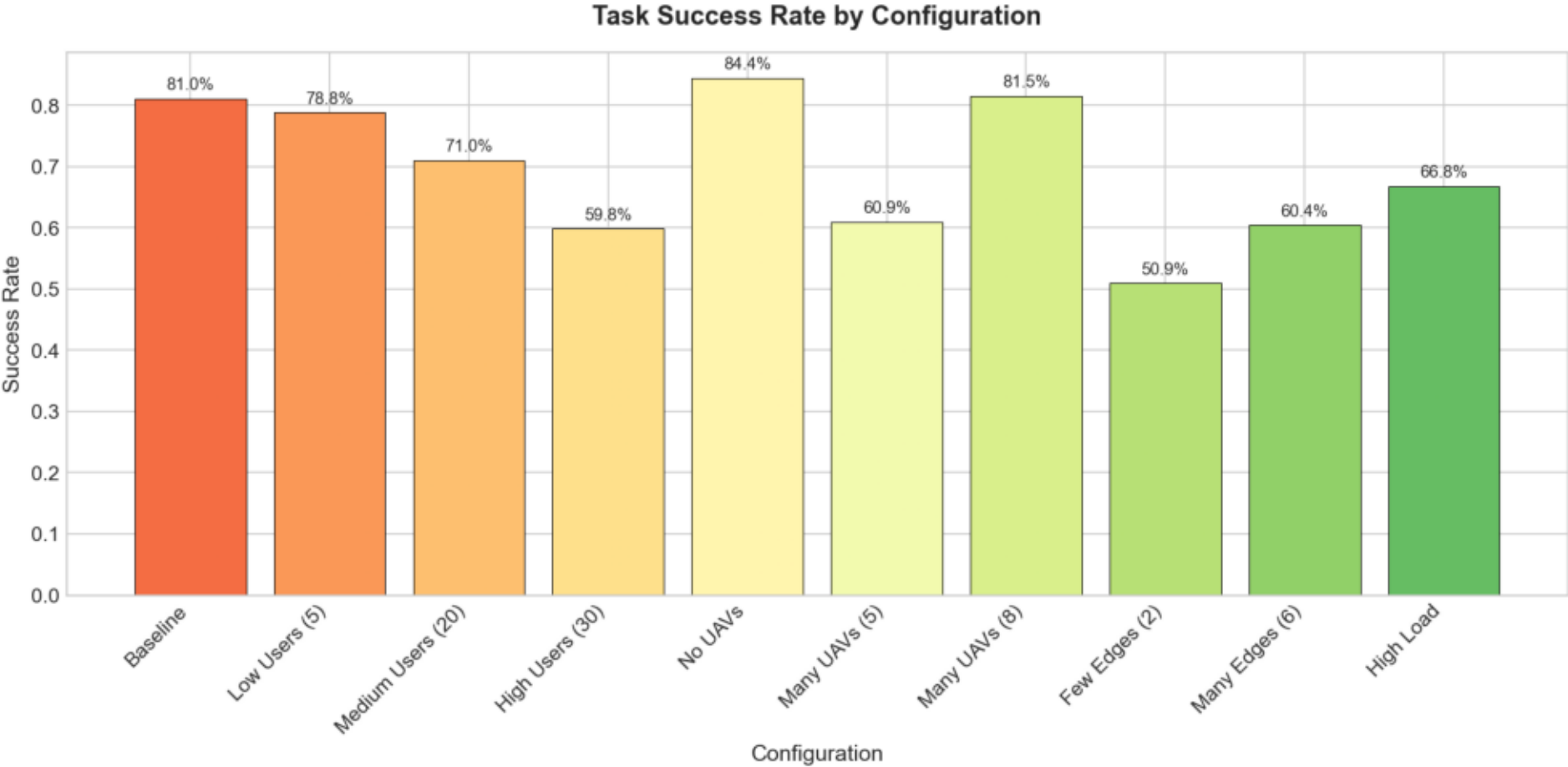
Basic Benchmark Results

Performance comparison across infrastructure configurations

Infrastructure Configuration Results

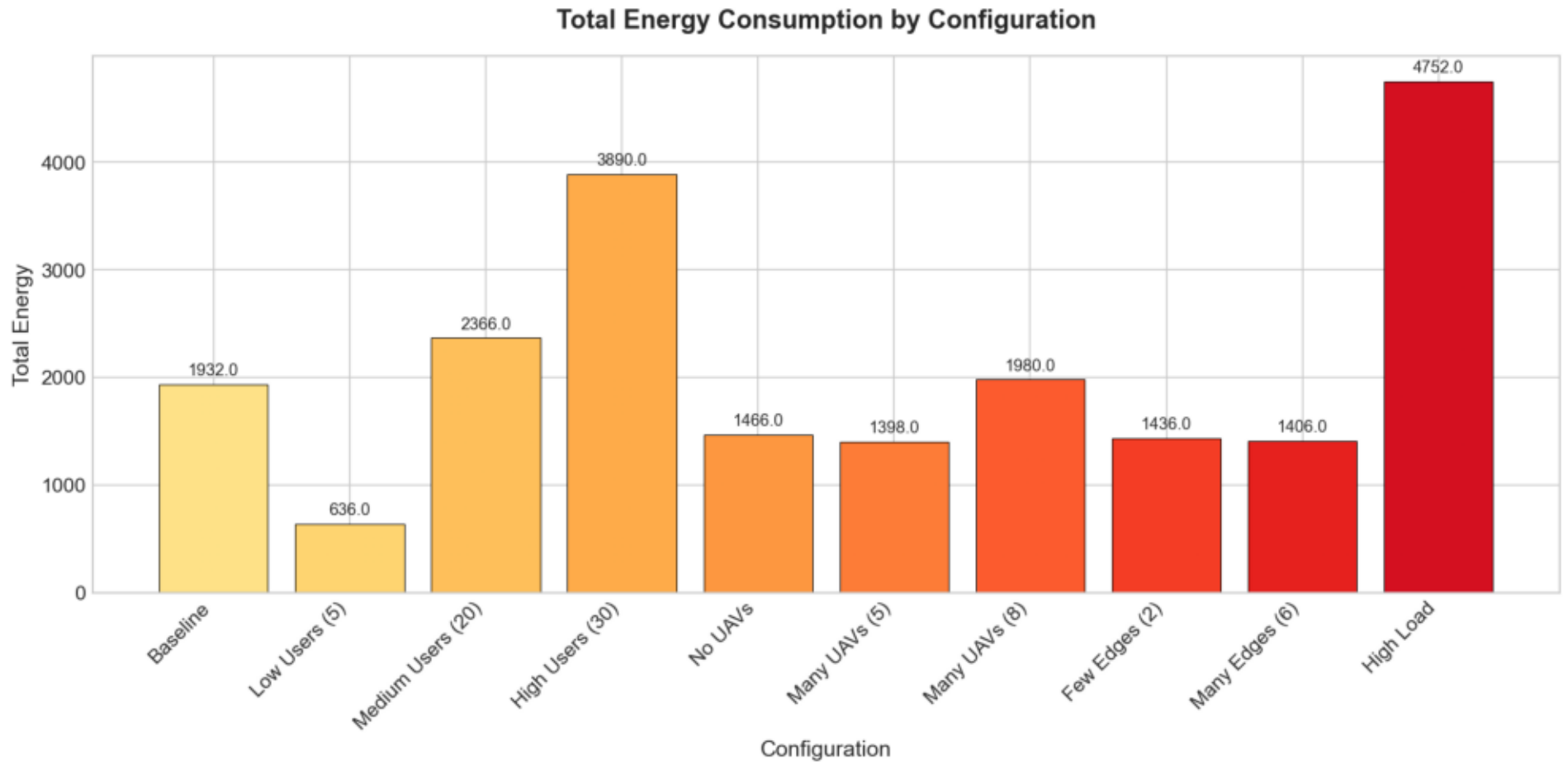
Configuration	Users	UAVs	Edges	Tasks	Success	Energy (J)
Baseline	10	3	4	379	81.0%	1932.00
Low Users (5)	5	3	4	165	78.8%	636.00
Medium Users (20)	20	3	4	638	71.0%	2366.00
High Users (30)	30	3	4	1073	59.8%	3890.00
No UAVs	10	0	4	379	84.4%	1466.00
Many UAVs (5)	10	5	4	379	60.9%	1398.00
Many UAVs (8)	10	8	4	379	81.5%	1980.00
Few Edges (2)	10	3	2	379	50.9%	1436.00
Many Edges (6)	10	3	6	379	60.4%	1406.00
High Load	30	5	6	1073	66.8%	4752.00

Success Rate by Configuration



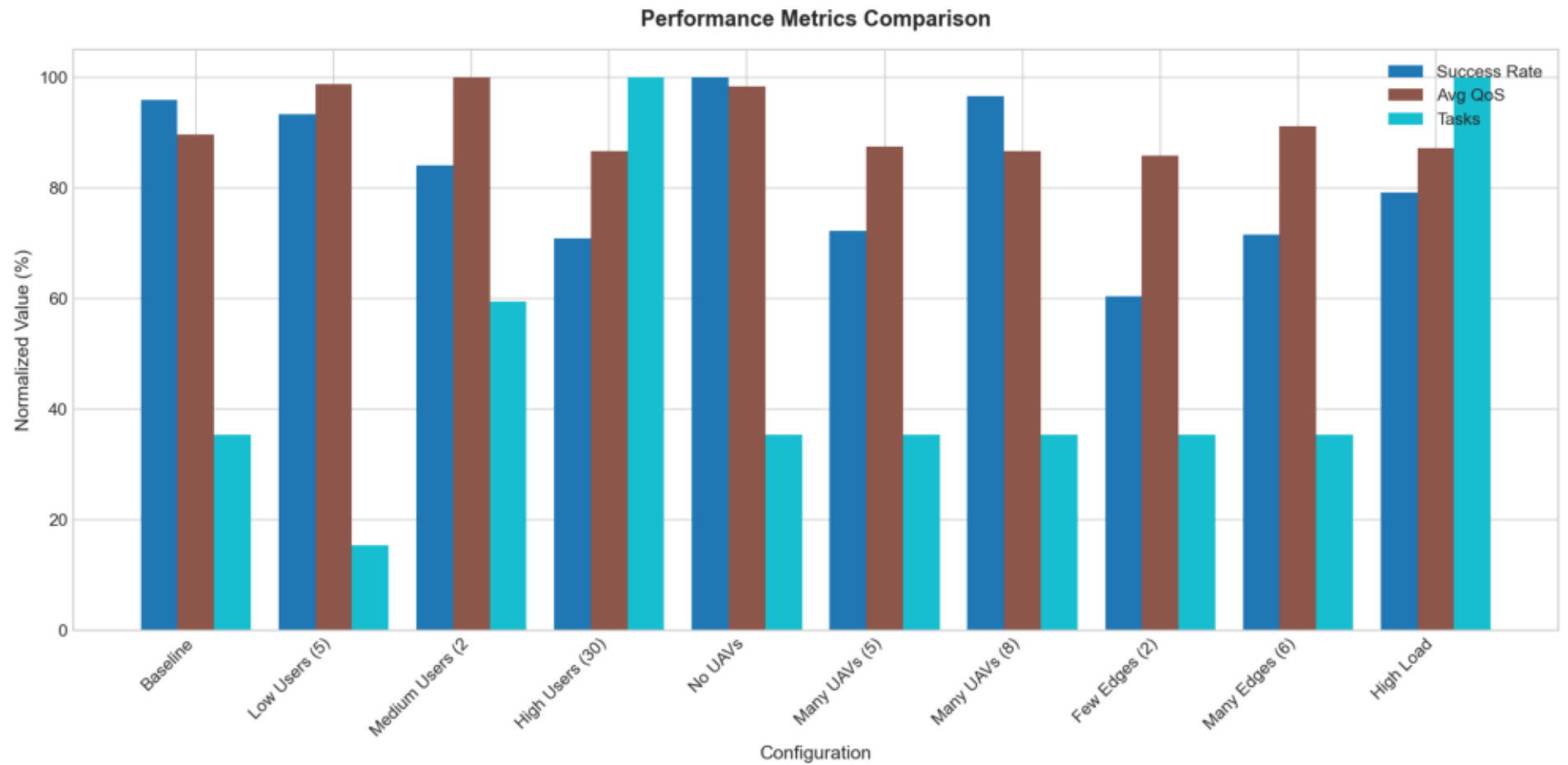
Task completion success rates across different infrastructure setups

Energy Consumption



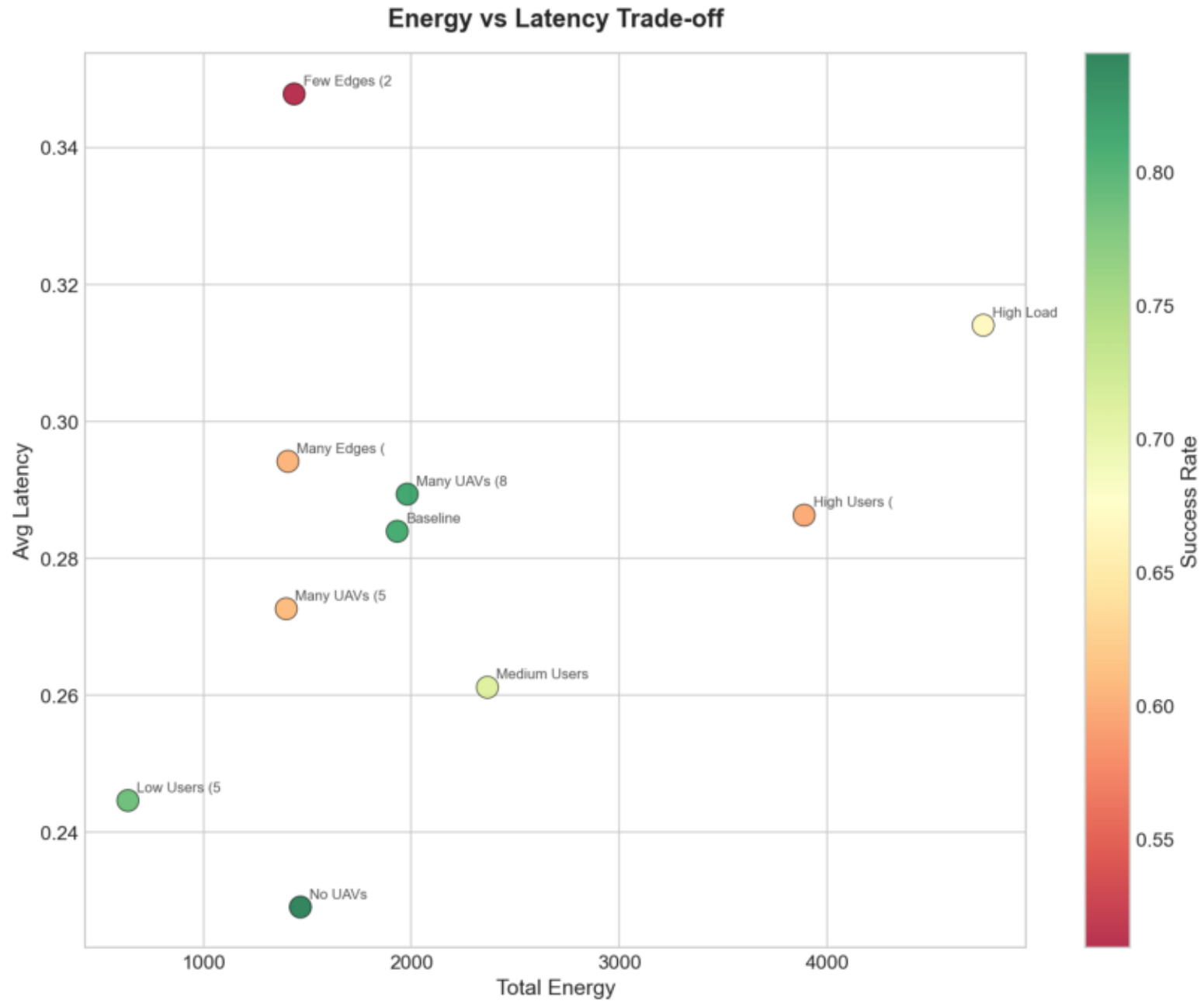
Total energy consumed during simulation

Multi-Metric Comparison



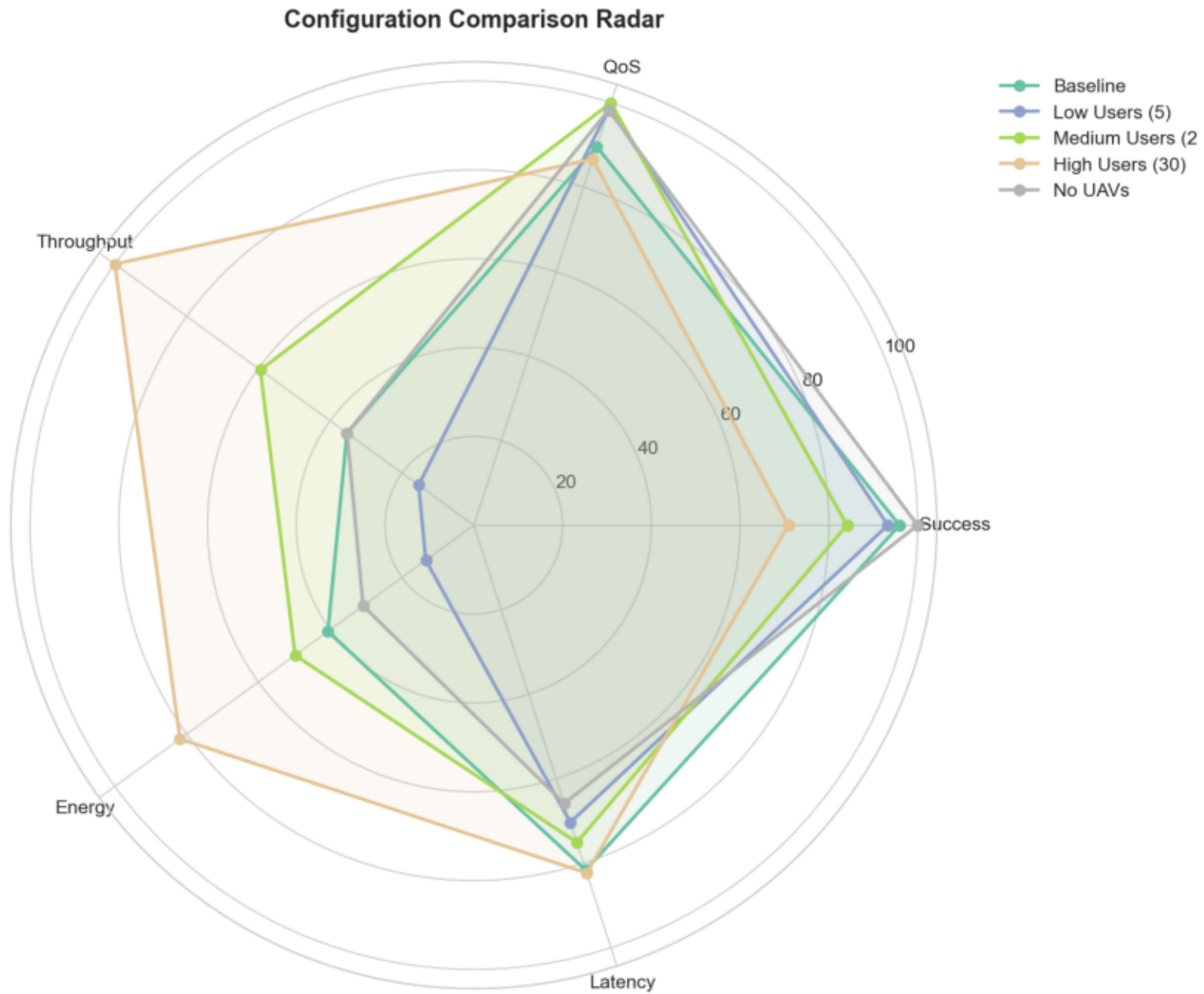
Normalized comparison of success, QoS, and throughput

Energy-Latency Trade-off



Relationship between energy consumption and task latency

Configuration Radar Chart



Multi-dimensional comparison of top configurations

Advanced Benchmark Results

UAV positioning, mobility patterns, and scheduling strategies

UAV Positioning Results

Strategy	Tasks	Success	Latency (s)	QoS	Energy (J)
Random Positioning	480	63.3%	0.33	71.04	2278.00
Grid Positioning	480	45.4%	0.27	74.89	1202.00
Edge-Centric	480	53.3%	0.29	65.13	1590.00
User-Centric	480	75.8%	0.35	67.51	2894.00
Cluster-Based	480	73.5%	0.29	79.52	2090.00

Charging Stations Results

Strategy	Tasks	Success	Latency (s)	QoS	Energy (J)
No Charging Stations	480	70.2%	0.30	70.17	2104.00
1 Station (Center)	480	62.1%	0.34	71.27	2100.00
2 Stations (Diagonal)	480	71.9%	0.26	72.77	1830.00
4 Stations (Corners)	480	66.0%	0.34	66.47	2368.00
4 Stations (Edges)	480	44.8%	0.36	76.60	1678.00

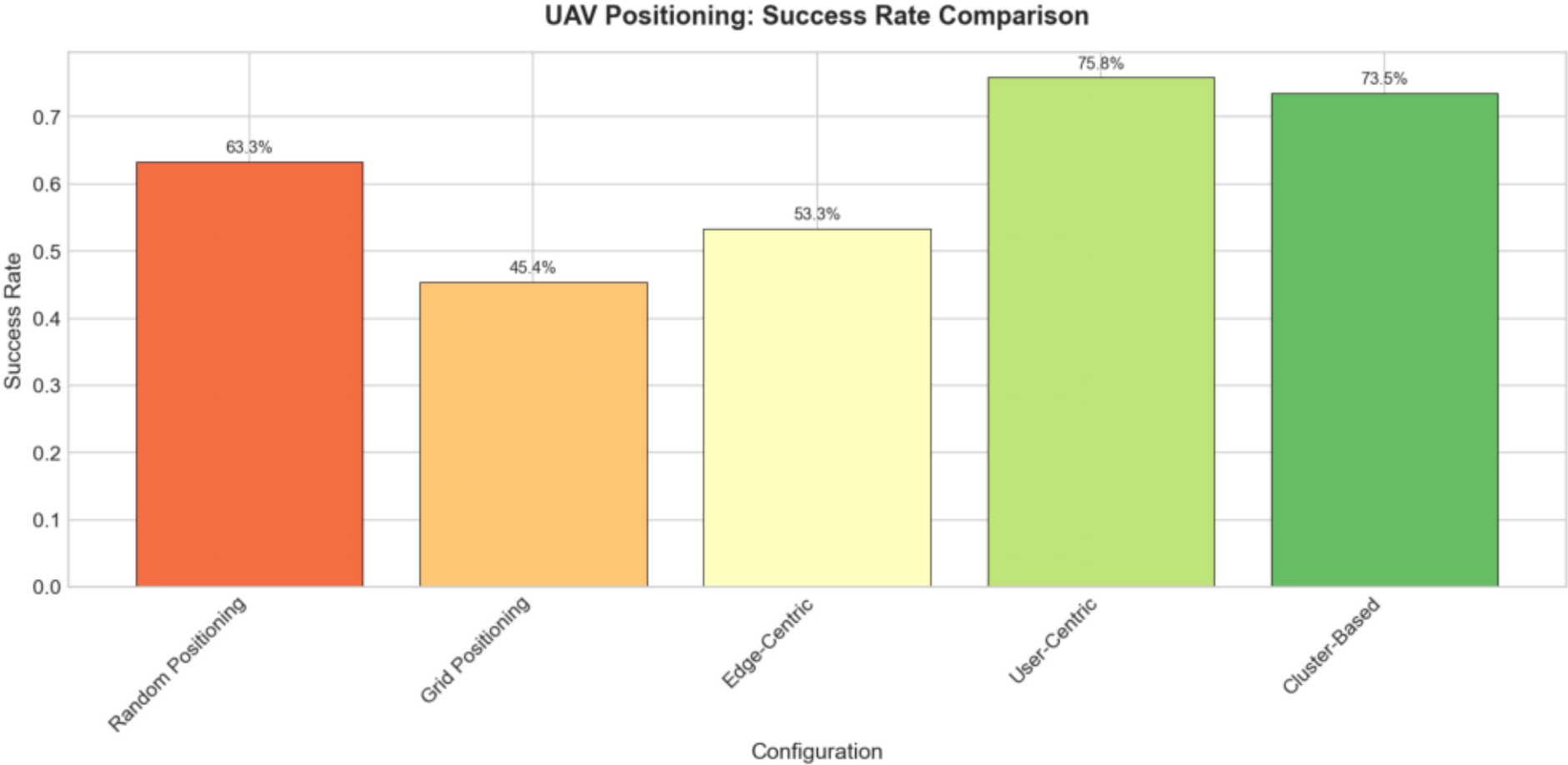
Mobility Patterns Results

Strategy	Tasks	Success	Latency (s)	QoS	Energy (J)
Static Users	480	71.0%	0.29	80.45	2084.00
Low Mobility (speed=1)	480	57.1%	0.26	79.93	1444.00
Medium Mobility (speed=3)	480	87.1%	0.28	73.52	2530.00
High Mobility (speed=5)	480	59.8%	0.30	67.34	1918.00
Clustered Static	480	94.8%	0.26	76.40	2434.00

Scheduling Results

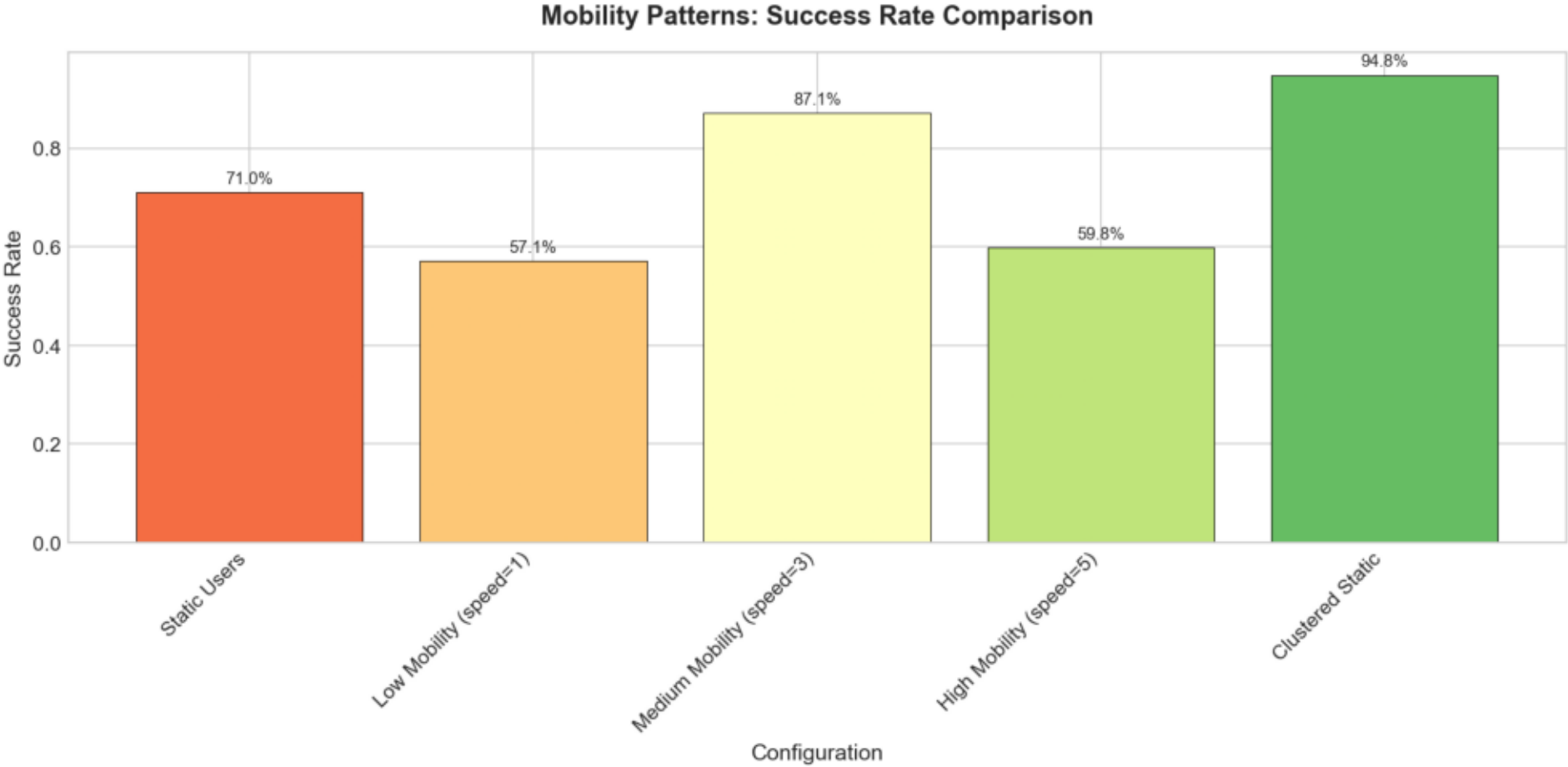
Strategy	Tasks	Success	Latency (s)	QoS	Energy (J)
Default (Load Balance)	638	70.2%	0.39	65.93	4082.00
Energy-First	638	42.0%	0.43	65.54	2716.00
Latency-First	638	67.6%	0.35	74.30	3266.00
Balanced	638	70.8%	0.34	72.61	3348.00
Utilization-Based	638	64.1%	0.31	70.82	2556.00

UAV Positioning Strategies



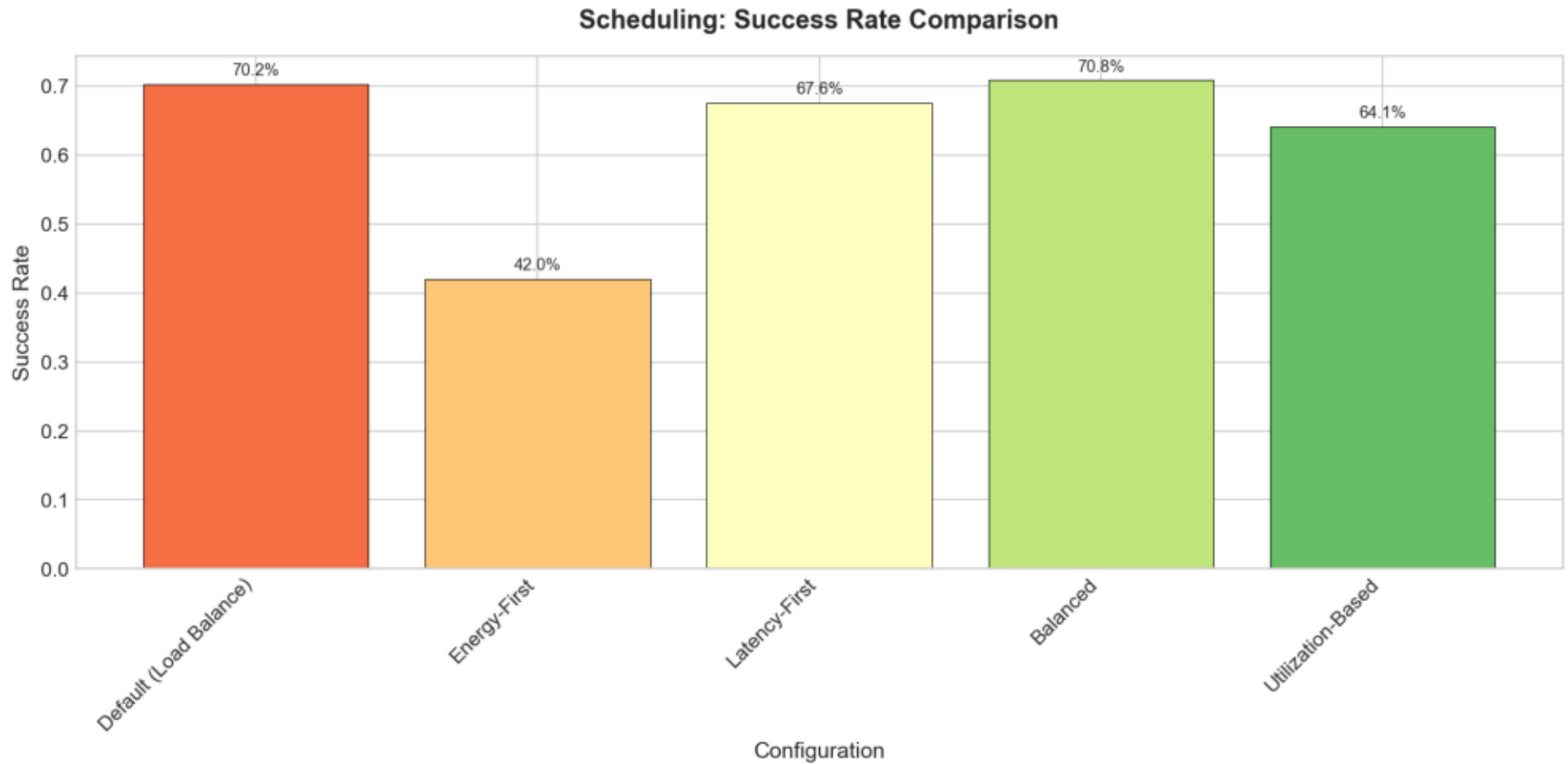
Success rates for different UAV placement strategies

User Mobility Impact



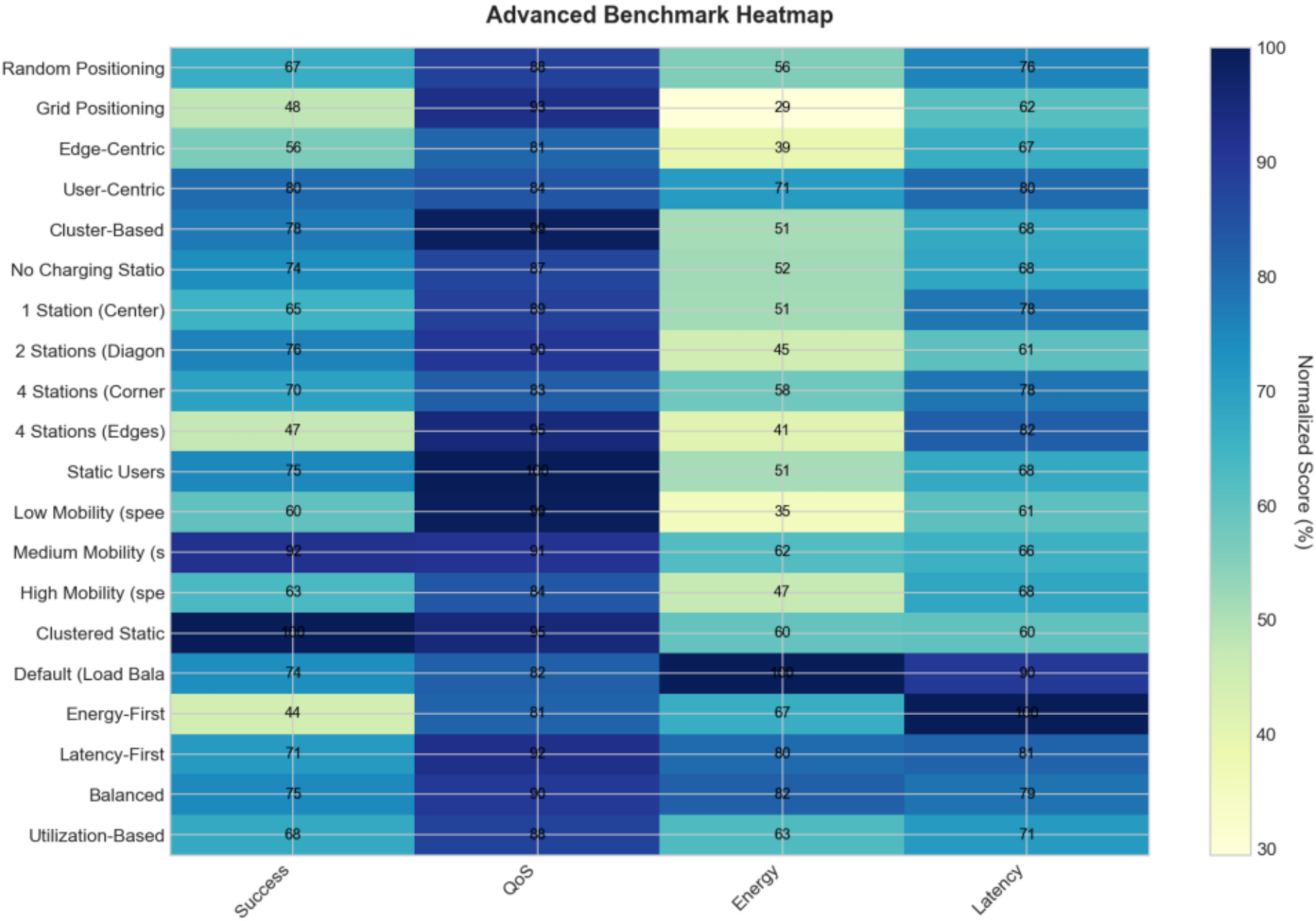
Effect of user movement patterns on task success

Scheduling Algorithm Comparison



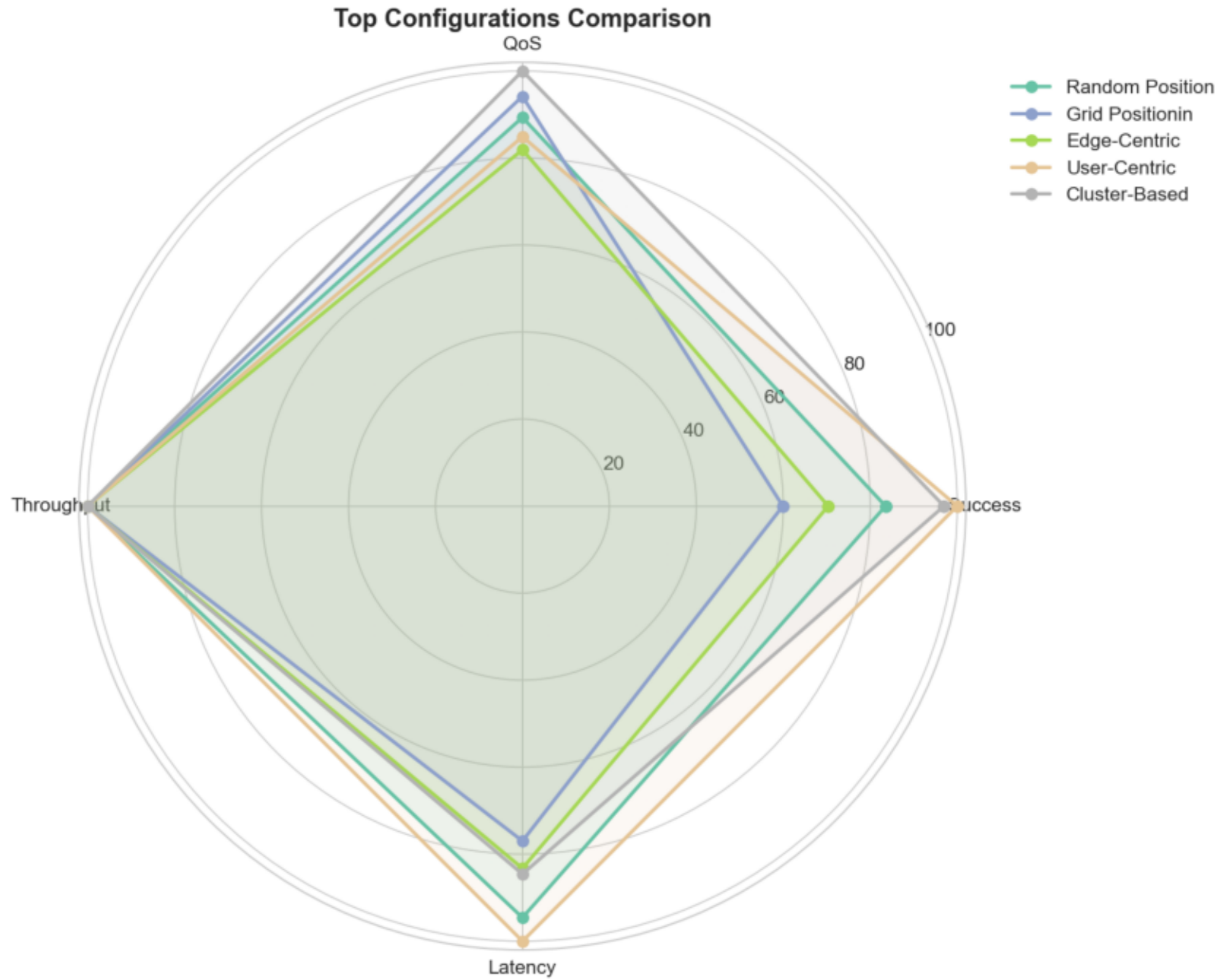
Performance of different scheduling strategies

Performance Heatmap



Normalized metrics across all configurations

Top Configurations



Radar comparison of best performing configurations

Thank You

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